Kansas Manufacturing Cluster

Production Pathway

CIP Code: 48.0000

Rating Scale: **4 Exemplary Achievement**
3 Proficient Achievement
2 Limited Achievement
1 Inadequate Achievement
0 No exposure- No instruction or training

Student:		Grade:
Teacher:	School:	
Enrolled Date:	Completion Date:	Graduation Date:
Student Signature	Teacher Signature	

Directions: *The following competencies are required for full approval of courses in the Manufacturing Pathway. Check the appropriate number to indicate the level of competency reached for student evaluation.*

Academic Foundations – Embedded in all courses

Benchmark: 0.1 Apply reading and writing, math, and science skills in personal, professional, and community situations		4	3	2	1	0
0.1.1	Apply the four basic math functions to whole numbers, decimals, percentages and fractions. CC K&S (ESS01.03.01 (ESS01.03.02)/ NCCER/ SkillsUSA/ M (1.1.K1, 1.1.A1)/ FA(VB.6.3)/ AS (I1)					
0.1.2	Use a standard ruler and a metric ruler to measure. NCCER/ S (HS.1.1.3 ▲)/ M (3.2.K1, 3.2.K2▲)/ AS (N3.5)/ CC K&S (ESS01.03.01 (ESS01.03.02) (MNPB08.01.05) /					
0.1.3	Explain the importance of the metric system in the construction trade and utilize metric units of length, weight, volume and temperature. CC K&S (ESS01.03.01 (ESS01.03.02)/ NCCER/ SkillsUSA/ S (HS.1.1.3 ▲)/ M (3.2.A1a)/					
0.1.4	Recognize the basic shapes used in the construction industry, and apply basic geometry to measure them. CC K&S (ESS01.03.04)/ NCCER/ SkillsUSA/ M (3.1.K1-8, 3.1.A1-2, 3.1.A1▲)/					
0.1.5	Demonstrate the ability to interpret information and instructions in both written and verbal form. CC K&S (ESS01.02.07) (ESS01.02.06) / NCCER/ SkillsUSA/ *21st (L03A)/ R (1.4.5, 1.4.8, 1.4.9, 1.4.10, 1.2.1, 1.4.4, 2.2.2)/ FA(D1.A.3)/ FA(TA.2.1, TA.1.3)/ FA(VP.1.3, VA.1.1, VA.1.2, VE.2.2)/ AS (B2, B3, B1, F1)					
0.1.6	Demonstrate the ability to communicate effectively in on-the-job situations using verbal and written skills. CC K&S (ESS01.02.02) (ESS01.02.06) (ESS02.02.01) (ESS02.02.03) (ESS04.01.02) (ESS04.03.01) (ESS04.03.01) (ESS04.03.01) (ESS04.05.01) (ESS04.05.02) / NCCER/ SkillsUSA/ 21st (L03A)/ S (HS.1.1.5)/ W (1.3.1-17)/ FA(TA.3.3, TP.3.1)/ FA(VE.2.2, VA.3.2)/ AS (A7, B1, F3, C10)					
0.1.7	Perform physics skills to work with materials and load applications CC K&S (ESS01.04.01) (ESS01.04.02) / SkillsUSA/ S (4.2.1.4)/					
0.1.8						
0.1.9						

Career Development Skills – Embedded in all courses

Benchmark: 0.2 Demonstrate appropriate career development skills		4	3	2	1	0
0.2.1	Utilizes effective job seeking skills. NCCER/ SkillsUSA/ S (HS.7.1.1)/ CC K&S (ESS09.03.01)					
0.2.2	Created and utilizes an occupationally specific resume. CC K&S (ESS01.02.03) (ESS01.02.04) (ESS09.03.02) (ESS04.05.01) (ESS04.05.02) / SkillsUSA/ 21st (L03A)/ AS (C10)					
0.2.3	Created and utilizes a portfolio. CC K&S (ESS01.02.03) (ESS01.02.04) (ESS09.04.01) (ESS09.04.02) (ESS09.04.03) (ESS04.05.01) (ESS04.05.02) / SkillsUSA/ W (All of Standards 1 & 2)/ FA (D6.A.2)/ FA(VE.3)/ 21st (L10.2)/ AS (C10)					
0.2.4	Understands proper interview techniques. CC K&S (ESS09.03.05) / SkillsUSA/ 21st (L03A)					
0.2.5	Understands performance reviews. CC K&S (ESS03.03.01) (ESS03.03.02) (ESS03.03.03) (ESS03.03.04) / SkillsUSA/ S (HS.7.1.2)/ R (1.42, 1.45, 1.48, 1.4.1, 1.2.1, 1.4.4)/ 21st (L03C)					
0.2.6	Explain the construction, manufacturing &/or transportation industry, the role of companies within the industry, and the role of individual professionals in the industry. CC K&S (ESS09.03.06) (ESS05.01.01) (ESS05.01.02) (ESS05.01.03) (MNC05.01.01)/ SkillsUSA/ 21st (L10B)/ S (HS.7.1.1)/ SS (HS.2.5.1, 2.5.2, 2.5.3▲)/					
0.2.7	Demonstrate the value of computers in the construction industry through use of email, databases, Internet and billing/inventory software. CC K&S (ESS02.03.01) (ESS02.03.02) (ESS04.02.01) (ESS04.03.01) (ESS04.03.01) (ESS04.03.01) (ESS04.04.01) (ESS04.04.02) (ESS04.04.03) / SkillsUSA/ S (HS.5.1.3)/ W (1.3.3-3, 6-17)/ FA(VB.4.3)/ 21st (L04D)					
0.2.8						
0.2.9						

Cross-walking Key (▲) Assessed Indicator for Kansas Assessment Tests
(CC K&S) Career Cluster Knowledge and Skills (www.careerclusters.org)
(M) Kansas Mathematics Curricular Standards
(SS) Kansas History & Government; Economics & Geography Curricular Standards
(FA) Kansas Fine Arts Standards
NSS (National Skill Standards)

(NCCER) National Center for Construction Education & Research
*(21st) 21st Century Learning Skills (www.21stcenturyskills.org)
(W) Kansas Writing Curricular Standards
(SkillsUSA) SkillsUSA Championships Technical Standards
(LVS) Kansas Listening, Viewing, Speaking Standards
(AS) Achieve ADP-End of High School Benchmarks/Standards

(R) Kansas Reading Curricular Standards
(C) Kansas School Counseling Standards
(S) Kansas Science Curricular Standards
(WL) Kansas World Language Standards
(LM) Kansas Library Media Standards

Leadership/ 21st Century Skills – Embedded in all courses

Benchmark: 0.3 Apply leadership and 21st Century Skills to personal, professional and community issues.		4	3	2	1	0
0.3.1	Demonstrates speaking skills CC K&S (ESS02.02.01) (ESS02.02.04) / NCCER/ SkillsUSA/ 21st (L03A)/ FA(TP.2.2, TA.2)/ FA(M1P1, 1A1, 2P1.2, 2A1)/ AS (B6)					
0.3.2	Utilizes listening skills - CC K&S (ESS01.02.01)) (ESS02.08.01) (ESS02.08.02) / NCCER/ SkillsUSA/ 21st (L03A)/ FA(M 6P1,2,3; 6A1,3)/					
0.3.3	Uses writing skills to produce and compile documents CC K&S (ESS01.02.03) (ESS01.02.04) (ESS02.02.03) (ESS02.03.02) (ESS04.01.02) (ESS04.05.01) (ESS04.05.02) / NCCER/ SkillsUSA/ 21st (L03A)/ W (All of Standards 1 & 2)/ AS (C10)					
0.3.4	Uses decision making / problem solving skills CC K&S (ESS09.03.07) (ESS07.01.02) (ESS03.01.01) (ESS03.01.02) (ESS03.01.03) (ESS03.01.04) / NCCER/ SkillsUSA/ 21st (L02B)/ S (HS.1.1.4)/ R (1.4.7, 1.4.15, 1.4.5, 2.2.2, 1.4.4, 1.2.1)/ FA (D1.E.2, D1.E.3, D2.E.3, D4.E.1)/ FA(T6.A.1)/ FA(M 1P2; 1A2,3; 2P2,3; 4P1,2,3; 4A1; 7P1,2)/					
0.3.5	Participates as team member to achieve common goals CC K&S (MNPB06.01.02) (MNPB06.01.03) (ESS07.01.02) (ESS07.01.03) (ESS07.01.05) (ESS07.01.07) (ESS07.03.01) (ESS07.03.02) (ESS07.03.03) (ESS07.03.04) (ESS07.03.05) (ESS07.03.06) (ESS07.03.07) (ESS07.03.08) (ESS07.03.09) (ESS07.03.10) (ESS07.03.11) / NCCER/ SkillsUSA/ 21st (L03D, L07A)/ FA(T1.3)/ FA(M 1P2,3; A2,3; 2P2,3; 5P2; 5A3)/ AS (B7)					
0.3.6	Demonstrates time management CC K&S (ESS10.02.01) (ESS10.02.02) (ESS10.02.03) (ESS10.02.04) / SkillsUSA/ 21st (L06C)/ FA(M1P3; 2P2)/					
0.3.7	Takes responsibility and displays work ethics CC K&S (ESS08.01.01) (ESS08.01.02) (ESS08.01.03) (ESS08.01.04) (ESS08.01.05) (ESS08.01.06) (ESS07.01.02) (ESS07.01.03) (ESS07.01.05) (ESS07.01.07) (ESS07.01.07) (ESS09.01.01) / SkillsUSA/ 21st (L08A, L09A)/ FA(T1.3)/ FA(M 1P1,2,3; 1A1,2,3; 2P1,2,3; 2A1)/					
0.3.8	Establishes positive relations with others CC K&S (ESS02.02.05) (ESS07.01.04) (ESS07.01.05) (ESS09.01.05) / NCCER/ SkillsUSA/ 21st (L07A)/ FA(TA.1.3)/ FA(M 1P3; 2P2)/					
0.3.9	Demonstrate a working knowledge of workplace issues such as sexual harassment, stress, and substance abuse. CC K&S (ESS07.04.04) (ESS07.04.07) (ESS07.01.03) (ESS07.01.05)(ESS03.02.04) / NCCER/ SkillsUSA/ 21st (L07C)/ SS (HS.1.4.3, HS.1.1.2▲ , HS.1.1.4)/					
0.3.10						

Workplace Safety Skills – Embedded in all courses

Benchmark: 0.4 Utilize Workplace Safety Skills in all aspects of the construction industry		4	3	2	1	0
0.4.1	Demonstrate a working knowledge of safety education, environment, and enforcement for life and work. CC K&S (MNC06.01.01) (MNC06.04.01) (MNC06.05.03) (MNPB07.01.01) (MNPB07.01.02) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.08) (ESS06.01.09) (ESS06.02.01) (ESS06.02.02) (ESS06.04.01) (MNPB03.01.01) (MNPB03.01.03) / NCCER/ SS (HS.3.5.3)/ FA(TE.4)/					
0.4.2	Apply safe practices while using tools and equipment to construct a project. CC K&S (MNC06.04.01) (MNC06.05.03) (ESS06.01.09) (MNPB03.01.03) / SkillsUSA/ NCCER/ FA(TE.4)/ FA(VI.5.1, I.5.2, P.5.1, P.5.2)/					
0.4.3	Apply safe practices for housekeeping, dress, fire, chemicals & personal protection while working in a shop. CC K&S (MNC06.05.03) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.05) (ESS06.01.06) (ESS06.01.07) (ESS06.01.08) (ESS06.01.09) (MNPB03.01.03) / NCCER/ NSS/ FA(TE.4)/					
0.4.4	Demonstrate the use and care of appropriate personal protective equipment (PPE). CC K&S (MNC06.02.01) (MNC06.04.01) (MNC06.05.03) (MNPB07.01.01) (MNPB07.01.02) (ESS06.01.05) (ESS06.01.06) (ESS06.01.07) (ESS06.03.03) / NCCER/ NSS/ S (HS.6.1.1)/ FA(TE.4)/ FA(VA.5.1, E.5.1)/					
0.4.5	Explain the importance of Hazard Communications (HazCom) and Material Safety Data Sheets (MSDS) CC K&S (MNC06.02.01)(MNC06.05.01) (MNC06.05.02) (MNPB07.01.01) (MNPB07.01.02) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.08) (ESS06.02.01) (ESS06.02.02) / NCCER/ NSS/ FA(TE.4)/ FA(VP.5.1, I.5.2, P.5.2, A.5.1, A.5.2)/					
0.4.6	Describe fire prevention and firefighting techniques. CC K&S (MNC06.03.01) / NCCER/ FA(TE.4)/					
0.4.7	Follow safety procedures required for lifting heavy objects. CC K&S (MNC06.04.01) (MNC06.05.03) (ESS06.01.04) (MNPB03.01.03) / NCCER/ FA(TE.4)/					
0.4.8	Follow safe behavior procedures on and around ladders and scaffolds. CC K&S (MNC06.04.01) (MNC06.05.03) (ESS06.01.04) (MNPB03.01.03) / NCCER/ S (HS.6.1.1)/ FA(TE.4)/					
0.4.9	Explain the purpose of OSHA and how it promotes safety on the job. CC K&S (MNC06.02.01) (MNC06.03.01) CC K&S (MNC06.05.01) (MNC06.05.02) (MNPB07.01.01) (MNPB07.01.02) (ESS06.02.01) (ESS06.02.02) (MNC05.01.05) / SS (HS.3.5.3)/ FA(TE.4)/					
0.4.10	Respond to hazardous-materials and hazardous-waste emergency situations in accordance with regulatory requirements. CC K&S (MNC06.02.01) (MNC06.03.01) (MNC06.04.01) MNC06.05.01) (MNC06.05.02) (MNC06.05.03) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.02.01) (ESS06.02.02) (ESS06.04.01) (MNPB03.01.03) (MNPB03.01.04) / NSS/ SS (HS.3.5.3)/ FA(TE.4)/ 21st (L02A)					
0.4.11						

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TECHNICAL COURSES

17001G0.5011 - Introduction to Industrial Technology (.5 credit)
An introductory level course designed to instruct students in the basic skills necessary to all occupations in the construction, Manufacturing & Transportation areas.

Benchmark: 0.5 Demonstrate basic skills in the industrial technology area of study.		4	3	2	1	0
0.5.1	**Basic Safety –** NCCER/ CC K&S/ SkillsUSA/ -Identify causes of accidents and the impact of accident costs. CC K&S (MNC06.01.01) (MNPB07.01.02) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (MNPB03.01.03) -Follow safe behavior procedures on and around ladders, scaffolds and stairs. – CC K&S (MNC06.04.01) (MNC06.05.03) (ESS06.01.04) -Follow safe behavior procedures around electrical hazards. CC K&S (MNC06.04.01) (MNC06.05.03) (ESS06.01.04) -Demonstrate the use, care and inspection of appropriate personal protective equipment (PPE) - CC K&S (MNC06.02.01) (MNC06.04.01) (MNC06.05.03) (MNPB07.01.02) (ESS06.01.05) (ESS06.01.06) (ESS06.01.07) (ESS06.03.03) (MNPB02.01.01) -Explain the importance of hazard communications (HazCom) and material safety data sheets (MSDSs).- CC K&S (MNC06.01.01) (MNC06.02.01) (MNC06.03.01) (MNPB07.01.02)) (ESS02.04.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.08) (ESS06.02.01) (ESS06.02.02) -Respond to hazardous-materials and hazardous-waste emergency situations in accordance with regulatory requirements. 21st (L02A)/ CC K&S (MNC06.02.01) (MNC06.03.01) (MNC06.04.01) MNC06.05.01) (MNC06.05.02) (MNC06.05.03)) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.02.01) (ESS06.02.02) (ESS06.04.01) (MNPB03.01.03) (MNPB03.01.04) - Follow safety procedures required for lifting heavy objects. - CC K&S (MNC06.04.01) (MNC06.05.03) (ESS06.01.04) (MNPB03.01.03) -Demonstrate a working knowledge of safety education, environment, and enforcement for life and work. - CC K&S (MNC06.01.01) (MNC06.03.01) (MNC06.05.03) (MNPB07.01.01) (MNPB07.01.02) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.08) (ESS06.01.09) (ESS06.04.01) (MNPB03.01.01) (MNPB03.01.03) - Apply safe practices while using tools and equipment. - CC K&S (MNC06.04.01) (MNC06.05.03)) (ESS06.01.09) (MNPB03.01.03) -Apply safe practices for housekeeping, dress, fire, chemicals & personal protection while working in a shop. - CC K&S (MNC06.04.01) (MNC06.05.03) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.05) (ESS06.01.06) (ESS06.01.07) (ESS06.01.08) (ESS06.01.09) (MNPB03.01.03) -Describe fire prevention and firefighting techniques.- CC K&S (MNC06.02.01) (MNC06.03.01) (MNC06.05.03) (MNPB07.01.02) -Explain the purpose of OSHA and how it promotes safety on the job. - CC K&S (MNC06.01.01) (MNC06.02.01) (MNC06.03.01) MNC06.05.01) (MNC06.05.02) (MNPB07.01.01) (MNPB07.01.02) (ESS06.02.01) (ESS06.02.02) (MNC05.01.05)					
0.5.2	**Industrial Math –** NCCER/ CC K&S/ SkillsUSA/ AS (N3.5) -Add, subtract, multiply, and divide whole numbers, fractions, decimals and percentages. – AS (I1)/ CC K&S (ESS01.03.01 (ESS01.03.02)/ -Use a standard ruler, a metric ruler, and a measuring tape to measure. - CC K&S (ESS01.03.01 (ESS01.03.02) (MNPB08.01.05) / -Demonstrate conversion skills for decimals and fractions.- CC K&S (ESS01.03.02)/ -Recognize and perform calculations using metric units of length, weight, volume and temperature. CC K&S (ESS01.03.01) (ESS01.03.02)/					
0.5.3	**Hand Tools –** NCCER/ CC K&S/ SkillsUSA/ -Recognize and identify some of the basic hand tools and their proper uses in industrial trades. - CC K&S (MNC10.01.02) -Demonstrate the safe use of common hand tools. - CC K&S (MNC10.01.02) (MNC06.05.03)					

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0.5.4	**Power Tools –** NCCER/ CC K&S/ SkillsUSA/ -Recognize and identify some of the basic power tools and their proper uses in the industrial trades. CC K&S (MNC10.01.02) -Demonstrate the safe use of common power tools. - CC K&S (MNC10.01.02) (MNC06.05.03) -Perform preventive maintenance on basic power tools used in the industrial trades - CC K&S (MNPB07.01.03) (MNPB02.01.01)					
0.5.5	**Blueprint Reading –** NCCER/ CC K&S/ SkillsUSA/ -Perform the drafting principles needed to draw the basic geometric shapes. CC K&S (MNC10.01.01) -Develop a pictorial sketch of an object. - CC K&S (ESS01.02.04) (MNC10.01.01) -Develop a multi-view drawing. - CC K&S (ESS01.02.04) (MNC10.01.01) -Identify basic symbols used in blueprints – AS (F5)/ CC K&S (MNC10.01.01) -Identify various types of blueprint views used in Architecture, Construction, Manufacturing and Engineering – AS (F5)/ CC K&S (MNC10.01.01)					
0.5.6	**Communication Skills –** NCCER/ CC K&S / 21st/ SkillsUSA/ -Interpret information and follow instructions presented in both verbal and written form. 21st (L04A)/ AS (A7, F1, F5)/CC K&S (ESS01.02.01) (ESS01.02.06)) (ESS02.04.01) -Communicate effectively in on-the-job situations using verbal and written skills in various delivery modes (face-to-face, paper, & electronic). 21st (L03A)/ CC K&S (ESS01.02.02) (ESS01.02.06) (ESS02.02.01) (ESS02.02.03) (ESS02.02.04) (ESS04.01.02) (ESS04.02.01) (ESS04.05.01) (ESS04.05.02) (MNPB05.01.01) (MNPB05.01.02) (MNPB05.01.03) -Create and complete various written documents used in industrial trades. 21st (L03A)/ AS (C10)/ CC K&S (ESS01.02.04) (ESS02.02.03) (ESS04.01.02) (ESS04.02.01) (ESS04.05.01) (ESS04.05.02) -Demonstrate knowledge and use of computer systems and word processing software in effective communication. 21st (L04E)/ CC K&S (ESS01.02.03) (ESS02.02.04)) (ESS02.04.01) (ESS04.02.01) (ESS04.05.01) (ESS04.05.02) /					
0.5.7	**Employability Skills –** NCCER/ CC K&S/ 21st /SkillsUSA/ -Create and utilize employment documents including a resume and portfolio. 21st (L03A)/ AS (C10)/ CC K&S (ESS01.02.03) (ESS01.02.04)/ (ESS09.04.01) (ESS09.04.02) (ESS09.04.03) (ESS09.03.02) (ESS09.03.03) (ESS09.03.04) (ESS04.05.01) (ESS04.05.02) -Demonstrate job seeking and interview skills. 21st (L04E, L10A)/ CC K&S (ESS09.03.05) (ESS09.03.01) -Understand and respond to performance reviews. 21st (L003C, L10A, L10C)/ CC K&S (ESS03.03.01) (ESS03.03.02) (ESS03.03.03) (ESS03.03.04) (ESS01.02.06)					
0.5.8	**21st Century/Foundation Skills –** NCCER/ CC K&S/ 21st/ -Demonstrate critical thinking skills and the ability to solve problems using those skills. 21st (L02D)/ CC K&S (ESS09.03.07) (ESS07.01.02) (ESS03.01.01) (ESS03.01.02) (ESS03.01.03) (ESS03.01.04) -Define effective relationship skills. 21st (L07A) / CC K&S (ESS07.04.01) (ESS07.04.02) (ESS07.04.04) (ESS07.04.05) (ESS07.04.06) (ESS07.01.03) (ESS07.01.04) (ESS07.01.05) -Demonstrate a working knowledge of workplace issues such as sexual harassment, stress, and substance abuse. 21st (L07C)/ CC K&S (ESS07.04.04) (ESS07.04.07) (ESS07.01.03) (ESS07.01.05) (ESS03.02.04) -Demonstrate the ability to achieve common goals through team work – CC K&S(MNPB06.01.02) (MNPB06.01.03) (ESS07.01.02) (ESS07.01.03) (ESS07.01.05) (ESS07.01.07) 21st (L03C, L03D)/ AS (B7)/					
0.5.9	**Materials Handling –** NCCER/ CC K&S/ SkillsUSA -Verify that health, safety, environmental and government regulations are met. - CC K&S (MNC06.02.01) (ESS06.01.02) (ESS06.01.04) (ESS06.01.08) (ESS06.01.09) (ESS06.02.01) (ESS06.02.02) -Recognize hazards and follow safety procedures required for materials handling. - CC K&S (MNC06.01.01) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.05) (ESS06.01.06) (ESS06.01.07) (ESS06.01.08) (ESS06.01.09) (ESS06.02.01) (ESS06.02.02) -Demonstrate ability to load and unload materials properly and safely. - CC K&S (MNC06.02.01) (MNPB08.01.07) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.08)					
0.5.10						
0.5.11						
0.5.12						
0.5.13						

21108G0.5011 - Production Blueprint Reading (.5 credit)
An introductory course designed to introduce students to the various types of blueprints utilized in the manufacturing industry.

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Benchmark: 0.6 Demonstrate basic skills in blueprint reading		4	3	2	1	0
0.6.1	Identify symbols associated with blueprints- NCCER/ CC K&S (MNC10.01.01) (ESS02.01.02) /					
0.6.2	Interpret work from multiview drawings- NCCER/ CC K&S (ESS01.03.07) (MNC10.01.01) (ESS02.01.02) /					
0.6.3	Interpret size and location of features- NCCER/ CC K&S (MNC10.01.01) (ESS02.01.04) /					
0.6.4	Visualize shapes and objects in multiple views- NCCER/ CC K&S (MNC10.01.01)/					
0.6.5	Demonstrate ability to convert fractions and decimals proficiently- NCCER/ CC K&S (ESS01.03.02)/ /					
0.6.6	Interpret inch and metric drawings- NCCER/ CC K&S (ESS01.03.07) (MNC10.01.01) (ESS01.02.06)) (ESS02.04.01) (ESS02.01.04) /					
0.6.7	Demonstrate legend and note reading skills- NCCER/ CC K&S (MNC10.01.01) (ESS01.02.06) (ESS02.01.04) (ESS02.01.02) /					
0.6.8	Interpret basic geometric dimensioning and tolerancing terminology- NCCER/ CC K&S (MNC10.01.01) (ESS02.01.02) /					
0.6.9	Identify different views utilized in blueprint reading- NCCER/ CC K&S (MNC10.01.01)/					
0.6.10	Identify orthographic projection such as lines and symbols for electrical, piping, mechanical, architectural, welding, and machining prints- NCCER/ CC K&S (MNC10.01.01) (ESS02.01.02) /					
0.6.11						

13207G0.5015 - Introduction to Welding (.5 credit)
An introductory course designed to introduce students in basic welding skills.

Benchmark: 0.6 Demonstrate basic skills in welding		4	3	2	1	0
0.6.1	Identify safe practices and safety & health issues and procedures – NCCER/ CC K&S (MNC06.01.01) (MNC06.02.01) (MNC06.03.01) (MNPB07.01.02) (ESS06.02.01) (ESS06.02.02)					
0.6.2	Demonstrate proper use of personal protective equipment and safe work habits- NCCER/ CC K&S (MNC06.04.01) (MNC06.05.03) (MNPB07.01.02) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.05) (ESS06.01.06) (ESS06.01.07) (ESS06.01.08) (ESS06.01.09) /					
0.6.3	Demonstrate safe set up of welding equipment- NCCER/ CC K&S (MNC06.04.01) (MNC06.05.03) (MNPB08.01.03) (ESS06.01.09) /					
0.6.4	Recognize joint design and welding terminology- NCCER/					
0.6.5	Identify and describe welding symbols- NCCER/					
0.6.6	Manually operate an oxyfuel torch to cut carbon steel structural materials of varying thicknesses- NCCER/ CC K&S (MNC10.01.02)					
0.6.7	Identify/select Arc welding electrodes used for welding- NCCER/					
0.6.8	Describe metallurgy and identify metals- NCCER/ 21st (L02A)/					
0.6.9	Weld joints in the F and H positions using a fast freeze electrode- NCCER/ CC K&S (MNC10.01.02)					
0.6.10	Weld joints in the F and H positions using GMAW carbon steel- NCCER/ CC K&S (MNC10.01.02)					
0.6.11	Weld joints in the F and H positions using GTAW carbon steel- NCCER/ CC K&S (MNC10.01.02)					

13002G1.0011 – Manufacturing Processes (1 Credit)
A comprehensive, technical level course to instruct students in the knowledge and skills common to all manufacturing occupations.

Benchmark: 0.7 Demonstrate understanding of basic skills in manufacturing		4	3	2	1	0
0.7.1	Identify materials and processes incorporated in the manufacturing industry- CC K&S (MNC10.01.01) (MNPB08.01.02)/					
0.7.2	Utilize technical drawings/blueprints, work orders, and other ways of conveying product specifications- NCCER/ CC K&S (MNC10.01.01) (ESS01.02.06) /					
0.7.3	Demonstrate proper safety procedures for manufacturing processes and material handling - NSS/ NCCER/ CC K&S (MNC06.02.01) (MNC06.04.01) (MNC06.05.03) (MNPB07.01.02) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.05) (ESS06.01.06) (ESS06.01.07) (ESS06.01.08) (ESS06.01.09) / /					
0.7.4	Safely use and maintain basic hand and power tools - NSS/ NCCER/ CC K&S (MNC06.04.01) (MNC06.05.03) (MNPB07.01.03) (ESS06.01.04)) (ESS06.01.07) (ESS06.01.09) (MNPB02.01.01)/					
0.7.5	Demonstrate and develop skills for bonding, casting, combining, conditioning, forming, and separating processes- CC K&S (MNC10.01.02)/					
0.7.6	Explore and/or implement computer automations into manufacturing processes- CC K&S (ESS04.11.01) (ESS04.11.02) (ESS04.11.03) (ESS04.11.04) /					

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(SkillsUSA) SkillsUSA Championships Technical Standards
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0.7.7	Analyze and solve problems using skills related to methods in production of a product- NCCER/ CC K&S (ESS01.03.04) (MNPB01.01.02) (MNPB01.01.03) /					
0.7.8	Integrate team and mass production processes into manufacturing- CC K&S (MNPB06.01.04) /					
0.7.9	Incorporate LEAN manufacturing concepts: _ visual management, value stream mapping, _ 5S, _ kanban systems, _ lean metrics, _ shop layout - - CC K&S (MNPB01.01.01) (MNPB01.01.04) (MNPB01.01.05) (MNPB01.01.06) (MNPB01.01.07) (MNPB01.01.08) (MNPB01.01.09) (MNPB06.01.02) (MNPB06.01.03) (MNPB06.01.04)					
0.7.10	Research future technologies affecting manufacturing with regards to going green, recycling supplies, alternative resources- NCCER/ CC K&S (ESS02.03.01) (ESS02.03.02) (ESS04.04.01) (ESS04.04.02) (ESS04.04.03) (ESS03.04.01) (ESS03.04.02) (ESS03.04.03) (ESS03.04.04) (ESS09.09.02) /					
0.7.11	Demonstrate soldering abilities - NSS/ NCCER/ CC K&S (MNC10.01.02)					
0.7.12	Demonstrate a basic understanding of metallurgy - SkillsUSA/ NCCER/					
0.7.13						
0.7.14						
0.7.15						

21108G0.5023 – Advanced Production Blueprint Reading (.5 Credit)
An technical level course providing students with advanced blueprint reading skills.

Benchmark: 0.8 Demonstrate advanced skills in blueprint reading		4	3	2	1	0
0.8.1	Interpret symbols associated with fields pertaining to manufacturing production- NCCER/ CC K&S (MNC10.01.01) (ESS02.01.04) (ESS02.01.02) /					
0.8.2	Interpret work from multiview drawings and computer models- NCCER/ CC K&S (MNC10.01.01) (ESS01.02.06) (ESS02.01.04) (ESS02.01.02) /					
0.8.3	Visualize shapes and objects in multiple views- NCCER/ CC K&S (MNC10.01.01) (ESS01.02.06) /					
0.8.4	Create product from multi-view drawings- NCCER/					
0.8.5	Demonstrate proficiency in dimensioning techniques - NCCER/ CC K&S(ESS04.10.01) (ESS04.10.03)/					
0.8.6	Determine processes and procedures for job completion- NCCER/ CC K&S (MNC10.01.01)/ 21st (L02A, L02B)/					
0.8.7	Develop a work order from production blueprint- NCCER/ 21st (L02A)/ CC K&S (ESS01.02.02) (ESS01.02.03) (ESS01.02.04) (MNC10.01.01) (ESS04.05.01) (ESS02.01.04) (ESS02.01.02)					
0.8.8						

21107G1.0011 – Drafting/CAD (1 Credit)
A comprehensive course designed to instruct students in the use of CAD design and software.

Benchmark: 0.9 Demonstrate basic skills in drafting/CAD.		4	3	2	1	0
0.9.1	Identify and demonstrate the use of CAD commands and system peripherals. CC K&S (ESS01.03.05) ESS01.03.03) (ESS04.10.01) (ESS04.10.03)// SkillsUSA/ FA(TE.4.3)/ NSS/					
0.9.2	Demonstrate the ability to dimension drawings on the CAD system. CC K&S(ESS04.10.01) (ESS04.10.03)// SkillsUSA/ FA(TE.4.3)/ NSS/					
0.9.3	Demonstrate proficiency in setting limits and scale on the CAD system. CC K&S (MNC10.01.01) (ESS04.10.01) (ESS04.10.03)// FA(TE.4.3)/ NSS/					
0.9.4	Demonstrate proficiency in setting, turning on and turning off layers. FA(TE.4.3)/ NSS/ CC K&S(ESS04.10.01) (ESS04.10.03)/					
0.9.5	Create standard drawings for templates. SkillsUSA/ FA(TE.4.3)/ AS (C8)/ NSS/ CC K&S (ESS01.02.04) (MNC10.01.01) (ESS04.10.01) (ESS04.10.03)/					
0.9.6	Demonstrate the ability to create drawings in 3D. CC K&S (ESS01.02.04) (ESS04.10.01) (ESS04.10.03)// SkillsUSA/ FA(TE.4.3)/ NSS/					
0.9.7	Demonstrate the ability to load, store files, and transport files via Internet. CC K&S (ESS01.02.03) (ESS02.03.01) (ESS02.03.02) (ESS04.10.01) (ESS04.10.02) (ESS04.10.03) (ESS04.02.01) / / FA(TE.4.3)/ NSS/					
0.9.8	Be proficient in the use of printer/plotter operations. FA(TE.4.3)/ CC K&S (MNPB08.01.03) (ESS04.02.01)					
0.9.9						
0.9.10	Place text on a drawing and be able to change to different font styles, sizes and angles. SkillsUSA/ FA(TE.4.3)/ NSS/ CC K&S (ESS01.02.05) (ESS04.10.01) (ESS04.10.03) /					
0.9.11						

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0.9.12						
0.9.13	Construct drawings using straight line, circle, and hidden line statements, etc. CC K&S (ESS01.02.04) (ESS04.10.01) (ESS04.10.03)// SkillsUSA/ FA(TE.4.3)/ AS (C8)/ 21st (L04D, L04E)/ NSS/					
0.9.14	Construct isometric and 3D drawings. CC K&S (ESS01.02.02)(ESS01.02.04)(ESS04.10.01) (ESS04.10.03)// FA(TE.4.3)/ AS (C8)/ 21st (L04D, L04E) /NSS/					
0.9.15	Set grid and snap specifications. FA(TE.4.3)/ NSS/ CC K&S (ESS01.03.04)(ESS04.10.01) (ESS04.10.03)//					
0.9.16	Define and use commands to modify a drawing. FA(TE.4.3)/ NSS/ CC K&S (ESS01.02.05)(ESS04.10.01) (ESS04.10.03)/					
0.9.17	Use symbols (from a symbol library) in a drawing. FA(TE.4.3)/ NSS/ CC K&S (ESS01.02.02)(ESS04.10.01) (ESS04.10.03) /					

13052G1.0012 – Mass Production (1 Credit)

A comprehensive, technical level course designed to instruct students in the knowledge and skills required for fabricating products using a variety of materials (wood, plastic, metal, composites).

Benchmark: 0.10 Demonstrate basic skills in production fabrication		4	3	2	1	0
0.10.1	Identify materials and processes incorporated in mass production- CC K&S (MNC10.01.01) (MNPB08.01.02)/					
0.10.2	Utilize technical drawings/blueprints, work orders, and other ways of conveying product specifications - SkillsUSA/ - NCCER/ CC K&S (MNC10.01.01) (MNPB05.01.01) (MNPB05.01.02) (MNPB05.01.03)/					
0.10.3	Apply math skills to manage distance, spacing, angle measurements, and placement for project development- - NCCER/ CC K&S (ESS01.03.02) (ESS01.03.03) (ESS01.03.04) /					
0.10.4	Perform steps to interpret, transfer and layout procedures for projects- CC K&S (ESS01.02.03) (MNC10.01.01) / 21st (L02A, L02B)/					
0.10.5	Estimate production costs based on product needs assessment- CC K&S (ESS01.03.02) (MNC10.01.01)/ 21ST (L02A)/					
0.10.6	Safely use and maintain basic hand and power tools – NCCER/ SkillsUSA/ NSS/ CC K&S (MNC06.04.01) (MNC06.05.03) (MNC10.01.02) (MNPB07.01.03) (ESS06.01.09) (MNPB02.01.01)/					
0.10.7	Demonstrate skills required to safely use power equipment – NCCER/ SkillsUSA/ NSS/ CC K&S (MNC06.04.01) (MNC06.05.03) (MNC10.01.02) (ESS06.01.02) (ESS06.01.04) (ESS06.01.05) (ESS06.01.07) (ESS06.01.09) / /					
0.10.8	Explore and/or implement computer automations into mass production- CC K&S (ESS04.11.01) (ESS04.11.02) (ESS04.11.03) (ESS04.11.04) / 21ST (L04D)/					
0.10.9	Analyze and solve problems using skills related to methods in production of a product - CC K&S (ESS01.03.07) (MNPB01.01.02) (MNPB01.01.03) / 21ST (L02B)/					
0.10.10	Integrate mass production processes into design as related to traditional methods of manufacturing and constructing products					
0.10.11	Select and perform best practices for joining, assembling, and finishing projects - CC K&S (MNC10.01.03) CC K&S (MNC10.01.04)					
0.10.12	Incorporate LEAN manufacturing concepts pertaining to mass production _ visual management, _ value stream mapping, _ 5S, _ kanban systems, _ lean metrics, _ shop layout CC K&S (MNPB01.01.01) (MNPB01.01.04) (MNPB01.01.05) (MNPB01.01.06) (MNPB01.01.07) (MNPB01.01.08) (MNPB01.01.09) (MNPB06.01.02) (MNPB06.01.03) (MNPB06.01.04) / 21ST (L05B, L08B, L08C)/					
0.10.13	Explain the role of business and market in the free enterprise system – CC K&S (ESS05.01.01) (ESS05.01.02)					
0.10.14	Research future technologies affecting mass production and teaming concepts related to going green, recycling supplies, alternative resources – AS (D2)/ 21ST (L04E)/ CC K&S (ESS02.03.01) (ESS04.04.01) (ESS04.04.02) (ESS04.04.03) (ESS03.04.01) (ESS03.04.02) (ESS03.04.03) (ESS03.04.04) (ESS09.09.02)					
0.10.15						

13203G1.0012 – Machine Tool Technology I (1 Credit)

A comprehensive, technical level course designed to instruct students in the basic theories, equipment & skills needed to perform maching skills.

Benchmark: 0.11 Demonstrate basic skills in machining		4	3	2	1	0
0.11.1	Perform Bench work and Layout Operations - NSS/ SkillsUSA/ CC K&S/ CC K&S (MNC10.01.02) (MNC10.01.01)					
0.11.2	Demonstrate Precision Measuring - NSS/ SkillsUSA/ NCCER/ CC K&S (ESS01.03.02) (MNPB08.01.05)					
0.11.3	Perform Layout Operations - NSS/ SkillsUSA/ CC K&S (MNC10.01.01)/					
0.11.4	Operate Drilling Machines - NSS/ SkillsUSA/ CC K&S (MNC10.01.02)					
0.11.5	Operate Manual Lathes - NSS/ SkillsUSA/ CC K&S (MNC10.01.02)					

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0.11.6	Operate Manual Milling Machines - NSS/ SkillsUSA/ CC K&S (MNC10.01.02)					
0.11.7	Operate Grinding tools and Equipment - NSS/ SkillsUSA/ CC K&S (MNC10.01.02)					
0.11.8	Interpret Blueprint Drawing - NSS/ SkillsUSA/ AS (F5)/ CC K&S (MNC10.01.01) (ESS01.02.06)) (ESS02.04.01) / 21ST (L04A, L02A)/					
0.11.9	Use Metric and English standards of Measurement - NSS/ SkillsUSA/ NCCER/ CC K&S (ESS01.03.02) (MNPB08.01.05) /					
0.11.10	Demonstrate the Use of Hand tools - NSS/ SkillsUSA/ NCCER/ CC K&S (MNC10.01.02)/					
0.11.11	Cut threads with taps and dies – NSS/					
0.11.12	Identify Tap Drill sizes					
0.11.13	Calculate Feeds and Speeds for machining –NSS/ SkillsUSA/ CC K&S (ESS01.03.02) (MNC10.01.01) (MNPB08.01.03)					
0.11.14	Demonstrate Work Process Planning – NSS/ SkillsUSA/ CC K&S (MNC10.01.01)/ 21ST (L02A)/					
0.11.15	Demonstrate applied math skills in Geometry and Algebra – NSS/ AS (J1, K)/ CC K&S (ESS01.03.02)/					
0.11.16	Demonstrate accurate use of specialty measuring tools –NSS/ NCCER/ CC K&S (MNPB08.01.05) /					
0.11.17	Establish Material preparation including saws - CC K&S (MNC10.01.01) (MNPB08.01.03) /					
0.11.18	Operate Boring Equipment – NSS/ CC K&S (MNC10.01.02)					
0.11.19	Determine applications of Materials - SkillsUSA/ CC K&S (MNC10.01.01) (MNPB08.01.02) (ESS09.01.06) / 21ST (L02B, L02C)/					
0.11.20	Demonstrate the use of machine shop formulas – NSS/ SkillsUSA/ CC K&S (ESS01.03.02) CC K&S (ESS01.03.03)/					

13204G1.0011 – CAM (Computer Aided Machining) (1 Credit)
A technical level course designed to instruct students in the knowledge and skills required to perform CAM activities.

Benchmark: 0.12 Demonstrate basic skills in CAM		4	3	2	1	0
0.12.1	Interpret and read blueprints to generate code – NSS/ SkillsUSA/ CC K&S (ESS01.02.05) (MNC10.01.01) (ESS01.02.06)) (ESS02.04.01) / 21ST (L02A)/					
0.12.2	Manipulate Mechanical Drawings using CAM – CC K&S (ESS01.02.05) (ESS04.10.01) (ESS04.10.03)/					
0.12.3	Use Cartesian coordinate system in generating Code – NSS/ SkillsUSA/ CC K&S (ESS01.03.03) (ESS04.10.01) (ESS04.10.03)/					
0.12.4	Create 2-D Multi-View drawings – NSS/ CC K&S (ESS01.02.02) CC K&S (ESS01.02.04) CC K&S (ESS01.03.06) ESS04.10.01) (ESS04.10.03)/					
0.12.5	Generate Pictorial Drawings - CC K&S (ESS01.02.02) CC K&S (ESS01.02.04) CC K&S (ESS01.03.06) (ESS04.10.01) (ESS04.10.03)/					
0.12.6	Create BOM (Bill of Material)- CC K&S (ESS01.02.04)/					
0.12.7	Demonstrate communication with machine tools- CC K&S (ESS04.11.01) (ESS04.11.02) (ESS04.11.03) (ESS04.11.04) // 21ST (L04D)/					
0.12.8	Import Solid models into CAM - CC K&S(ESS04.10.01) (ESS04.10.03)/					
0.12.9	Create a 2-D from a 3-D model - CC K&S (ESS01.02.02) (ESS01.02.05) (ESS04.10.01) (ESS04.10.03)/					
0.12.10	Demonstrate Knowledge of Machining Fundamentals – NSS/ SkillsUSA/ CC K&S (MNC10.01.02))					
0.12.11	Establish Plan of Procedure - 21ST (L02A)/ CC K&S (ESS01.02.03) (MNC10.01.01) (ESS04.05.01) /					
0.12.12	Knowledge of various industry specific software – CC K&S(ESS04.02.01)					
0.12.13	Demonstrate editing CNC Code with CAM CC K&S (ESS01.02.05) (MNPB01.01.02) (MNPB01.01.03) (ESS04.10.01) (ESS04.10.03)/					
0.12.14	Program Multiple Axis code CC K&S(ESS04.10.01) (ESS04.10.03)/					

13207G1.0014 – Production Welding Processes I (1 Credit)
A comprehensive course designed to instruct students in the theories & terminology required to perform brazing and Arc welding.

Benchmark: 0.13 Demonstrate basic skills in brazing & Arc welding		4	3	2	1	0
0.13.1	Identify safe practices and safety and health issues and procedures – NSS/ NCCER/ CC K&S (MNC06.01.01) (MNC06.02.01) (MNC06.03.01) (MNPB07.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.05) (ESS06.01.08) (ESS06.02.01) (ESS06.02.02) /					

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0.13.2	Demonstrate proper use of personal protective equipment and safe work habits – NSS/ NCCER/ CC K&S (MNC06.02.01) (MNC06.04.01) (MNC06.05.03) (ESS06.01.01) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.05) (ESS06.01.06) (ESS06.01.07) (ESS06.01.08) (ESS06.01.09) (ESS06.02.01) (ESS06.02.02) /					
0.13.3	Demonstrate safe set up of welding equipment – NSS/ NCCER/ CC K&S (MNC06.04.01) (MNC06.05.03) (MNPB08.01.03) (ESS06.01.09) /					
0.13.4	Identify and describe welding theory related to standard processes - NCCER/ CC K&S (ESS02.01.02) (ESS02.01.03) (ESS02.01.04)					
0.13.5	Make welds using the oxyfuel process – NSS/ NCCER/ CC K&S (MNC10.01.02)					
0.13.6	Braze weld carbon steel – NSS/ CC K&S (MNC10.01.02)					
0.13.7	Describe the flame cutting process- NCCER/ CC K&S (MNC10.01.02)					
0.13.8	Strike the Arc/weld a pad of beads- NCCER/ CC K&S (MNC10.01.02)					
0.13.9	Describe nondestructive testing methods and demonstrate their use- CC K&S (MNC10.01.05) (MNP04.01.04) (MNPB08.01.05) /					
0.13.10	Describe destructive testing methods and demonstrate their use- CC K&S (MNC10.01.05) (MNP04.01.04) (MNPB08.01.05) /					
0.13.11	Identify physical and chemical properties of metals and how they impact a metals' weldability- NCCER/ CC K&S (MNP04.01.04) /					
0.13.12	Draw welding symbols to illustrate a welded joint- NCCER/ CC K&S (ESS02.09.01)					
0.13.13	Weld joints in the F and H positions using a fast fill electrode - CC K&S (MNC10.01.02) (MNC10.01.03)					
0.13.14	Weld joints in the F and H positions using multi-pass technique GMAW – NSS/ NCCER/ CC K&S (MNC10.01.02) (MNC10.01.03)					
0.13.15	Weld joints in the F and H positions using multi-pass technique GTAW – NSS/ NCCER/ CC K&S (MNC10.01.02) (MNC10.01.03)					
0.13.16	Weld joints in the F and H positions using multi-pass technique SMAW – NSS/ NCCER/ CC K&S (MNC10.01.02) (MNC10.01.03)					

21150G1.0011 – Advanced Drafting/CAD (1 Credit)
An advanced level application course designed to provide students with the knowledge and skills needed to utilize CAD design and software.

Benchmark: 0.14 Demonstrate advanced skills in CAD design and software		4	3	2	1	0
0.14.1	Demonstrate the ability to create drawings in 3D - SkillsUSA/ CC K&S (ESS01.02.02) (ESS01.02.04) (ESS01.03.06) (ESS04.10.01) (ESS04.10.03) (ESS02.09.01) /					
0.14.2	Demonstrate proficiency in creating auxiliary views - SkillsUSA CC K&S (ESS01.02.02) (ESS01.02.04) (ESS04.10.01) (ESS04.10.03)/					
0.14.3	Identify, draw, and position appropriate auxiliary views - SkillsUSA/ CC K&S (ESS01.02.04) (ESS04.10.01) (ESS04.10.03) (ESS02.09.01)/					
0.14.4	Demonstrate proficiency in creating section views - SkillsUSA/ CC K&S (ESS01.02.04 (ESS04.10.01) (ESS04.10.03) (ESS02.09.01)/					
0.14.5	Identify ,draw, and position appropriate section views - SkillsUSA/ CC K&S (ESS01.02.04) (ESS04.10.01) (ESS04.10.03) (ESS02.09.01)/					
0.14.6	Demonstrate knowledge of user coordinate system - SkillsUSA/ CC K&S(ESS04.10.01) (ESS04.10.03)/					
0.14.7	Demonstrate ability to manipulate UCS - CC K&S(ESS04.10.01) (ESS04.10.03)/					
0.14.8	Demonstrate ability to set and use advanced dimensioning functions correctly - SkillsUSA/ CC K&S(ESS04.10.01) (ESS04.10.03)/					
0.14.9	Construct solid models -					
0.14.10	Manipulate solid models					
0.14.11						
0.14.12						
0.14.13						

13203G1.0022 – Machine Tool Technology II (1 Credit)
An application level course designed to provide students with advanced machining skills and further opportunities to apply those skills.

Benchmark: 0.15 Demonstrate advanced skills in machining		4	3	2	1	0
0.15.1	Apply the post process treatment of materials- CC K&S(MNC10.01.04)					
0.15.2	Perform Advanced concepts in milling - SkillsUSA/ CC K&S (MNC10.01.02)					

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0.15.3	Perform Advanced concepts in turning - SkillsUSA/ CC K&S (MNC10.01.02)					
0.15.4	Demonstrate CNC Lathe Fundamentals - SkillsUSA/ CC K&S (MNC10.01.02) (ESS04.11.01) (ESS04.11.02) (ESS04.11.03) (ESS04.11.04) (ESS04.10.01) (ESS04.10.03)/					
0.15.5	Demonstrate CNC Milling Fundamentals - SkillsUSA/ CC K&S (MNC10.01.02) (ESS04.11.01) (ESS04.11.02) (ESS04.11.03) (ESS04.11.04) (ESS04.10.01) (ESS04.10.03)/					
0.15.6	Operate Precision Measurement tools and equipment - SkillsUSA/ CC K&S (MNC10.01.02) (MNPB08.01.05) /					
0.15.7	Demonstrate Inspection and Quality control - SkillsUSA/ CC K&S (MNC10.01.05) (MNP04.01.04) (MNPB08.01.05) / 21ST (L08B, L08C)/					
0.15.8	Interpret Blueprint Drawings and Sketches - SkillsUSA/ CC K&S (MNC10.01.01) (ESS01.02.06)) (ESS02.04.01) / 21ST (L02A)/					
0.15.9	Determine Work Process planning- CC K&S (ESS01.02.03) (MNC10.01.01) / 21ST (L02A)/					
0.15.10	Demonstrate use of advanced Math Skills related to machining- CC K&S (ESS01.03.02) (ESS01.03.03) (ESS01.03.04) (ESS01.03.05)					
0.15.11	Apply the use of CAM in machining processes - SkillsUSA/ CC K&S (ESS04.11.01) (ESS04.11.02) (ESS04.11.03) (ESS04.11.04) /					
0.15.12	Perform Measurements on a surface plate - SkillsUSA/ CC K&S (ESS01.03.02) (MNPB08.01.05) /					

13052G1.0022 – Mass Production II (1 Credit)

An application level course designed to instruct students in the knowledge and skills required for fabricating products using a variety of materials (wood, plastic, metal and composites.

Benchmark: 0.16 Demonstrate advanced skills in mass production fabrication		4	3	2	1	0
0.16.1	Identify and select materials used in developing production processes- CC K&S (MNC10.01.01) (MNPB08.01.02) /					
0.16.2	Use technical drawings, blueprints, work orders, and product specifications in product development- NCCER/ CC K&S (ESS01.02.03) (MNC10.01.01) (ESS01.02.06) /					
0.16.3	Apply math skills to manage distance, spacing, angle measurements, and placement for project development- NCCER/ CC K&S (ESS01.03.02)/					
0.16.4	Perform steps to interpret, transfer and layout production methods for projects- 21st (L02A)/ CC K&S (ESS01.02.05) (MNC10.01.01)					
0.16.5	Safely use and maintain basic hand and power tools - SkillsUSA/ NCCER/ CC K&S (MNC06.04.01) (MNC06.05.03) (MNC10.01.02) (MNPB07.01.03) (ESS06.01.09) (MNPB02.01.01) /					
0.16.6	Demonstrate skills required to safely use specialized equipment - SkillsUSA/ CC K&S (MNC06.04.01) (MNC06.05.03) (ESS06.01.02) (ESS06.01.03) (ESS06.01.04) (ESS06.01.05) (ESS06.01.07) (ESS06.01.09) / /					
0.16.7	Incorporate traditional methods of fabrication and design with advanced technologies to create plans, and construct products- CC K&S (ESS01.02.04) (MNC10.01.01) (ESS04.02.01) / 21st (L02B)/					
0.16.8	Analyze and solve problems using skills related to methods in fabrication of a product- CC K&S (ESS01.03.07) (MNPB01.01.02) (MNPB01.01.03) / 21st (L02B, L02E)/					
0.16.9	Develop project bill of material, cost estimates and plan of procedure for products- NCCER/ 21st (L04D)/ CC K&S (ESS01.02.03) (ESS01.02.04) (ESS01.03.02) (MNC10.01.01) (MNPB08.01.02) (ESS04.05.01)					
0.16.10	Select and perform best practices for joining, assembling, and finishing products - CC K&S (MNC10.01.03) (MNC10.01.04)					
0.16.11	Incorporate LEAN manufacturing concepts pertaining to product fabrication and design. - 21st (L02C, L05A,L05B)/ CC K&S (MNPB01.01.01) (MNPB01.01.04) (MNPB01.01.05) (MNPB01.01.06) (MNPB01.01.07) (MNPB01.01.08) (MNPB01.01.09) (MNPB06.01.02) (MNPB06.01.03) (MNPB06.01.04) _ visual management, _ value stream mapping, _ 5S, _ kanban systems, _ lean metrics, _ shop layout					
0.16.12	Research future technologies affecting mass production and design – AS (D2)/ 21st (L04E)/ CC K&S (ESS02.03.01) (ESS02.04.01) (ESS04.04.01) (ESS04.04.02) (ESS04.04.03) (ESS03.04.01) (ESS03.04.02) (ESS03.04.03) (ESS03.04.04) (ESS09.09.02)					

13207G1.0024 – Production Welding Processes II (1 Credit)

An application level course designed to instruct students in the knowledge and skills of nondestructive testing and to weld joints in the F&H positions.

Benchmark: 0.17 Demonstrate advanced skills in nondestructive testing and weld joints		**4**	**3**	**2**	**1**	**0**
0.17.1	Describe metallurgy and identify metals- NCCER/ 21ST (L02A, L02B, L02E)/					
0.17.2	Measure materials and solve fabrication problems using welding specific measuring tools- CC K&S (ESS01.03.02) (ESS01.03.07) (MNPB08.01.05)					
0.17.3	Calculate the material required from a bill of materials- NCCER/ CC K&S (ESS01.03.02) (MNC10.01.01) (ESS09.01.06) / 21ST (L02A)/					
0.17.4	Calculate weld sizes from prints, drawings, and measure welds produced in the lab- NCCER/ CC K&S (ESS01.03.02) (MNPB08.01.05) /					

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0.17.5	Measure weld defects- NCCER/ CC K&S (ESS01.03.02) (MNC10.01.05) (MNP04.01.04) (MNPB08.01.05) /					
0.17.6	Weld joints in the V using SMAW on a variety of materials – NSS/ NCCER/ CC K&S (MNC10.01.02) (MNC10.01.03)					
0.17.7	Weld joints in the V using GTAW on a variety of materials – NSS/ NCCER/ CC K&S (MNC10.01.02) (MNC10.01.03)					
0.17.8	Weld joints in the OH position using SMAW on a variety of materials- NCCER/ CC K&S (MNC10.01.02) (MNC10.01.03)					
0.17.9	Weld joints in the OH position using GMAW on a variety of materials- NCCER/ CC K&S (MNC10.01.02) (MNC10.01.03)					
0.17.10	Weld joints in the F, H, and V position using FCAW- NCCER/ CC K&S (MNC10.01.02) (MNC10.01.03)					
0.17.11	Plasma cut and gouge materials in shapes, bevels, and straight lines- NCCER/ CC K&S (MNC10.01.02)					
0.17.12	Layout and weld a project from a print- NCCER/ CC K&S (MNC10.01.01)/ CC K&S (MNC10.01.02)					
0.17.13						

21010G0.5011 – Automated Systems (.5 Credit)

An advanced application course designed to provide students with the knowledge and skills needed to program and operate robotic equipment in manufacturing occupations.

Benchmark: 0.20 Demonstrate application level skills in robotics		**4**	**3**	**2**	**1**	**0**
0.20.1	Set up a robotic cell and program a movement path - SkillsUSA/ CC K&S (MNC10.01.01) (MNPB08.01.03) (ESS04.11.01) (ESS04.11.02) (ESS04.11.03) (ESS04.11.04) /					
0.20.2	Program a part on a robotic cell - SkillsUSA/ CC K&S (MNC10.01.01) (ESS04.11.01) (ESS04.11.02) (ESS04.11.03) (ESS04.11.04) /					
0.20.3	Run a programmed part and edit the program to include a fixture movement - CC K&S (MNC10.01.02) (ESS04.10.01) (ESS04.10.03)					
0.20.4	Program a new job and edit the job - SkillsUSA/ CC K&S (MNPB01.01.02) (MNPB01.01.03) (ESS04.10.01) (ESS04.10.03)					
0.20.5	Create a robot program using a weave instruction format - CC K&S (ESS01.02.04) (ESS04.10.01) (ESS04.10.03)					
0.20.6	Create a new program on an assembled part, set up, and run the part - SkillsUSA/ CC K&S (ESS01.02.04) (MNPB08.01.03) (ESS04.10.01) (ESS04.10.03)					
0.20.7						

13998G1.0011 – Research & Design for Manufacturing (1 Credit)

An advanced level application course that provides students with work-based experience, supported by classroom attendance and discussion, within their area of interest/study..

Benchmark: 0.21 Demonstrate skills in work-based experiences		**4**	**3**	**2**	**1**	**0**
0.21.1	Work with a client to develop a client-driven product- CC K&S (ESS01.02.02) (ESS02.11.01) (MNPB08.01.01) (ESS02.02.05) (MNPB05.01.01) (MNPB05.01.02) (MNPB05.01.03) / 21st (L03B)/					
0.21.2	Produce a working model (graphic or physical) using advanced software and/or equipment - (ESS04.05.01) (ESS04.05.02)					
0.21.3	Demonstrate ability to apply shading and rendering techniques to 3d surfaces and solid models - CC K&S (ESS01.02.05)					
0.21.4	Demonstrate ability to access and utilize industry resources – AS (D2)/ CC K&S (ESS02.03.01) (ESS02.03.02) / 21st (L04E)/					
0.21.5	Use appropriate grammar and word usage in the creation and implementation of a formal graphic presentation using current standards and technology- CC K&S (ESS01.02.02) (ESS01.02.03)/ CC K&S (ESS01.02.04) (ESS01.02.10) (ESS02.02.02) (ESS02.03.01)(ESS02.03.02) (ESS02.03.03) (ESS02.05.03) (ESS02.06.01) (ESS02.06.02) (ESS02.06.03) (ESS02.06.04) (ESS02.06.05) (ESS02.06.06) (ESS04.05.03) (ESS04.06.01) (ESS04.06.02) / 21st (L04D)/					
0.21.6	Apply principles of dimensioning/ tolerances, fasteners/hardware, and power transmission - CC K&S (MNC10.01.03)					
0.21.7	Apply basic principles of form and function to enhance project acceptance and quality - CC K&S (MNC10.01.04) CC K&S (MNC10.01.05)/					
0.21.8	Utilize effective management techniques to organize work flow- CC K&S (MNPB06.01.04) (ESS07.04.03) (ESS07.02.01) (ESS07.02.06) / 21st (L06C, L09D)/					
0.21.9	Conduct product evaluations and critique their effectiveness- CC K&S (ESS01.03.07) CC K&S (MNC10.01.05) (MNP04.01.04) / 21st (L02E)/					
0.21.10	Research new technologies to meet future client needs – AS (D2)/ NCCER / 21st (L04E)/ / CC K&S (MNPB08.01.01) (ESS02.03.01) (ESS02.03.02) (ESS02.04.01) (ESS04.04.01) (ESS04.04.02) (ESS04.04.03) (ESS03.04.01) (ESS03.04.02) (ESS03.04.03) (ESS03.04.04) (ESS09.09.02)					
0.21.11	Demonstrate abilities in design/planning, visual communication & problem solving in the manufacturing industry- CC K&S (ESS01.02.03) (MNC10.01.01) CC K&S (MNPB01.01.02) (MNPB01.01.03) (ESS04.02.01) / 21st (L02A, L02C)/					
0.21.12	Integrate alternative manufacturing methods and materials in current production process drawings- CC K&S (ESS02.09.01)/					
0.21.13	Demonstrate an awareness of current manufacturing standards & Methodologies- CC K&S (ESS02.04.01) /					
0.21.14	Demonstrate ability to incorporate industry specific codes as given for a selected project					

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0.21.15	Demonstrate ability to set and work within defined budget – CC K&S (ESS07.02.02) (ESS09.01.06)					
0.21.16	Research & use information for product development – AS (D2)/ NCCER/ 21st (L04E)/ CC K&S (MNC10.01.01) (ESS02.03.01) (ESS02.03.01) (ESS02.03.01) (ESS02.04.01) (ESS04.04.01) (ESS04.04.02) (ESS04.04.03) (ESS03.04.01) (ESS03.04.02) (ESS03.04.03) (ESS03.04.04) (ESS09.09.02)					
0.21.17	Manipulate materials and processes to meet client needs- 21st (L02C)/ CC K&S (MNPB08.01.02)					
0.21.18	Demonstrate ability to manage and set project goals and timelines- 21st (L06C)/ CC K&S (MNC10.01.01)					

OCCUPATIONAL PROFILE RATING SCALE RUBRIC

Rating Scale (Occupational Profile)

4 - Exemplary Achievement:	Student possesses outstanding knowledge, skills or professional attitude. Works Independently.
3 - Proficient Achievement:	Student demonstrates good knowledge, skills or professional attitude. Requires limited supervision.
2 - Limited Achievement:	Student demonstrates fragmented knowledge, skills or professional attitude. Requires close supervision.
1 - Inadequate Achievement:	Student lacks knowledge, skills or professional attitude.
0 - No Instruction / Training:	Student has not received instruction or training in this area.

*Key for 21st Century Skills:

CI = Creativity and Innovation
CP= Critical Thinking and Problem Solving
CC = Communication and Collaboration
IT = Information, Communication, Technology and Media Literacy
FA = Flexibility and Adaptability
IS = Initiative and Self-Direction
SC = Social and Cross-Cultural Skills
PA = Productivity and Accountability
LR = Leadership and Responsibility
EC = Employability and Career Development

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