

COURSE SYLLABUS

Course Title: AUMT 2325-271 Automatic Transmission and Transaxle (3:1:8)

Semester/Year: Spring 2020

Instructor: Mr. Gary Ufford

Office/Location: Lubbock Center, 3907 Ave. Q, Lubbock, TX. 79412, Room 136B

Phone/ E-mail: 716-4911, gufford@southplainscollege.edu

Office Hours: Check posted hours after classes begin or by appointment.

SOUTH PLAINS COLLEGE IMPROVES EACH STUDENTS LIFE

I. GENERAL COURSE INFORMATION

- A. Course Description: (3:1:8) – Prerequisite:** AUMT 1407 or consent of instructor. This course is a study of the operation, hydraulic principles, and related circuits of modern automatic transmission and automatic transaxles. Topics include diagnosis, disassembly, and assembly procedures with emphasis on the use of special tools and proper repair techniques. Elements of the course may be taught manufacturer specific.
- B. Course Goals/Objectives:** A study of operation, hydraulic principles, and related circuits of modern automatic transaxles. Diagnosis, disassembly, and assembly procedures with emphasis on the use of special tools and proper repair techniques. May be manufacturer specific. Utilizing appropriate safety procedures, the student will perform general transmission and transaxle diagnosis; perform automatic transmission and transaxle maintenance and adjustments; and perform in-vehicle automatic transmission and transaxle repair.
- C. Course Competencies:** A = 100-90 B = 89-80 C = 79-70 F = 69 or below
A grade of a C or higher is required in AUMT 2325 in order to successfully complete this course.
- D. Academic Integrity.** It is the aim of the faculty of South Plains College to foster a spirit of complete honesty and a high standard of integrity. The attempt of any student to present as his own, any work which he has not honestly performed, is regarded by the faculty and administration as a most serious offense and renders the offender liable to serious consequences, possibly suspension. For further information concerning Cheating and Plagiarism, read the section on Academic Integrity in the SPC General Catalog. **If you have a question as to whether you may work with other students on any assignment, ASK YOUR INSTRUCTOR. On some assignments working with others is encouraged.**
- E. SCANS and Foundation Skills.** Specific SCANS competencies and foundation skills applicable to this course are listed adjacent to each objective in the course objective table. They include: Foundation Skills (F): 1,2,4,6,8,9,10,12. Competencies (C): 5,6,7,8,15,16,17,18,19,20. A complete list of SCANS competencies and foundation skills is attached at the end of this syllabus.

- F. **Verification of Workplace Competencies-Technical Education Division.** The learning outcomes of this course will prepare the student to meet the competencies measured in a comprehensive elective course experience (Course #'s AUMT 1366 and AUMT 2366). In addition the student will also be prepared to take the ASE Student Certification test for Automatic Transmissions and Transaxles.

II SPECIFIC COURSE/INSTRUCTOR REQUIREMENTS

A. Textbook & Other Required Materials:

1. Halderman, James; Birch, Tom. Automatic Transmissions and Transaxles. 7th edition Pearson Publishers, 2018 (with on-line curriculum)
2. Pen and 8 1/2" x 11" Notebook for note taking and assignments
3. Safety Glasses and Hearing Protection sufficient enough for course length.

B. Class Attendance Policy. . Students are expected to attend all classes in order to be successful in a course. When absences become excessive, and you have a failing grade average at the time of the excessive absence, you may be administratively dropped from the course and any concurrent courses, **without notice. Any combination of absences or tardies that equals 4 or more is considered excessive. There are no excused absences. Excessive absences cause you to miss key points of a class and show you are not reliable/dependable for employment. Two (2) tardies will count as one absence. Leaving class without instructor approval is considered an absence, regardless of the time you leave.**

When an unavoidable reason for class absence arises, such as illness, an official trip authorized by the college or an official activity, the instructor may permit the student to make up work missed. It is the student's responsibility to complete work missed within a reasonable period of time as determined by the instructor. Students are officially enrolled in all courses for which they pay tuition and fees at the time of registration. Should a student, for any reason, delay in reporting to a class after official enrollment, absences will be attributed to the student from the first class meeting.

Students who enroll in a course but have "Never Attended" by the official census date, as reported by the faculty member, will be administratively dropped by the Office of Admissions and Records. A student who does not meet the attendance requirements of a class as stated in the course syllabus and does not officially withdraw from that course by the official census date of the semester, may be administratively withdrawn from that course and receive a grade of "X" or "F" as determined by the instructor.

It is the student's responsibility to verify administrative drops for excessive absences through MySPC using his or her student online account. If it is determined that a student is awarded financial aid for a class or classes in which the student never attended or participated, the financial aid award will be adjusted in accordance with the classes in which the student did attend/participate and the student will owe any balance resulting from the adjustment.

- C. **Assignment Policy:** All assignments are due at the beginning of class on the due date unless otherwise stated by your instructor. **Part of these assignments can be on-line through the on-line curriculum, you should log on to this at the beginning of the semester in order to complete them on time. There may be no makeup assignments and no late assignments will be accepted.**

The dates printed in this syllabus can change. Every effort will be made to inform students of those changes, but the students are ultimately responsible for all assignments regardless of any changed dates. Please check the dates with your instructor throughout the course.

- D. **Grading Policy/ Procedure and/or Methods of Evaluation:** All exams are mandatory for effective student evaluation. Exams will cover theory and practical skills pertaining to all aspects of material presented. Adequate study time should be set aside for exam reviews. **There may be no makeup exams. All fees owed to South Plains College, including projects, are required to be paid in full before you take your final exam.** The ASE Student Certification test mentioned above can be used in place of your final exam.

You will be evaluated during this course by the following method:

Unit exams, written assignments, pop quizzes, and attendance = 25%

Lab sheets, Unit skills tests = 50% (approximately 4 skills tests)

Final Exam: = 25%

A unit skills test is a measure of how well you follow instructions, your safety in the shop, your use of tools, your cleanliness in the work area and your attention to detail while you perform diagnostics or repairs within a required time period. **If you're late for a skills test the following will happen; 0 to 5 minutes late = -10pts; more than 5 min. but less than 10 min. late = -20pts; more than 10 min. but less than 15 min. late = -30pts. If you are more than 15 minutes late you will have earned a "0" for the test.**

A task sheet is used to plan and track students while they perform required skills in the shop. This is not used to average your grade, but it is a professional evaluation of how well you work independently and your level of expertise in completing assigned tasks. Prospective employers will want to see this during an interview, so please follow the shop and repair procedures to the best of your ability.

- E. **Special Requirements: A student's conduct is expected to follow the guidelines stated in the college catalogue and student handbook, any deviation will result in immediate disciplinary action. No smoking, chewing, or dipping is permitted in the building or outside the back doors of the shop and food and drinks are not allowed in any classroom, lab or shop.** These activities will be limited to break time in the designated areas only. Breaks will be limited to 20 minutes. A detailed list of lab/shop guidelines will be handed to you at the beginning of class, you are expected to follow them whenever you are in the shop. Please turn off all cell phones, pagers, etc. during class. Do not park on the back lot unless preauthorized by your instructor, unauthorized vehicles can be towed at the owner's expense.

Dress Code: The Automotive Program requires you to dress appropriately. Flip flops or opened toed shoes are not allowed in the shop, proper foot attire should be worn to protect your feet, leather work boots are recommended. Jeans/pants will be worn so that neither one falls to your thighs or knees, belts must hold them at your waist line. Safety glasses will be worn at all times in the shop. If a student fails to comply with the above dress code, he or she, will be sent home and given an absence for that day.

LUBBOCK CAMPUS GUIDELINES

CHILDREN ON CAMPUS

Many of the students attending classes at South Plains College - Lubbock Camps are also parents who value the opportunity to participate in higher education. Sometimes students are faced with the decision of whether to remain at home with their children, bring children with them to class, or be absent from class. The following guidelines address concerns for the safety of children on campus and provide for an environment conducive to learning.

CHILDREN IN THE CLASSROOM

Students are not allowed to bring children to class and will be asked to leave in the interest of providing an environment conducive for **all** students enrolled in the class. Students are responsible for adherence to the attendance requirements set forth by the instructor in the course syllabus.

UNATTENDED CHILDREN ON CAMPUS

Children may not be left unattended. In order to provide for the safety of children on campus, parents or other guardians are responsible for supervising children while utilizing services or conducting business on campus.

DISRUPTIVE CHILDREN

Disruptive children will not be allowed to interfere with college business. Parents or other guardians are responsible for supervising and controlling the behavior of children they have brought on campus.

Diversity Statement

In this class, the teacher will establish and support an environment that values and nurtures individual and group differences and encourages engagement and interaction. Understanding and respecting multiple experiences and perspectives will serve to challenge and stimulate all of us to learn about others, about the larger world and about ourselves. By promoting diversity and intellectual exchange, we will not only mirror society as it is, but also model society as it should and can be.

Americans with Disabilities Act Statement

Students with disabilities, including but not limited to physical, psychiatric, or learning disabilities, who wish to request accommodations in this class should notify the Disability Services Office early in the semester so that the appropriate arrangements may be made. In accordance with federal law, a student requesting accommodations must provide acceptable documentation of his/her disability to the Disability Services Office.

For more information, call or visit the Disability Services Office at Levelland Student Health & Wellness Center 806-716-2577, Reese Center (also covers ATC) Building 8: 806-716-4675, Plainview Center Main Office: 806-716-4302 or 806-296-9611, or the Health and Wellness main number at 806-716-2529.

GENERAL SAFETY ON CAMPUS

South Plains College recognizes the importance of safety on campus. The protection of persons and property is a responsibility which we all share. Personal safety begins with the individual. The following guidelines are intended to assist you in protecting yourself and to encourage practices that contribute to a safe environment for our campus community.

- Never leave your personal property unsecured or unattended.
- Look around and be aware of your surroundings when you enter and exit a building.
- Whenever possible, avoid walking alone, particularly after dark. Walk to your vehicle with other class members or request that the Security Guard walk you to your car.
- When approaching your vehicle, keep your keys in your hand; look under your car and in the back seat and floorboard. Lock the doors as soon as you are inside your car.

FOOD AND DRINK IN CLASSROOMS

It is the policy of South Plains College not to permit food or drink in the classrooms or laboratories.

**In case of emergency, contact the following numbers, but DO NOT leave a voice mail message.
716-4677 - Lubbock Center 716-2923 - Reese Center (mobile 806-893-5705)**

Foundation Skills	COURSE OBJECTIVES	Competencies
F1,4,8,9,10,12	<p>I. Course Objectives: Upon completion of this course, the student will be able to:</p> <ul style="list-style-type: none"> • understand the relationship of gear ratios, speed ratios and torque ratios. • explain how fluids can be used to transmit force. • recognize the various components that make up a clutch assembly and discuss how it works. • list the various components of a torque converter and discuss its function. • discuss and perform service procedures used in routine and diagnostic repair. • identify component failures, determine probable causes, and recommend corrective action. • discuss the advantages of front wheel drive and overdrive. <p>II. Content Outline: Unit 1: Gear Designs and Planetary Gearsets Apply Devices and Introductory Diagnostics</p> <p>Upon completion of this unit, the student will be able to:</p> <ul style="list-style-type: none"> • identify and define the various types of gears used in automatic transmissions. • define what is meant by gear reduction, direct drive, and overdrive. • discuss the relationship between torque and speed. • discuss what is meant by the term "final drive". • name the components of a planetary gearset. • list the 5 operations of a planetary gearset. • contrast a Simpson gearset and a Ravigneaux gearset. • list the 3 primary shop practices of a professional transmission technician. • distinguish between torque and power.. • discuss the importance of strict cleanliness techniques during all phases of transmission repair. • determine by inspection if linkage adjustment is correct and adjust if necessary. 	C5-8,15,16,19
F1,4,6,8-10,12		C5,7,15,16,19,20
F1,4,6,8,10,12		C5,7,15,19,20
F1,2,6,10,12		C5,6,15,16,19,20
F1,4,6,8,9,12		C5,7,8,15,16,18-20
F1,2,4,6,8,9,10,12		C5,7,8,15,16,18-20
F1,6,10,11,12 F2,6,10,12		C5,7,15-17, 19 C5,7,15,16,19
F1,10,11	<p>Upon completion of this unit, the student will be able to:</p> <ul style="list-style-type: none"> • identify and define the various types of gears used in automatic transmissions. • define what is meant by gear reduction, direct drive, and overdrive. • discuss the relationship between torque and speed. • discuss what is meant by the term "final drive". • name the components of a planetary gearset. • list the 5 operations of a planetary gearset. • contrast a Simpson gearset and a Ravigneaux gearset. • list the 3 primary shop practices of a professional transmission technician. • distinguish between torque and power.. • discuss the importance of strict cleanliness techniques during all phases of transmission repair. • determine by inspection if linkage adjustment is correct and adjust if necessary. 	C5,15
F1,3,6,10		C5,7,15
F3,4,6		C5,7,15
F6,12		C5,7,15
F2,10,12		C5,7,15
F2,4,12		C5,15
F10		C5,15
F1,2,5		C11,16
F3,12		C5,15
F6,8		C15,2
F8,9,10,12	<ul style="list-style-type: none"> • determine by inspection if linkage adjustment is correct and adjust if necessary. 	C5,15,16,18
F8,9,10,12	conduct a diagnostic road test to verify if a problem exists.	C5,15,16

Foundation Skills	COURSE OBJECTIVES	Competencies
F8,9,10,12	<ul style="list-style-type: none"> inspect, adjust, or replace manual shift valve,throttle valve, linkage or cables, and check gear select indicator. 	C5,15,16,18
F8,9,10,12	<ul style="list-style-type: none"> Interpret and verify drivers complaints, perform a road test and determine needed repairs. 	C5,15,16
F2,10	<ul style="list-style-type: none"> list the different types of apply devices used to hold or drive planetary gearsets. 	C5,15,16,19
F6,F10	<ul style="list-style-type: none"> discuss the function of a band and how it is applied. 	C5,15,16,19
F6,10	<ul style="list-style-type: none"> list the parts of a multiple disc clutch assembly and discuss how the clutch operates. 	C5,15,16,19
F1,10	<ul style="list-style-type: none"> discuss the function of a one-way clutch and how it operates. 	C5,15,16,19
Unit 2: Principles of Hydraulics, Transmission Hydraulic System, Fluid and Diagnostics		
Upon completion of this unit, the student will be able to:		
F1,3,4,6,8,10 11,12	<ul style="list-style-type: none"> read and interpret troubleshooting tables to find what problems may be causing a particular condition and follow the recommended procedure to isolate the cause. (Includes Hybrid vehicle.) 	C5,15,16
F8,9,10,12	<ul style="list-style-type: none"> perform leak test using the recommended procedure. 	C5,15,16,18,19
F8,9,10,12	<ul style="list-style-type: none"> perform a stall test using the recommended procedure. 	C5,15,16,18,19
F8,9,10,12	<ul style="list-style-type: none"> perform diagnostic hydraulic pressure tests to determine problem causes. (Includes Hybrid Vehicle) 	C5,16,18
F2,11	<ul style="list-style-type: none"> list the 3 tools used to check transmission fluid pressure 	C16,18,19
F6,10	<ul style="list-style-type: none"> discuss what is meant by the term `hydraulic'. 	C5,7,15
F2,11,12	<ul style="list-style-type: none"> contrast the differences between force and pressure within the context of a hydraulic system. 	C5,15
F2	<ul style="list-style-type: none"> state Pascal's Law. 	C5,15,19
F6	<ul style="list-style-type: none"> discuss the first law of thermodynamics and how it relates to hydraulic systems. 	C5,15,19
F2,10	<ul style="list-style-type: none"> list the principle parts of a hydraulic system. 	C15,19
F6,10	<ul style="list-style-type: none"> discuss how pressure is created on fluids in motion. 	C5,15
F2,6,10,12	<ul style="list-style-type: none"> list and discuss the 3 ways hydraulic pressure is regulated in a transmission. 	C5,15,19
F2,12	<ul style="list-style-type: none"> list the four jobs performed by automatic transmission fluid. 	C5,15
F6,9,12	<ul style="list-style-type: none"> discuss the importance of maintaining compatibility of the transmission fluid. 	C5,15
F6,9,10	<ul style="list-style-type: none"> discuss the three principle automatic transmission pressures 	C5,15

Foundation Skills	COURSE OBJECTIVES	Competencies
F6,9,12 F2,10 F2,10	<ul style="list-style-type: none"> demonstrate and discuss how to perform diagnostic pressure tests. list the 6 functions automatic transmission fluid must perform list and discuss the 7 general properties of automatic transmission fluid. 	C5,16,18,20 C5,15 C5,15
F6,12	<ul style="list-style-type: none"> discuss the necessity of maintaining strict compatibility of the transmission fluid. 	C5,15
F2,10 F6,10	<ul style="list-style-type: none"> list the three types of filters used in automatic transmissions. discuss the function of transmission oil coolers and why they are needed. 	C5,16 C5,15
F6,10	<ul style="list-style-type: none"> discuss the need for following manufacturer's recommended fluid change intervals. (Includes Hybrid Vehicle) 	C5,20
<p>Unit 3: Torque Converters, Transmission Removal, Tear-down, Inspection, and Rebuild</p>		
<p>Upon completion of this unit, the student will be able to:</p>		
F2,10,12	<ul style="list-style-type: none"> contrast the differences between ordinary fluid coupling and torque converters. 	C5,15,17
F6,10,12	<ul style="list-style-type: none"> list and discuss the 3 types of fluid flow developed in a torque converter. 	C5,15,16,19
F6,10,12 F6,10,12 F6,9,10,12 F2,4,10,12	<ul style="list-style-type: none"> discuss how torque multiplication occurs in a torque converter. define stall speed. discuss advantages of the lockup torque converter. discuss the need for electronically controlled torque converter clutches. 	C5,7,15,16,19 C5,15,16,19 C5,15,16,19 C5,15,16,19
F2,10,11,12	<ul style="list-style-type: none"> list the four conditions that must be met before a torque converter clutch will lockup. 	C5,15,17,19
F1,10 F1,9,10	<ul style="list-style-type: none"> identify the different types of metal seals. discuss how radial play is controlled in an automatic transmission. 	C5,15,16,18 C5,15,16,18
F1,9,10 F1,10	<ul style="list-style-type: none"> discuss how axial play is controlled in automatic transmission. identify the various types of snap rings and discuss how they are used. 	C5,15,16,18 C5,15,16,18
F1,10	<ul style="list-style-type: none"> demonstrate how to replace bushings, seals and `O'-rings on assigned vehicles. 	C5,15,16,18
F1,9,10	<ul style="list-style-type: none"> discuss the function of gaskets and seals. 	C5,7,18,19

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Foundation Skills	COURSE OBJECTIVES	Competencies
F9,10,12 F9,10,12 F9,10,12	<ul style="list-style-type: none"> distinguish between static and dynamic seals identify the 3 types of rubber seals discuss the steps necessary in preparing a transmission for removal 	C5,7,18,19 C5,7,18,19 C5,15,16,18
F9,10,12 F6,9,10,12	<ul style="list-style-type: none"> remove a transmission for inspection and repair. identify parts which are normally discarded when performing a major transmission repair. 	C5,15,16,19 C5,15,16,18,20
F6,9,10,12	<ul style="list-style-type: none"> identify and inspect all internal and external components to determine serviceability. 	C5,15,16,18,20
F6,9,10,12	<ul style="list-style-type: none"> suggest recommended replacement or reuse of internal and external components. 	C5,15,16,18,20
F8,12 F9,10,11,12 F6,10,11,12	<ul style="list-style-type: none"> discuss and demonstrate the procedure for measuring end play. list the 4 ways by which clutch pack clearance is controlled. disassemble, clean, and inspect a transmission assembly including clutches, bands, planetary gearsets, retainers, modulators, valve bodies and all other internal and external assemblies. 	C5,15,16,18,20 C5,15,16,18,20 C5,7,18,19
F6,10,11,12 F6,10,11,12	<ul style="list-style-type: none"> air check all clutch assemblies prior to installation. Disassemble a hybrid transmission or transaxle as applicable. 	C5,7,18,19 C5,7,18,19
Unit 4: Transmission Installation Procedures and Electronic Controlled Transmission Diagnosis		
Upon completion of this unit, the student will be able to:		
F9,10,12 F9,10,12 F1,3,4,6,8,10,11,12	<ul style="list-style-type: none"> reinstall a transmission after repair. test the accuracy of the repair by visual inspection and road testing. read and interpret troubleshooting tables to verify any existing conditions and follow recommended corrective procedures to isolate the cause and repair it. (Includes Hybrid Vehicle) 	C5,15,16,19 C5,15,17 C5,15,16
F6,10 F6,10,11,12 F6,10,11,12	<ul style="list-style-type: none"> list the 5 most common electronic shift control inputs Inspect and repair a VSS assembly Inspect, test, adjust, and repair electrical/electronic controls such as an ECM, solenoids, relays, switches, and harnesses. 	C5,15,16,18 C5,7,18,19 C5,7,18,19
F6,10,11,12	<ul style="list-style-type: none"> Diagnose electrical/electronic concerns pertaining to hybrid transmissions/transaxle according to manufacturer standards 	C5,7,18,19

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Automotive Transmission/Transaxle Assignment and Test Dates

Unit 1: Gear Designs, Planetary Gearsets, Apply Devices, and Introductory Diagnostics

January 13th – January 29th

Unit 1 Assignment: Log on to the on-line curriculum

In your textbook read Chapters 1,2,3,6 and 7. Browse through Chapters 1& 2 in textbook and be familiar with the safety items since you will be graded, in part, on safety. Study any handouts related to your shop activities. Perform any on-line assignments as required by your instructor. Be prepared to discuss this material in the classroom or shop. Answer the questions in the handout and use this as a study guide for your Unit 1 test.

Unit 1 Written Test: January 29th

Unit 2: Principles of Hydraulics, Transmission Hydraulic Systems, Fluid, and Diagnostics

February 3rd – February 26th

Unit 2 Assignment:

In your textbook read Chapters 4,13,14, & 16. Study any handouts related to your shop activities. Perform any on-line assignments as required by your instructor. Be prepared to discuss this material in the classroom or shop. Answer the questions in the handout and turn in on the due date for a grade.

Unit 2 Assignment Due Date: February 26th

Unit 2 Written Test: February 26th (possibly on-line)

Unit 2 Skills Test: February 26th

Spring Break is March 16th – 20th

Easter Holiday April 13th

Unit 3: Torque Converters, Transmission Removal, Teardown, Inspection, and Rebuild

March 2nd – April 1st

Unit 3 Assignment:

In your textbook read Chapters 5, 15, and 17. Study any handouts related to your shop activities. Perform any on-line assignments as required by your instructor. Be prepared to discuss this material in the classroom or shop. Answer the questions in the handout and turn in on the due date.

Unit 3 Assignment Due Date: April 1st

Unit 3 Written Test: April 1st (possibly on-line)

Unit 3 Skills Test: April 1st

Unit 4: Transmission Installation Procedures and Electronic Controlled Transmission Diagnostics

April 6th – April 29th

Unit 4 Assignment:

Review Chapter 17. Read Chapters 8, 9,10,11 & 12. Study any handouts related to your shop activities. Perform any on-line assignments as required by your instructor. Be prepared to discuss this material in the classroom or shop. Answer the questions in the Unit 4 assignment handout and turn in on the due date.

Unit 4 Assignment Due Date: April 29th

Unit 4 Skills Test: April 29th

Unit 4 Written Test: No separate written test, this material will be included with your final exam.

Final Exam: May 4th at 1:30 pm

Your final exam will be comprehensive, please allow yourself adequate study time.

SCANS COMPETENCIES

- C-1 **TIME** - Selects goal - relevant activities, ranks them, allocates time, prepares and follows schedules.
- C-2 **MONEY** - Uses or prepares budgets, makes forecasts, keeps records and makes adjustments to meet objectives.
- C-3 **MATERIALS AND FACILITIES** - Acquires, stores, allocates, and uses materials or space efficiently.
- C-4 **HUMAN RESOURCES** - Assesses skills and distributes work accordingly, evaluates performances and provides feedback.

INFORMATION - Acquires and Uses Information

- C-5 Acquires and evaluates information.
- C-6 Organizes and maintains information.
- C-7 Interprets and communicates information.
- C-8 Uses computers to process information.

INTERPERSONAL-Works With Others

- C-9 Participates as members of a team and contributes to group effort.
- C-10 Teaches others new skills.
- C-11 Serves Clients/Customers-works to satisfy customer's expectations.
- C-12 Exercises Leadership-communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- C-13 Negotiates-works toward agreements involving exchanges of resources; resolves divergent interests.
- C-14 Works With Diversity-works well with men and women from diverse backgrounds.

SYSTEMS-Understands Complex Interrelationships

- C-15 Understands Systems-knows how social, organizational, and technological systems work and operates effectively with them.
- C-16 Monitors and Corrects Performance-distinguishes trends, predicts impacts on system operations, diagnoses systems performance and corrects malfunctions.
- C-17 Improves or Designs Systems-suggests modifications to existing systems and develops new or alternative systems to improve performance.

TECHNOLOGY-Works With a Variety of Technologies

- C-18 Selects Technology-chooses procedures, tools, or equipment, including computers and related technologies.
- C-19 Applies Technology to Task-understands overall intent and proper procedures for setup and operation of equipment.
- C-20 Maintains and Troubleshoots Equipment-prevents, identifies, or solves problems with equipment, including computers and other technologies.

FOUNDATION SKILLS

BASIC SKILLS–Reads, Writes, Performs Arithmetic and Mathematical Operations, Listens and Speaks

- F-1 Reading–locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- F-2 Writing–communicates thoughts, ideas, information and messages in writing and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- F-3 Arithmetic–performs basic computations; uses basic numerical concepts such as whole numbers, etc.
- F-4 Mathematics–approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- F-5 Listening–receives, attends to, interprets, and responds to verbal messages and other cues.
- F-6 Speaking–organizes ideas and communicates orally.

THINKING SKILLS–Thinks Creatively, Makes Decisions, Solves Problems, Visualizes and Knows How to Learn and Reason

- F-7 Creative Thinking–generates new ideas.
- F-8 Decision-Making–specifies goals and constraints, generates alternatives, considers risks, evaluates and chooses best alternative.
- F-9 Problem Solving–recognizes problems, devises and implements plan of action.
- F-10 Seeing Things in the Mind’s Eye–organizes and processes symbols, pictures, graphs, objects, and other information.
- F-11 Knowing How to Learn–uses efficient learning techniques to acquire and apply new knowledge and skills.
- F-12 Reasoning–discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

PERSONAL QUALITIES–Displays Responsibility, Self-Esteem, Sociability, Self-Management, Integrity and Honesty

- F-13 Responsibility–exerts a high level of effort and perseveres towards goal attainment.
- F-14 Self-Esteem–believes in own self-worth and maintains a positive view of self.
- F-15 Sociability–demonstrates understanding, friendliness, adaptability, empathy and polite-ness in group settings.
- F-16 Self-Management–assesses self accurately, sets personal goals, monitors progress and exhibits self-control.
- F-17 Integrity/Honesty–chooses ethical courses of action.