**Course Description**

This course introduces students to all aspects of machining applications in manufacturing. They will be able to perform routine calculations, interpret basic drawings, begin the process of performing accurate measurements and be able to plan simple machining processes. Students will learn the fundamental principles and practices of cutting, drilling and grinding using modern machine tools, hand tools and precision measuring instruments.

**Strand 1. Business Operations/21st Century Skills**

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field.

**Outcome 1.1. Employability Skills:** Develop career awareness and employability skills (e.g. face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

**Competencies**

1.1.1. Identify the knowledge, skills, and abilities necessary to succeed in careers.

1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure, and experience.

1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options.

1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor and use networking techniques to develop and maintain professional relationships.

1.1.5. Develop strategies for self-promotion in the hiring process (e.g. filling out job applications, resume writing, interviewing skills, portfolio development).

1.1.6. Explain the importance of work ethic, accountability, and responsibility and demonstrate associated behaviors in fulfilling personal, community, and workplace roles.

1.1.7. Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions.

1.1.8. Identify the correlation between emotions, behavior, and appearance and manage those to establish and maintain professionalism.

1.1.9. Give and receive constructive feedback to improve work habits.

1.1.10. Adapt personal coping skills to adjust to taxing workplace demands.

1.1.11. Recognize different cultural beliefs and practices in the workplace and demonstrate respect for them.

1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits, and abusive behavior.

**Outcome 1.2. Leadership and Communications:** Process, maintain, evaluate, and disseminate information in a business. Develop leadership and team building to promote collaboration.

**Competencies**

1.2.1. Extract relevant, valid information from materials and cite sources of information.

1.2.2. Deliver formal and informal presentations.

1.2.3. Identify and use verbal, nonverbal, and active listening skills to communicate effectively.

1.2.4. Use negotiation and conflict-resolution skills to reach solutions.

1.2.5. Communicate information (e.g. directions, ideas, vision, workplace expectations) for an intended audience and purpose.

1.2.6. Use proper grammar and expression in all aspects of communication.

1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.

1.2.8. Identify the strengths, weaknesses, and characteristics of leadership styles that influence internal and external workplace relationships.

1.2.9. Identify advantages and disadvantages involving digital and/or electronic communications (e.g. common content for large audience, control of tone, speed, cost, lack of non-verbal cues, potential for forwarding information, longevity).

1.2.10. Use interpersonal skills to provide group leadership, promote collaboration, and work in a team.

1.2.11. Write professional correspondence, documents, job applications and resumes.

1.2.12. Use technical writing skills to complete forms and create reports.

1.2.13. Identify stakeholders and solicit their opinions.

1.2.14. Use motivational strategies to accomplish goals.

**Outcome 1.3. Business Ethics and Law:** Analyze how professional, ethical, and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

**Competencies**

1.3.1. Analyze how regulatory compliance affects business operations and organizational performance.

1.3.2. Follow protocols and practices necessary to maintain a clean, safe, and healthy work environment.

1.3.3. Use ethical character traits consistent with workplace standards (e.g. honesty, personal integrity, compassion, justice).

1.3.4. Identify how federal and state consumer protection laws affect products and services.

1.3.5. Access and implement safety compliance measures (e.g. quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], U.S. Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization.

1.3.6. Identify deceptive practices (e.g. bait and switch, identity theft, unlawful door-to-door sales, deceptive service estimates, fraudulent misrepresentations) and their overall impact on organizational performance.

1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g. harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]).

1.3.8. Verify compliance with computer, copyright, and intellectual property laws and regulations.

1.3.9. Identify potential conflicts of interest (e.g. personal gain, project bidding) between personal, organizational, and professional ethical standards.

**Outcome 1.4. Knowledge Management and Information Technology:** Demonstrate current and emerging strategies and technologies used to collect, analyze, record, and share information in business operations.

**Competencies**

1.4.1. Use office equipment to communicate (e.g. phone, radio equipment, fax machine, scanner, public address systems).

1.4.2. Select and use software applications to locate, record, analyze, and present information (e.g. word processing, electronic mail, spreadsheet, databases, presentation, Internet search engines).

1.4.3. Verify compliance with security rules, regulations, and codes (e.g. property, privacy, access, accuracy issues, client and patient record confidentiality) pertaining to technology specific to industry pathway.

1.4.4. Use system hardware to support software applications.

1.4.5. Use information technology tools to maintain, secure, and monitor business records.

1.4.6. Use electronic database to access and create business and technical information.

1.4.7. Use personal information management and productivity applications to optimize assigned tasks (e.g. lists, calendars, address books).

1.4.8. Use electronic media to communicate and follow network etiquette guidelines.

**Outcome 1.5. Global Environment:** Evaluate how beliefs, values, attitudes, and behaviors influence organizational strategies and goals.

**Competencies**

1.5.1. Describe how cultural understanding, cultural intelligence skills, and continual awareness are interdependent.

1.5.2. Describe how cultural intelligence skills influence the overall success and survival of an organization.

1.5.3. Use cultural intelligence to interact with individuals from diverse cultural settings.

1.5.4. Recognize barriers in cross-cultural relationships and implement behavioral adjustments.

1.5.5. Recognize the ways in which bias and discrimination may influence productivity and profitability.

1.5.6. Analyze work tasks for understanding and interpretation from a different cultural perspective.

1.5.7. Use intercultural communication skills to exchange ideas and create meaning.

1.5.8. Identify how multicultural teaming and globalization can foster development of new and improved products and services and recognition of new opportunities.

**Outcome 1.6. Business Literacy:** Develop foundational skills and knowledge in entrepreneurship, financial literacy, and business operations.

**Competencies**

1.6.1. Identify business opportunities.

1.6.2. Assess the reality of becoming an entrepreneur, including advantages and disadvantages (e.g. risk vs. reward, reasons for success and failure).

1.6.3. Explain the importance of planning your business.

1.6.4. Identify types of businesses, ownership, and entities (i.e. individual proprietorships, partnerships, corporations, cooperatives, public, private, profit, not-for-profit).

1.6.5. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments, and interdepartmental interactions.

1.6.6. Identify the target market served by the organization, the niche that the organization fills, and outlook of the industry.

1.6.7. Identify the effect of supply and demand on products and services.

1.6.8. Identify the features and benefits that make an organization’s product or service competitive.

1.6.9. Explain how the performance of an employee, a department, and an organization is assessed.

1.6.10. Describe the impact of globalization on an enterprise or organization.

1.6.11. Describe how all business activities of an organization work within the parameters of a budget.

1.6.12. Describe classifications of employee benefits, rights, deductions, and compensations.

**Outcome 1.9. Financial Management:** Use financial tools, strategies, and systems to develop, monitor, and control the use of financial resources to ensure personal and business financial well-being.

**Competencies**

1.9.1. Create, analyze, and interpret financial documents (e.g. budgets, income statements).

1.9.2. Identify tax obligations

1.9.3. Review and summarize savings, investment strategies, and purchasing options (e.g. cash, lease, finance, stocks, bonds).

1.9.4. Identify credit types and their uses in order to establish credit.

1.9.5. Identify ways to avoid or correct debt problems.

1.9.6. Explain how credit ratings and the criteria lenders use to evaluate repayment capacity affect access to loans.

1.9.7. Review and summarize categories (types) of insurance and identify how insurances can reduce financial risk.

1.9.8. Identify income sources and expenditures.

1.9.9. Compare different banking services available through financial institutions.

1.9.10. Identify the role of depreciation in tax planning and liability.

**Strand 6. Precision Machining**

Learners apply principles of precision machining to measuring work pieces, drawing interpretation, inspection, bench work and layout, power saws, drilling machines, lathes and turning machines, milling machines and grinding machines.

**Outcome 6.1. Measurement and Interpretation:** Interpret drawings and documentation and perform measurements.

**Competencies**

* + 1. Identify measuring tools and gradations used in precision machining and their purposes.
		2. Identify typical measurements in precision machining (e.g. angles, diameter, hardness).
		3. Identify measuring systems and convert between systems.
		4. Identify information and symbols typically provided in drawings and specifications. Measure and inspect work pieces according to product specifications.
		5. Measure and inspect work pieces according to product specifications.

**Outcome 6.2. Layout and Planning:** Plan a machining process.

**Competencies**

* + 1. Determine product requirements, dimensions, and tolerances from drawing and specifications.
		2. Determine process steps (e.g. cut, drill, turn, mill, grind, heat treat).
		3. Plan individual process steps based on industry standards (e.g. manufacturer’s specifications, machining standards).
		4. Schedule machining equipment as required.

**Outcome 6.3. Cutting:** Cut materials.

**Competencies**

* + 1. Identify the type of material and cuts required in product specifications.
		2. Select cutting equipment, work-holding devices, speeds, feeds, and cutting fluids.
		3. Configure the cutting equipment.
		4. Prepare work pieces for cutting.
		5. Cut the materials.
		6. Inspect the work to meet requirements.

**Outcome 6.4. Drilling:** Drill materials.

**Competencies**

* + 1. Identify the type of material and apertures required in product specifications.
		2. Select drill, bit, work-holding devices, speeds, feeds, and cutting fluids.
		3. Configure the drilling equipment.
		4. Prepare work pieces for drilling.
		5. Drill the materials.
		6. Inspect the work to meet requirements.

**Outcome 6.7. Grinding:** Grind materials.

**Competencies**

6.7.1. Identify the type of material and grinding required in product specifications.

6.7.2. Select grinding machine, wheels, work‐holding devices, speeds and cutting fluids.

6.7.3. Configure the grinding equipment.

6.7.4. Prepare work pieces for grinding.

6.7.5. Grind the materials.

6.7.6. Inspect the work to meet requirements.

**Outcome 6.8 Maintenance:** Maintain tools and equipment in working condition.

**Competencies**

* + 1. Identify equipment maintenance requirements in the equipment manufacturer’s documentation.
		2. Identify maintenance tasks required (e.g. inspecting, grinding, sharpening, dressing, lubricating, cleaning).
		3. Verify measuring tool accuracy and recalibrate as needed.
		4. Develop a preventive maintenance schedule.
		5. Monitor equipment performance during use.
		6. Repair or replace equipment and accessories as needed.