2005 Manufacturing Technologies Competencies Correlated with Ford PAS

Competency		Ford PAS Modules
MANUFACTURING TECHNOLOGIES CORE		
Unit 1: Career Exploration and Development		
1.1	Explore career pathways in manufacturing technology	4
1.2	Explore professional development and career advancement opportunities for a manufacturing technology professional	4
1.3	Explain apprenticeship and their role in the manufacturing industry	3,4
1.4	Demonstrate positive work behaviors and personal qualities	4,6
1.5	Develop personal career goals and the objectives to meet those career goals	4
Unit 2: Business Practices		
2.1	Develop a business process model for manufacturing operations	1,6,7,8
2.2	Analyze the manufacturing industry	1,3,4,5,6,7,8
2.3	Analyze trends and issues in the manufacturing industry	1,3,4,5,6,7,8
2.4	Explain how planning and budgeting are used to accomplish organizational goals and objectives	1,6,7,8,9,11
2.5	Explain material control and product inventories necessary to meet customer and business requirements	6,7,8,11
2.6	Benchmark financial and market performance against competitors	8,11,14
2.7	Explain how changes outside the manufacturing business impact the manufacturing process	1,3,4,5,6,7,11,14,15
2.8	Explain the role of risk management in reducing risks and improving performance in manufacturing businesses	3,5,6
2.9	Explain the roles and functions of government in regulating and supporting manufacturing business	4,5,14
2.10	Explain how manufacturing businesses manage customer relationships	1,8,15
2.11	Develop a management plan for business	5,6,7
2.12	Identify basic procedures in the accounting cycle	7

Unit 3: Communications		
3.1	Apply active listening skills to obtain and clarify information provided in oral communication	1,2,3,4,10,12,15
3.2	Listen and speak effectively to contribute to group discussions and meetings	1,2,5,6,10,12
	Competency	
3.3	Deliver formal and informal presentations that demonstrate organization and delivery skill	2,4,5,6,7,11,12
3.4	Write and utilize coherent and focused technical communications that support a defined perspective	1,2,10,11
3.5	Employ information technology applications	1,2,3,4,6,7,8,9,10,11,12,14
3.6	Utilize written documents to direct the work	1,2,3,4,5,8,9,11,12,15
3.7	Explain the fundamentals of manufacturing drawings, schematics, specifications and diagrams	1,10,11
3.8	Research and respond to customer needs	1,7,8,9,10,11,15
Unit 4: Problem Solving and Critical Thinking		
4.1	Employ critical thinking and problem solving skills independently or in teams to formulate solutions to problems	1,2,5,6,8,9,10,11,12,13,14,15
4.2	Apply problem solving and critical thinking techniques to the conflict between available resources, requirements of the project and manufacturing timelines	1,4,6,8,10,11
4.3	Combine critical thinking and team-building skills to solve problems	1,2,5,6,8,10,11,12,13
4.4	Evaluate and adjust plans/schedules to respond to unexpected events and conditions	1,6,7,8
Unit 5: Leadership and Teamwork		
5.1	Summarize the interpersonal skills that contribute to positive leadership and teamwork	1,2,5,6,7,11,13,14,15
5.2	Demonstrate the ability to work on a team and recognize the importance of teamwork and its impact on business in a manufacturing environment	1,4,6,10,11
5.3	Perform responsibly as a team member	1-15
5.4	Use motivational techniques to enhance performance in others	1-15
5.5	Describe the basic origins of conflict and needs that motivate behavior	1,5
5.6	Examine the different responses to conflict as they relate to results	1,5
5.7	Resolve conflicts to maintain a smooth workflow	1,5,6

Unit 6: Legal and Ethical Aspects		
6.1	Differentiate between legal and ethical issues	3,5,9,10
6.2	Complete work-related duties within an ethical framework	5,9,10,11,15
6.3	Assess the implications of ethical/unethical behavior	5,7,9,10,15
6.4	Perform duties according to laws, regulations, contract provisions, and policies	3,5,10,14,15
6.5	Comply with applicable governmental regulations and codes	3,5,15
6.6	Explain employee and employee liability	-
Unit 7: Safety		
7.1	Maintain general safety in accordance with government regulations, health standards, and company policy	-
	Competency	
7.2	Evaluate the ergonomic factors associated with the manufacturing industry	11
7.3	Identify state, federal, and local worker safety, health, and environmental regulations	3,5,14,15
7.4	Demonstrate practices that contribute to an accident-free environment	-
7.5	Explain emergency response plans in a variety of industry settings	-
7.6	Complete requirements for First Aid/CPR certification	-
7.7	Complete and apply operations and safety training on all new equipment	-
Unit 8: Health and Environment		
8.1	Identify practices that contribute to a healthy environment	5,15
8.2	Explain the environmental aspects of work-sites with contaminated waste	5,15
8.3	Handle hazardous materials in accordance with government regulations and health standards	-
8.4	Identify the relationship between production processes and human health and environmental problems	1,5,12,15
Unit 9: Tools and Equipment		
9.1	Identify basic tools and equipment appropriate to manufacturing	-
9.2	Demonstrate appropriate use of basic hand tools to complete work functions	-
9.3	Operate power tools and stationary equipment	-
9.4	Maintain hand and power tools appropriate to manufacturing	-
9.5	Use appropriate personal protection equipment (PPE)	-

Unit 10: Manufacturing Technology Basics		
10.1	Evaluate products in relation to size, proportion and tolerances	8,10,11
10.2	Interpret drawings, prints, and schematics	1,8,10,11
10.3	Demonstrate basic drawing skills	10,11
10.4	Describe basic electrical and electronic theory	12
10.5	Identify voltage, current, resistance, charge and load using electrical test equipment	12
10.6	Describe basic hydraulic and pneumatic systems	-
10.7	Describe fluid flow concepts	-
10.8	Describe welding procedures for metals and plastics	-
10.9	Describe materials joining procedures	-
10.10	Identify machining procedures for metals and plastics	10
10.11	Describe the applications of basic mechanical physics	-
10.12	Describe plastic processing and compounding	5,10
10.13	Test materials for type and quality	10
	Competency	-
10.14	Perform preventive and predictive maintenance in accordance with guidelines specified by manufacturer and/or outside authorities with jurisdiction	-
10.15	Explain the impact of emerging technologies in manufacturing	5,12
10.16	Describe basic metallurgy and metal processing	-
MANUFACTURING OPERATIONS		
Unit 11: Management		
11.1	Recognize management styles and organizational concepts	6,8
11.2	Describe human resources and integrated teams	6,8,11,13,14
11.3	Provide leadership to individuals and teams	1,2,5,6,7,11,13,14,15
11.4	Describe risk management	5,6,14
11.5	Analyze and demonstrate effective project management	1-15
11.6	Identify material characteristics and manufacturing process needed to produce a product	1,10
11.7	Research and discuss trends in automated manufacturing	6
11.8	Develop a business process model for manufacturing operations	1,6,7,8
11.9	Examine and apply the most appropriate manufacturing process	6,10
11.10	Coordinate work teams to produce product	1,6
11.11	Explain production floor execution and control	6
11.12	Discuss procedures to implement new manufacturing process	6,10

11.13	Explain material procurement, handling, and cost analysis	7,10
11.14	Explain marketing concepts that affect manufacturing process	2,4,7,10,11
Unit 12: Process and Product Quality Assurance		
12.1	Implement continual improvement actions	2,8
12.2	Explain quality and productivity	2,6,8
12.3	Employ audits and inspections to maintain quality and continual improvement processes	8
12.4	Utilize automated data collection techniques	8
12.5	Apply the principles of probability and statistics to quality management	8
12.6	Correct processes to assure that products meet quality standards	6,8
12.7	Evaluate the product design for its impact on quality assurance	8,10,11
Unit 13: Logistics		
13.1	Explain the nature and scope of logistics and supply chain management	1,4,5,8
13.2	Demonstrate the basics of supply chain management	5,8
	Competency	
13.3	Explain the scope of domestic and global transportation	-
13.4	Explain the general costs included in transportation rates	-
13.5	Describe various domestic and international transportation documents	-
13.6	Assess the advantages and disadvantages of warehousing	6
13.7	Manage inventory to meet production requirement	6,8
13.8	Explain how packaging influences logistic activities	1,10,11
13.9	Explain the relationship between production, logistics and inventory	1,6
13.10	Assess the nature and scope of reverse logistics	-
13.11	Describe the importance of the process of shipping and receiving to meet customer satisfaction	8
Unit 14: Maintenance		
14.1	Analyze the role of maintenance in manufacturing operations	-
14.2	Demonstrate the benefits of predictive and preventive maintenance	-
14.3	Maintain hands-on knowledge of equipment operations to identify maintenance needs	-
14.4	Identify, diagnose and repair equipment problems	-
14.5	Explain the advantages of preventative versus breakdown maintenance	-
14.6	Explain the installation, customization, or upgrading of equipment	-

Unit 15: Manufacturing Costs		
15.1	Identify the range of costs required to produce a product	1,7,10
15.2	Evaluate the range of labor costs required to produce a product	7
15.3	Evaluate the range of material costs required to produce a product	7,10
15.4	Evaluate the range of equipment and tooling costs required to produce a product	7,10
15.5	Evaluate the range of energy costs required to produce a product	5,7,10,12
15.6	Identify the range of purchased services required to produce a product	7
15.7	Discuss the impact domestic and international economic conditions on product costs	13,14,15
Unit 16: Marketing		
16.1	Define product, price, place, and promotion and explain how they apply to manufacturing processes	2,7
16.2	Explain the scope of demand forecasting as it impacts manufacturing operations	7
16.3	Explain market research as a formal and informal process	1,2,7
Competency		
Unit 17: Safety, Health and Environment		
17.1	Determine a product's impact on health and environment	5,15
17.2	Describe continual improvement in health, safety, and environmental practices	5,15
DEVELOPMENT AND DESIGN		
Unit 18: Design Process		
18.1	Explain the design process	1,10,11
18.2	Describe the principles of engineering design	10,11
18.3	Diagram the lifecycle of a product	1,5
18.4	Maintain a journal to document progress during the development phase	10,11,12
18.5	Demonstrate quality assurance in the development phase	8
18.6	Analyze the role of research and development, invention, and innovation, and experimentation in design problem solving	1,7,10,11
18.7	Describe basic production systems	1,6
18.8	Examine the role of packaging and shipping in product design	1,8,10
18.9	Explain the design considerations for product recycling or disposal	5,11
18.10	Evaluate cost associated with design features	7,10
Unit 19: Teamwork and Project Management		
19.1	Employ teamwork skills as a technical member of a cross-functional project team	1,8,10,11

19.2	Explain the organization and project structure	1,6
19.3	Demonstrate effective project management techniques	1-15
19.4	Communicate with internal customers	1,4,15
Unit 20: Marketing		
20.1	Explore marketing potential for a product	1,2,7,10
20.2	Determine the aspects of a product's design that are important to consumers, producers, and other stakeholder groups	1,2,7,10,11
Unit 21: Technical Applications		
21.1	Demonstrate technical applications common to all types of drafting	10
21.2	Construct various geometric forms and shapes	1,10,11
21.3	Describe geometric constraints	
21.4	Demonstrate technical knowledge and skills for making basic orthographic drawings	11
21.5	Sketch views of given objects	1,10,11
21.6	Evaluate a sketch and generate a model utilizing CAD software	10,11
21.7	Demonstrate technical skills for making pictorial drawings	10,11
Competency		
21.8	Demonstrate technical skills for making auxiliary view drawings	10,11
21.9	Demonstrate technical skills for making sectional view drawings	10,11
21.10	Demonstrate technical skills for making working drawings	1,10,11
21.11	Demonstrate technical skills for making a reverse engineered drawing (as built) from a solid object	10
21.12	Demonstrate technical skills for making technical illustrations	10,11
21.13	Demonstrate technical skills for making engineering drawings	10,11
21.14	Demonstrate the Cartesian Coordinate System	10
21.15	Evaluate and select the necessary view to graphically communicate design features	10,11
21.16	Demonstrate abilities to apply the design process	1,10,11
Unit 22: Modeling		
22.1	Explain the role modeling in the design process	10,11
22.2	Demonstrate assembly modeling skills using CAD to solve a variety of design problems	10,11
22.3	Explore assembly constraints, part libraries, sub-assemblies, driving constraints, and adaptive design	1,10,11
22.4	Select the appropriate modeling materials to complete a three-dimensional prototype/mockup	-

22.5 Evaluate a model for design imperfections	-
Unit 23: Materials	
23.1 Compare/contrast and analyze the physical properties of organics (natural), metals, polymers, ceramics, and composites	5,10
23.2 Assess and document the properties of materials	5,10,12
23.3 Specify the production processes used to create products from categories of materials	1,5,10
23.4 Analyze a material failure	10
23.5 Evaluate types and magnitude of stresses and forces	10
23.6 Explain the effects the stress has on a material and explain how the material will react	10
Unit 24: Quality Assurance	
24.1 Explain the difference between the characteristics of quality in a final product and the control of quality in each step of a process	8
24.2 Explain applications of metrology	-
Competency	
MANUFACTURING SPECIALTIES	
PRECISION MACHINING	
Unit 25: Measuring Workpieces, Drawing Interpretation, and Inspection	
25.1 Demonstrate basic math skills essential to precision machining	-
25.2 Explain the different measuring systems	-
25.3 Identify, explain and utilize measuring tools that are basic to precision machining	-
25.4 Interpret and apply information from prints and drawings	10,11
Unit 26: Benchwork and Layout	
26.1 Perform basic layouts according to print specifications, dimensions, and tolerances	-
26.2 Analyze the materials being used in the manufacturing process	5,10
26.3 Explain heat-treating processes	-
Unit 27: Power Saws	
27.1 Differentiate between the various types of power saws	-
27.2 Operate power saws according to manufacturers' specifications and applicable to machining standards	-
Unit 28: Drilling Machines	
28.1 Sharpen drill bits to specified geometry	-
28.2 Mount workpieces in the appropriate holding devices	-
28.3 Operate drilling machines according to manufacturers' specifications and applicable to machining standards	-

Unit 29: Lathes and Turning Machines	
29.1 Summarize lathes operations	-
29.2 Assess general maintenance procedures	-
29.3 Grind cutting tools	-
29.4 Set up turning operations	-
29.5 Perform turning operations according to print specifications, dimensions, and tolerances	-
Unit 30: Milling Machines	
30.1 Examine the basic functions of the milling machine	-
30.2 Employ general maintenance procedures for milling machines	-
30.3 Set up milling machines according to manufacturers' specifications	-
30.4 Perform milling operations according to print specifications	-
Unit 31: Grinding Machines	
31.1 Examine general maintenance procedures for grinding machines	-
Competency	
31.2 Explain the functions of grinding wheels and dressing devices	-
31.3 Operate pedestal and/or bench grinders	-
31.4 Operate surface grinders	-
31.5 Explain superabrasives	-
Unit 32: Computer Numerical Control (CNC)	
32.1 Demonstrate basic computer numerical control (CNC) machine functions	-
32.2 Prepare CNC programs according to print specifications, dimensions, and tolerances	-
32.3 Set up/operate CNC milling machines	-
32.4 Set up/operate CNC turning machines	-
32.5 Identify advanced manufacturing techniques	10
Unit 33: Job Planning and Management	
33.1 Identify planning and process procedures necessary for organization and production	1,6,7,10
33.2 Execute production plan as designed	1,6
ELECTRONICS	
Unit 34: Basic Electronic Theory	
34.1. Explain basic electrical theory	12
34.2 Describe and illustrate electronic components	-
34.3 Analyze transistor circuits	-

Unit 35: Basic Electronic Skills	
35.1 Explain and demonstrate soldering and desoldering applications	-
35.2 Explain block diagrams, schematics, and wiring diagrams	-
35.3 Explain and demonstrate cabling applications	-
35.4 Analyze power supplies	-
Unit 36: Basic Troubleshooting and Repair	
36.1 Utilize test equipment and record measurements	12
36.2 Analyze and demonstrate safe operating procedures	
36.3 Calculate electronic mathematical formulas	12
36.4 Analyze, simulate, and construct series and parallel electronic circuits	12
36.5 Explain, simulate, and construct amplifiers ~~and~~ with their applications	-
36.6 Analyze interfacing of electronics products	-
36.7 Analyze, simulate, and construct digital concepts and circuitry	-
Unit 37: Computer Applications and Servicing	
37.1 Analyze computer electronics	-
37.2 Explain and demonstrate computer applications	3,6,7,9,10,11,12,14
37.3 Explain optical electronics	-
Competency	
37.4 Describe basic telecommunications and networking	-
37.5 Analyze technician work procedures	-
37.6 Develop software applications	-
37.7 Design and implement industrial motor control	-
WELDING	
Unit 38: Safety	
38.1 Describe fumes, gases and toxic materials	-
38.2 Demonstrate gas storage safety	-
38.3 Demonstrate fire safety	-
Unit 39: Materials Science/Inspection/Testing	
39.1 Assess materials	5,10,12
39.2 Explain weld testing	-
39.3 Predict degree of distortion	-
Unit 40: Engineering Drawings	
40.1 Describe and interpret welding symbols and definitions	-
40.2 Interpret Drawings/Prints	1,10,11
40.3 Explain welding procedures specifications	-
40.4 ~~Assess~~ Select and utilize measuring devices	-
Unit 41: Welding Fabrication	
41.1 Demonstrate knowledge of power metalworking machinery	-
41.2 Construct simple weldments from drawings	-

Unit 42: Oxyfuel Brazing/Soldering	
42.1 Explain Oxyfuel brazing/soldering	-
Unit 43: Shielded Metal Arc Welding (SMAW)	
43.1 Explain the SMAW process	-
43.2 Demonstrate SMAW of mild steel plate	-
43.3 Demonstrate SMAW of stainless steel	-
43.4 Demonstrate SMAW of mild steel pipe	-
43.5 Describe SMAW ~~cast iron~~ hardfacing	-
43.6 Describe SMAW cast iron	-
Unit 44: Thermal Cutting	
44.1 Demonstrate cutting of metals using plasma arc cutting (PAC) process	-
44.2 Explain cutting and gouging of metals using the air carbon arc (CAC-A) process	-
44.3 Demonstrate cutting of metals using manual and machine-guided oxyfuel processes	-
44.4 Explain advanced welding and cutting systems	-
Unit 45: Gas Metal Arc Welding (GMAW)	
45.1 Explain the GMAW process	-
45.2 Demonstrate GMAW of mild steel	-
45.3 Demonstrate GMAW of stainless steel	-
45.4 Demonstrate GMAW of aluminum	-
45.5 Demonstrate GMAW of mild steel pipe	-
Competency	
Unit 46: Gas Tungsten Arc Welding (GTAW)	
46.1 Explain the GTAW process	-
46.2 Demonstrate GTAW of mild steel	-
46.3 Demonstrate GTAW of stainless steel	-
46.4 Demonstrate GTAW of aluminum	-
46.5 Demonstrate GTAW of mild steel pipe	-
Unit 47: Flux Core Arc Welding (FCAW)	
47.1 Explain the FCAW process	-
47.2 Demonstrate FCAW of mild steel	-
47.3 Demonstrate FCAW of stainless steel	-