



## Manufacturing Foundation

Code	Topic	Course	Knowledge and Skill	Performance Element	Measurement Criteria
MNC02.01	Communications	Language Arts Courses	Comprehend the use of reading strategies to learn meaning, technical concepts, vocabulary, and to bring together information needed for a particular situation.	Select and use the reading strategy or strategies (e.g., skimming, reading for detail, reading for meaning and critical analysis) needed to fully comprehend a written document.	Summarize overall purpose of text.
				Interpret, transcribe, and communicate information, data, and observations from a written document for use in an actual situation.	Identify key technical concepts and vocabulary.
					Identify complexities and discrepancies.
					Determine relevance, accuracy and appropriateness for a given purpose.
					Explain meaning of new terms, vocabulary and concepts.
					Interpret technical materials.
					Summarize overall meaning of text.
					Write specific steps for applying information to task or new situation.
					Share information from text with others and show how it can be applied to a particular task or new situation.
MNC02.02	Communications	Language Arts Courses	Locate, organize, and document written information from various sources needed by co-workers and clients/participants.	Locate written information needed by co-workers and clients/participants.	Conduct search of information on topic using card catalog, keywords, and/or search engines.
					Locate variety of resources such as books, journals, and electronic forms including the Internet.
					Organize resources to share key information.



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			(CONTINUED)	Organize information for use in written and oral communications.	Read and take notes from selected resources. Prepare outline that emphasizes major points with supporting data. Present information in organized, easy-to-follow manner.
				Document the source and proper reference for written information.	Prepare a bibliography using the style prevalent in a given manufacturing situation. Use parenthetical, footnote and endnote text citations accurately. Follow plagiarism and copyright rules and regulations.
MNC02.03	Communications	Language Arts Courses	Use correct grammar, punctuation and terminology to write and edit documents.	Write documents with more than one paragraph to be clear, succinct, and accurate.  Use knowledge of audience and their needs to prepare written documents.  Use correct grammar, spelling, punctuation and capitalization to prepare written documents.  Use computer skills to design and develop written and supporting material.	Organize and arrange information for effective coherence. Report relevant information in order of occurrence. Interpret information, data, and observations correctly. Present main ideas and supporting facts. Use technical terms and concepts. Incorporate and use references effectively and accurately. Report objective and/or subjective information. Use correct grammar and sentence structure. Use correct spelling. Use correct punctuation and capitalization. Use word processing software to develop text, charts, graphs or figures correctly. Use presentation software to prepare visual support materials. Format written documents with correct font and layout for easy reading.



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MNC02.04	Communications	Language Arts Courses #2: Information Technology Applications	Develop and deliver formal and informal presentations using appropriate media to engage and inform audiences.	Prepare oral presentation to provide information for intended purpose and audience.	Know subject matter well enough to be independent of written aids.
					Identify characteristics of the audience and adjust to their ability to understand.
					Use technical terms and concepts correctly.
				Identify and prepare support materials to accompany oral presentation.	Use proper organization and structure to achieve coherence of major points.
					Identify media and visual aids appropriate to understanding of topic.
					Prepare visual aids and support materials for easy viewing and without error.
					Smoothly and efficiently operate any equipment used with support materials.
					Adhere to basic visual communication principles.
				Deliver presentation to sustain listeners' attention and interest.	Rehearse presentation as needed.
					Deliver presentation without grammatical error.
					Speak clearly with appropriate volume, rate and gestures while making and maintaining appropriate eye contact.
					Use support materials in the presentation that enhance the understanding of the topic and the interest level of the audience.
					Stay within presentation time parameters.
	Evaluate listeners' interest and receptiveness.				
	Use verbal and nonverbal feedback strategies to engage discussion and adjust message and delivery.				
	Respond to questions and comments on presentation.				



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MNC02.05	Communications	Language Arts Courses	Interpret verbal and nonverbal behaviors to enhance communication with co-workers and clients/participants.	Interpret verbal behaviors to enhance communication.	Identify verbal cues (e.g., voice speed, voice quality and tone).
					Explain how verbal cues conveyed the message.
				Interpret nonverbal behaviors to enhance communication.	Identify nonverbal cues (e.g., eye contact, facial expressions, posture, gestures and other body language).
					Explain the message(s) conveyed by nonverbal cues.
MNC02.06	Communications	Language Arts Courses	Apply active listening skills to obtain and clarify information.	Interpret message/information given to clarify information.	Determine familiarity of discussion.
					Respond accordingly using appropriate verbal and non-verbal language.
					Explain the message given in your own words.
				Respond with restatement and clarification techniques to clarify information.	Ask questions to seek or confirm understanding.
					Paraphrase and/or repeat information.
					Record and summarize information in written notes.
	Follow directions and/or respond in a positive way with clear, concise comments.				
MNC02.07	Communications	Language Arts Courses	Interpret and use information in tables, charts, and figures to support written and oral communications.	Interpret information found in tables, charts, and figures to support written and oral communications.	Compile facts and arrange in an organized manner for a table, chart or figure.
					Document sources of data.
					Determine most appropriate way to display data for effective coherence.
					Prepare table, chart, graph or figure for inclusion in publication or presentation.
				Use tables, charts and figures to support written and oral communication.	Evaluate reference or source of data for authenticity and reliability.
					Explain information presented in tables, charts and figures.
	Prepare written summary of findings expressed in tables, charts and figures.				



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MNC03.01	Problem Solving and Critical Thinking	#3: Employment in Manufacturing Occupations	Formulate solutions to problems using critical thinking skills while working independently and/or in teams.	Describe the value of using problem-solving and critical thinking skills to improve a situation or process.	Define problem-solving methods accepted in the manufacturing industry.
					Explain how using a defined problem solving system can improve a situation or process and benefit all parties involved.
				Prepare ideas, proposals, and solutions to problems using concrete terms.	Clarify the problems or issues to be addressed and the objectives.
					Identify constraints and parameters.
					Obtain and analyze available information.
					Generate alternative ideas, proposals, and solutions that appear useful in solving the problem.
					Evaluate alternative solutions by using information and data from a variety of sources and separating the irrelevant from the relevant.
					Identify the best solution based on risks related to costs, schedules, and quality.
					Use the logic and rationale for the solution to present the solution.
				Analyze and evaluate ideas, proposals, and solutions to problems.	Confirm definition of problem and objectives.
					Confirm constraints and parameters.
					Evaluate the underlying assumptions.
					Evaluate the quality of information used and the analysis of data used to support the solution.
					Evaluate the logic and reasoning used to develop the solution.
					Evaluate the risks, costs, and benefits of testing and implementing the solution.



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			(CONTINUED)	Develop solution to performance problems using a structured problem-solving process.	Describe the problem completely and accurately using data and graphs and charts.
					Develop and present a comprehensive mapping of potential root and indirect causes (e.g. fishbone diagrams).
					Identify and evaluate alternative solutions.
					Test and evaluate best solutions.
					Develop plans to fully implement solutions to address performance problem.



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MNC04.01	Information Technology Applications	#2: Information Technology Applications	Use Personal information Management (PIM)/productivity applications.	Manage personal schedule and contact information.	Create prioritized-tasks (to-do) list.
					Manage daily/weekly/monthly schedule using applications.
					Manage personal and professional contact information.
				Create memos and notes.	Create reminder for oneself.
					Create and send notes, informal memos, and reminder using PIM applications.
MNC04.02	Information Technology Applications	#2: Information Technology Applications	Use electronic mail applications.	Use email to communicate within and across organizations.	Access email system using login and password functions.
					Access email messages received.
					Create email messages in accordance with established business standards (e.g., grammar, word usage, spelling, sentence structure, clarity, email etiquette).
					Send email messages.
				Use email to share files and documents.	Access email attachments.
					Attach documents to messages.
					Save email messages/attachments.
					Demonstrate knowledge of contamination protection strategies for email.
MNC04.03	Information Technology Applications	#2: Information Technology Applications	Use Internet applications.	Search for information and resources.	Select search engine(s) to use.
					Select appropriate search procedures and approaches.
					Locate information using search engine(s) and Boolean logic.
					Navigate web sites using software functions.



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			(CONTINUED)	Access and evaluate Internet resources.	Access business and technical information using the Internet. Access commercial, government, and education resources. Evaluate Internet resources (e.g., accuracy of information).
MNC04.04	Information Technology Applications	#2: Information Technology Applications	Use writing/publishing applications.	Prepare simple documents and other business communications.	Retrieve existing documents. Create documents (e.g., letters, memos, reports) using existing forms and templates. Safeguard documents using name and save functions. Format text using basic formatting functions. Employ word processing utility tools (e.g., spell checker, grammar checker, thesaurus).
				Prepare reports and other business communications, integrating graphics and other non-text elements.	Use advanced formatting features (e.g., headers/footers/dropped caps, indexing). Place graphics and tables in document. Enhance publications using different fonts, styles, attributes, justification, etc. Enhance publications using paint/draw functions.
				Prepare complex publications.	Create new word processing forms, style sheets, and templates. Prepare publications using desktop publishing software. Format new desktop publishing files. Output desktop publishing files.



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MNC04.05	Information Technology Applications	#2: Information Technology Applications	Use presentation applications.	Prepare presentations for training, sales, and information sharing.	Create computer presentations and handouts in accordance with basic principles of graphics design and visual communication.	
					Insert graphic elements (e.g., graph, clip art, table) in a slide.	
				Deliver presentations with supporting materials.	Edit presentations.	
					Identify hardware items that support presentation software (e.g., scanners, digital cameras, printers, and projection systems).	
					Print a single slide, an entire presentation, an outline, and notes.	
					Run slide shows manually and automatically.	
MNC04.06	Information Technology Applications	#2: Information Technology Applications	Use spreadsheet applications.	Create a spreadsheet.	Create a spreadsheet.	
					Retrieve existing spreadsheets.	
					Edit spreadsheets.	
					Save spreadsheets.	
					Print spread sheets.	
				Perform calculations and analysis on data.	Group worksheets.	
					Create charts and graphs from spreadsheets.	
					Perform calculations using simple formulas.	
					Input/process data using spreadsheet functions.	
MNC04.07	Information Technology Applications	#2: Information Technology Applications	Use database applications.	Manipulate data elements.	Enter data using a form.	
						Locate/replace data using search and replace functions.
						Process data using database functions (e.g., structure, format, attributes, relationships, keys).



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			(CONTINUED)	Manage, analyze, and report on interrelated data elements.	Search a database table to locate records. Sort data using single- and multiple-field sorts. Perform single-and multiple-table queries (e.g., create, run, save). Print forms, reports, and results of queries. Verify accuracy of output.
MNC04.08	Information Technology Applications	#2: Information Technology Applications	Use collaborative/groupware applications.	Facilitate group work through management of shared schedule and contact information.	Manage daily/weekly/monthly schedule using applications. Maintain shared database of contact information.
MNC04.09	Information Technology Applications	#2: Information Technology Applications	Use computer operations applications.	Manage computer operations. Manage file storage. Compress or alter files.	Apply basic commands of operating system software. Employ desktop operating skills. Apply appropriate file and disk management techniques. Differentiate between files and directories. Determine file organization. Demonstrate knowledge of the system utilities used for file management. Convert file formats. Unpack files using compression software. Convert existing files.
MNC04.10	Information Technology Applications	#2: Information Technology Applications	Use computer-based equipment (containing embedded computers or processors used to control electromechanical devices).	Operate computer-driven equipment and machines.	Secure needed supplies and resources. Follow power-up and log-on procedures. Interact with/respond to system messages using console device. Run applications/jobs in accordance with processing procedures. Follow log-off and power-down procedure(s).



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			(CONTINUED)	Use installation and operation manuals.	Access needed information using appropriate reference materials.
				Troubleshoot computer-driven equipment and machines and access support as needed.	Test system using diagnostic tools/software.
					Repair/replace malfunctioning plug and play hardware.
					Reinstall software as needed.
					Recover data and/or files.
					Restore system to normal operating standards.
MNC05.01	Systems	#1: Introduction to Manufacturing Occupations #4: Applications in Manufacturing Technology	Demonstrate knowledge of how manufacturing businesses operate.	Explain the role and major functions of manufacturing businesses.	Explain the importance of manufacturing to society.
					Identify the mission, major internal functions and structure of manufacturing businesses.
					Identify the customers, suppliers, and stakeholders of manufacturing businesses, their roles, and how they relate.
					Explain the major competitive challenges faced by the manufacturing businesses.
					Identify and describe types of manufacturing systems.
					Analyze current trends in manufacturing systems.
				Explain how manufacturing businesses manage performance.	Explain how financial performance is measured.
					Explain how market performance is gauged.
					Explain how service and internal operations performance is determined.
					Explain how compliance and performance related to health, safety, and environment are evaluated.



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			(CONTINUED)	Explain how changes outside the manufacturing business impact the manufacturing business.	Explain the impact of economic changes. Explain the impact of social changes. Explain the impact of technology changes.
				Explain the role of risk management in reducing risks and improving performance in manufacturing businesses.	Explain the objectives of risk management programs. Explain the major types of loss exposure for manufacturing businesses. Explain the approaches for managing organizational risks.
				Explain the roles and functions of government in regulating and supporting manufacturing businesses.	Explain the government's roles in regulating domestic operations. Explain the government's roles in regulating international operations. Explain the government's roles in managing the infrastructures of manufacturing businesses. Explain the government's roles in health, safety, and environmental management.
MNC05.02	Systems	#1:Introduction to Manufacturing Occupations #4:Applications in Manufacturing Technology	Demonstrate knowledge of how manufacturing businesses improve performance.	Explain how manufacturing businesses manage customer relationships.  Explain how planning and budgeting are used to accomplish organizational goals and objectives.	Identify needs and requirements of internal and external customers.  Describe customer satisfaction and fulfillment of customer requirements. Explain how manufacturing businesses respond to customer problems and complaints. Explain how work plans and budgets are used to allocate people and resources. Identify reports used to track performance and resources and explain how they are used. Explain how plans and budgets are revised to meet goals and objectives.



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			(CONTINUED)	Explain how planning is used to improve overall performance.	Identify and describe the most critical performance problems that manufacturing businesses typically face. Describe how improvements are identified.
MNC06.01	Safety, Health, and Environmental	#3: Employment in Manufacturing Occupations	Demonstrate knowledge of safety, health, and environmental management systems.	Describe the major regulatory areas.	Identify specific health and safety laws and regulations that impact manufacturing and the major areas they address. Identify specific environmental management laws and regulations and the major areas they address. Explain how the manufacturing industry and its organizations typically perceive the major components.
				Explain how government agencies ensure compliance and promote improved performance.	Provide examples of the major measures and types of data used by government to measure and monitor performance. Provide examples of how manufacturing organizations ensure their compliance. Provide examples of consequences that manufacturing organizations suffer when they fail to comply.
				Demonstrate commitment to policies and procedures.	Promote and maintain knowledge of organizational safety, health, and environmental management policies and procedures. Follow organizational policies and procedures. Educate and orient other workers. Maintain a safe work area. Identify, describe, and report workplace hazards. Perform and participate in regular audits and inspections. Provide and maintain documentation needed for compliance. Conduct and participate in accident/incident investigations.
				Develop plans to improve safety performance.	Use structured problem-solving process to develop improvement plans.



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MNC07.01	Leadership and Teamwork	#3: Employment in Manufacturing Occupations #7: Problem Solving and Teamwork	Demonstrate leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.	Provide group leadership.	Work with others to develop and gain commitment to team goals.
					Motivate team members to achieve goals.
					Promote the full involvement and utilization of team members.
					Distribute responsibility and work load fairly.
				Collaborate with others.	Demonstrate commitment to and a positive attitude toward team goals.
					Take responsibility for shared group and individual work tasks.
					Complete personal share of the work.
					Assist team members in completing their work.
					Adapt effectively to changes in projects, deadline, schedules, and changes in process.
					Negotiate effectively to arrive at decisions.
					Treat people with respect.
					Provide feedback (e.g., praise, critique and constructive criticism).
					Demonstrate sensitivity to and value for diversity.
					Resolve conflicts.
Manage stress and control emotions.					



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			(CONTINUED)	Conduct and participate in meetings.	Develop meeting objectives and agenda.
					Prepare materials for leading discussion.
					Assemble and distribute meeting materials.
					Attend scheduled meetings on time.
					Conduct meeting to achieve objectives within scheduled time frame.
					Demonstrate effective communication skills.
					Produce and distribute meeting minutes including decisions and next steps.
					Provide and maintain documentation needed for compliance.
					Conduct and participate in accident/incident investigations.
				Develop plans to improve performance.	Use structured problem-solving process to develop improvement plans.



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MNC08.01	Ethics and Legal Responsibilities	#3: Employment in Manufacturing Occupations	Demonstrate knowledge of and commitment to professional ethics and legal responsibilities.	Distinguish between ethical and legal responsibilities.	Compare the similarities/differences between ethical and legal responsibilities for different roles and functions.
					Explain employer expectations for ethical and legal behaviors in work situations and how expectations are expressed in organizational policies and culture.
					Compare similarities/differences in employee practices involving personal and professional ethics.
					Identify both short- and long-term effects of an individual employee's lack of ethics or failure to comply with legal requirements.
					Provide examples of ethical decisions.
				Demonstrate awareness of legal responsibilities for different roles and functions within organizations.	Explain legal responsibilities of employees to comply with governmental laws and regulations.
					Identify personal and organizational ramifications for failure to comply with governmental laws and regulations.
					Explain the major government laws and regulations that define legal responsibilities within the manufacturing industry.
				Apply ethical reasoning to different workplace situations.	Evaluate alternative responses to workplace situations based on legal responsibilities and employer policies.
					Evaluate alternative responses to workplace situations based on personal or professional ethics.
					Determine and explain most appropriate response based on legal and ethical obligations.
				Identify strategies for responding to unethical or illegal actions of individuals and organizations.	Identify and explain alternative strategies for responding to unethical or illegal actions.
Identify and explain best strategy.					



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MNC09.01	Employability and Career Development	#3: Employment in Manufacturing Occupations	Explain written organizational policies, rules and procedures to help employees perform their jobs.	Locate appropriate information on organizational policies in handbooks and manuals.	Identify the contents of various organizational publications.
					Determine the appropriate document(s) for specific job responsibilities and work assignments.
				Discuss how specific organizational policies and rules influence a specific work situation.	Locate and identify specific organizational policies, rules or procedures to assist with a given situation.
					Articulate how a specific organizational policy, rule or procedure will improve a given situation.
MNC09.02	Employability and Career Development	#3: Employment in Manufacturing Occupations	Identify and demonstrate positive work behaviors and personal qualities.	Demonstrate self-discipline, self-worth, positive attitude, and integrity in a work situation.	Demonstrate regular attendance.
					Follow company dress and appearance standards.
					Exhibit pride in work.
				Demonstrate flexibility and willingness to learn new knowledge and skills.	Demonstrate leadership and teamwork.
					Exhibit ability to handle stress.
					Display initiative and open-mindedness.
					Participate in company orientation and training programs with enthusiasm.
				Exhibit commitment to the organization.	Identify progressive strategies that will impact efficiency of job.
					Follow established rules, regulations and policies.
					Explain employer/management responsibilities.
	Demonstrate cost effectiveness.				
	Demonstrate time management.				
	Complete all tasks thoroughly.				



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MNC09.03	Employability and Career Development	#1: Introduction to Manufacturing Occupations	Develop a personal career plan to meet career goals and objectives.	Develop career goal and objectives to plan future career direction.	Identify career that matches individual interests and aptitudes.
					Develop career goal with time frame.
					Identify goals and objectives for reaching and advancing in career.
				Develop strategies to reach career objectives.	Write a list of strategies for achieving educational requirements.
					Identify strategies for obtaining employment experiences.
					Write a time line for achieving career goals and objectives.
List alternatives and potential changes.					
MNC09.04	Employability and Career Development	#3: Employment in Manufacturing Occupations	Demonstrate ability to seek and apply for employment.	Use multiple resources to locate job opportunities.	Identify resources for finding employment.
					Analyze resources to determine those that are most appropriate for desired career.
					Compare job requirements with personal qualifications, interests, and aptitudes.
					Select job that matches personal qualifications, interests, and aptitudes.
				Prepare a resume and letter of application to apply.	Identify respective employer's submission requirements.
					Gather information and prepare rough draft of resume.
					Put resume in proper format.
				Complete an employment application to obtain employment.	Write letter of application for specific job opening in correct format without error.
					Gather information for application.
					Complete all questions on application with appropriate and honest answers.
					Sign and date application.
Attach any supporting material required or requested.					
Submit full application package to employers.					



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			(CONTINUED)	Interview to obtain employment.	Dress appropriately for interview. Exhibit professional conduct before, during and after interview. Explain your qualifications and interests clearly and concisely. Answer all questions honestly and concisely. Write follow-up letter after the interview.
MNC09.05	Employability and Career Development	#3: Employment in Manufacturing Occupations	Demonstrate ability to evaluate and compare employment opportunities and accept employment.	Evaluate and compare employment opportunity to individual needs and career plan.  Accept or reject employment.	Identify job advantages and disadvantages.  Compare job benefits to individual needs.  Compare job opportunities and responsibilities to career plan.  Make decision to accept or reject employment. Write acceptance or rejection letter without error. Complete employment forms upon acceptance.



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MNC10.01	Technical Skills	#3: Employment in Manufacturing Occupations	Demonstrate understanding of the basic technical skills and knowledge required for careers in manufacturing.	Understand the planning and layout processes (e.g., designing, print reading, measuring) used in manufacturing.	Read prints and use the information to play, lay out, and produce parts or products.
				Understand how materials can be processed using tools and machines.	Use tools and the processes of cutting, shaping, combining, forming, etc. materials to manufacture a part or product.
				Understand various types of assembling processes (e.g., mechanical fastening, mechanical force, joining, fusion bonding, adhesive bonding) used in manufacturing.	Apply appropriate fastening or joining procedure to the design and production of a manufactured part or product.
				Understand finishing processes (e.g., types of finishing materials, surface preparation, methods of application) used in manufacturing.	Select a finishing process for a product appropriate to the job it must perform, the environment in which it functions, and its aesthetic appeal.
				Understand inspection and quality control in the manufacturing process.	Perform continuous on-line inspections to ensure that parts or products meet design specifications.