

VALLEY ROP COURSE OUTLINE

COURSE TITLE: Advanced Ag Engine / Diesel

VALLEY ROP #: TR-5664-AgEng
CDE #: Pending Approval

CBEDS TITLE: Automotive Mechanics
CBEDS #: 5664

CTE SECTOR: Transportation
CTE PATHWAY: Vehicle Maintenance, Service & Repair

JOB TITLES: Automotive Master Mechanic 49-3023.01

COURSE DESCRIPTION:

Advanced Ag Engine / Diesel is designed to train students for employment opportunities available within the agricultural/industrial industry. This course emphasizes skills necessary in the field of diesel equipment mechanics where students will learn major overhaul and tune-up diesel engines. The course will also focus on skills in power machinery and small engine repair and maintenance with strong emphasis upon safety, tool and equipment usage and preventative maintenance procedures. The development of leadership and employability skills is emphasized throughout the course. This advanced course follows the Model Curriculum Standards and Frameworks for Agriculture Specialization in the Agricultural Mechanics Advanced Core Cluster.

DATE APPROVED:

REVISED DATE: Nov 2009

HOURS: 180

CREDITS: 10

PREREQUISITES: Small Gas Engines Preferred but not required.

GRADE LEVEL: 11-12

ARTICULATION(S):

TEXTBOOKS: Norman, A., Corinchock, J. & Scharff, R. *Diesel Technology: Fundamentals, Service, Repair*. GW Publisher (ISBN 1-56637-733-1)

COURSE COMPETENCIES:

Upon completion of this course, the student will:

1. To gain insight into the opportunities of the auto mechanics trade
2. To become acquainted with the major and minor components of an automobile.
3. To learn the correct procedures of starting and completing an automotive job and the proper tools and equipment to use in these procedures
4. To develop an understanding of the methods, materials, and other related technology of the auto mechanics trade
5. To learn how to use manuals, schematics, and sketches
6. To develop good judgment and sound repair practice
7. To coordinate acquired skills for purposes of testing, diagnosing, and troubleshooting
8. To learn the use of specialized equipment
9. To learn to accept responsibility
10. To learn the related trade information needed for a complete understanding of repair and servicing operations
11. To gain entry-level knowledge and skills needed for job placement in the automotive or diesel fields

INSTRUCTIONAL METHODS:

Methods of instruction will include, but are not limited to:

1. Direct instruction (lecture, reading, labs, and investigations, writing – reports, journals, analyses, essay – speaking, presentations, guest speakers).
2. Laboratory investigations and project using educational courseware and computer technology.
3. Team teaching including assisted instruction from university, business, and community partners.
4. Community – based research projects with professional mentors.
5. Use variety of instructional materials and resources including electronic media, professional journals and reference materials, textbooks and other print information.
6. Self-directed, cooperative, and collaborative learning to increase responsibility of students for their own learning.
7. Student presentations, exhibits, and competitions – both team and individual.

EVALUATION METHODS:

Assessment opportunities, which allow continuous evaluation of students' progress, will be embedded throughout the course and should be a learning experience. All students will be expected to achieve mastery of all topics; often, demonstrations of mastery will occur in a public forum. The following strategies, which include both formal and informal assessment techniques will include, but are not limited to:

1. Performance – based assessments such as experiments, demonstrations, discussions, debates simulations, and projects.
2. On-going and cumulative portfolio record of project and component investigative accomplishments.
3. Written tests and assignments with a variety of short answer and essay questions.
4. Individual and group assessments (including assessments of working relationships).

Course Outline

Units	Topics	CTE Pathway Standards	CTE Foundation Standards	Hours
1. Classroom Orientation	Class Procedures			1
	Attendance			
	Grading			
	Paperwork			
2. Career Development	See below		CMP 3.1, CMP3.2, CPM3.3, CMP3.4, CMP3.5, CMP 3.6	5
3. Equipment Mechanics A. Shop procedures B. Identification of tools C. Proper use of tools				58
			T4.1, T4.2, T4.3, T4.4	
			T4.1, T4.2, T4.3, T4.4	
	Micrometers, dial indicators, bore gauges, telescoping gauges and calipers	A2.2, A2.4, A2.5		
	Forklifts, hoists jacks and jack stands		T4.1, T4.2, T4.3, T4.4, TKS10.5, DA11.0	
	Boil out tank steam cleans, parts tanks, cold tank cleaning, glass bead machines, and sand blasting		T4.1, T4.2, T4.3, T4.4, TKS10.5, DA11.0	
	Pullers, hydraulic presses, and arbor presses		T4.1, T4.2, T4.3, T4.4, TKS10.5, DA11.0	
	Valve grinders, boring machines, and lathes		T4.1, T4.2, T4.3, T4.4, TKS10.5, DA11.0	
	Air impact tools	A2.1, A2.2		
	Specialty tools	A2.1, A2.2	T4.1, T4.2, T4.3, T4.4, TKS10.5, DA11.0	
	Drilling threading, and removal of broken bolts and threaded inserts	A2.2	T4.1, T4.2, T4.3, T4.4, TKS10.5, DA11.0	
	Grinders and metal cutting equipment		T4.1, T4.2, T4.3, T4.4, TKS10.5, DA11.0	
	Welding equipments		T4.1, T4.2, T4.3, T4.4, TKS10.5, DA11.0	

D. Fasteners	Sharpening and fitting tools		T4.1, T4.2, T4.3, T4.4, TKS10.5, DA11.0	
	Identification	A2.1, A2.2	T4.1, T4.2, T4.3, T4.4, TKS10.5, DA11.0	
	Copper tubing		T4.1, T4.2, T4.3, T4.4	
	Brass fittings		T4.1, T4.2, T4.3, T4.4	
	Hoses and fittings		T4.1, T4.2, T4.3, T4.4	
	Hydraulic fittings and lines		T4.1, T4.2, T4.3, T4.4	
3. Diesel Engines			S1.d	58
A. General Information				
	History of diesel engines development and fields of application		T4.3	
	Comparison of diesel and gas engines			
	Four stroke cycle engine design and operation principles		S1.d	
	Two stroke cycle engine design and operation principles			
	Model, serial, and general identification system			
	Information necessary for ordering parts	A5.3	PSCT5.1, PSCT5.3, PSCT5.5	
B. Basic engine cylinder block assembly design, component parts, disassembly, inspection, and reassembly			S1.d, PSCT5.1	
	Cylinder block general description and servicing procedures		PSCT5.1, PSCT5.3, PSCT5.5	
	Cylinder block and end plates and covers		PSCT5.1, PSCT5.3, PSCT5.5	
	Cylinder liners		PSCT5.1, PSCT5.3, PSCT5.5	
	Crankshaft and main bearings		PSCT5.1, PSCT5.3, PSCT5.5	
	Flywheel, ring gear, clutch pilot bearing, flywheel housing and gear train			

	cover		
	Vibration damper		
	Pistons and connection rods		PSCT5.1, PSCT5.3, PSCT5.5
	Timing gear train and camshaft		
	Cylinder head and valves		PSCT5.1, PSCT5.3, PSCT5.5
C. Lubrication systems			
	Lubrication purpose, circulation, and distribution system		
	Engine oil recommendations		
	Oil filters and strainers; purpose and application		
	Oil cooler requirements		S3.a
	Lubricating oil pump		
	Oil leakage test purpose and procedures		
	Oil pressure and heat safety control devices		
D. Cooling System			S3.a
	Cooling system coolant circulation and component assemblies		S3.a
	Thermostatically controlled hydraulically driven fan, design operation principles and service principles		S3.a
E. Air Intake Systems			
	Naturally aspirated engines		
	Turbocharger engines		
	Air cleaners		
F. Fuel Injection Systems			
	Fuel system fundamental assemblies and their basic operation principles		

G. Engine Balancers	Fuel oil recommendations			
	Transfer pumps			
	Field instillation and service		S4.a, S5.b	
	Balancing requirements			
	Balancer purpose, theory, and operating principles			
	Balancer timing and servicing procedure			
	4. Equipment Operation			TKS10.5, DA11.0
A. Safety			HS6.1, HS6.2, HS6.3, HS6.4	
	Laws pertaining to agricultural Machinery		HS6.4	
	Rules for safe operation		HS6.1, HS6.2, H.S6.3, HS6.4	
	Pinch and grab points		HS6.3	
	Roll Over Protection (ROPS)		HS6.3	
	Stability and center of gravity			
	Emergency start procedures			
B. Tractors	Servicing equipment		TKS10.5, DA11.0	
			TKS10.5, DA11.0	
	Introduction			
	Daily maintenance and service		TKS10.5, DA11.0	
	Starting and stopping procedures	A2.1, A2.2	TKS10.5, DA11.0	
	Driving and backing	A2.1, A2.2	TKS10.5, DA11.0	
	Speed control			
	Ground and engine			
		A2.1, A2.2	TKS10.5, DA11.0	
	Introduction			
C. Tracklayers	Daily maintenance and service			
	Starting and stopping procedures			
	Driving and backing	A2.1, A2.2	TKS10.5, DA11.0	
	Speed control	A2.1, A2.2	TKS10.5, DA11.0	
	Ground and engine			
		A2.1, A2.2	TKS10.5, DA11.0	
	Introduction			
D. Hitching	Daily maintenance and service			
	Starting and stopping procedures			
	Driving and backing	A2.1, A2.2	TKS10.5, DA11.0	
	Speed control	A2.1, A2.2	TKS10.5, DA11.0	
	Ground and engine			
	A2.1, A2.2	TKS10.5, DA11.0		
3 point hitches	A2.1, A2.2	TKS10.5, DA11.0		
Category selection and engagement		HS6.1, HS6.2, HS6.3, HS6.4		

E. Loaders	and safety			
	PTO connection and engagement and safety		HS6.1, HS6.2, HS6.3, HS6.4	
	Auxiliary hydraulic connections			
		A2.1, A2.2	TKS10.5, DA11.0	
	Introduction			
	Daily maintenance and service			
	Safety and stability			
F. Forklifts	Operating and handling		TKS10.5, DA11.0	
			TKS10.5, DA11.0	
	Daily maintenance and service			
	Safety and load handling		HS6.1, HS6.2, HS6.3, HS6.4	
	Operation	A2.1, A2.2	TKS10.5, DA11.0	
G. Trucks	Speed control and efficiency			
	Starting and stopping			
	Driving and backing			
	Speed control hitching			
	Daily maintenance and service			
5. Safety and First Aid			HS6.1, HS6.2, HS6.3, HS6.4	8
	Safe work habits with equipment and tools			
	Accident prevention			
	Potential hazard identification	A1.0, A1.1		
	Handling emergencies	A1.0, A1.1, A1.2, A1.3, A1.4, A1.5		
	OSHA	A1.0, A1.1, A1.2, A1.3, A1.4, A1.5, A4.2		
	Power machinery			
	Servicing equipment			
6. Leadership A. FFA Organization				10
	Contest/participation	A6.0	S5.a, S5.b	
	Record books			
B. Communication skills		LT9.5		
B. Critical thinking/problem solving		M3.2, M3.3, PSCT5.0		
			Total Hours	180

CAREER PREPARATION STANDARDS:

- A. **PERSONAL SKILLS** - Students will understand how personal skill development affects their employability. This skill includes positive attitudes, self-confidence, honesty, responsibility, initiative, self-discipline, personal hygiene, time management, and the capacity for lifelong learning.
1. Demonstrate an understanding of classroom policies and procedures.
 2. Discuss importance of the following personal skills in the business environment:
 - a. positive attitude
 - b. self-confidence
 - c. honesty
 - d. perseverance
 - e. self-management/work ethic
 - f. pride in product/work
 - g. dependability
 3. Identify acceptable work attire.
 4. Establish goals for self-improvement and further education/training.
 5. Prioritize tasks and meet deadlines.
 6. Understand the importance of initiative and leadership.
 7. Understand the importance of lifelong learning in a world of constantly changing technology.
- B. **INTERPERSONAL SKILLS** - Students will understand key concepts on group dynamics, conflict resolution, and negotiation. This skill includes the ability to work cooperatively, accept supervision, assume leadership roles, and show respect for others. This standard includes an understanding of sexual harassment laws and an appreciation of cultural diversity in the workplace.
1. Identify and discuss behaviors of an effective team.
 2. Explain the central importance of mutual respect in the workplace relations.
 3. Discuss and demonstrate strategies for conflict resolution and negotiation, and explain their importance within the business environment.
 4. Understand laws that apply to sexual harassment in the workplace, and identify tactics for handling harassment situations.
 5. Work cooperatively, share responsibilities, accept supervision and assume leadership roles.
 6. Demonstrate cooperative working relationships and proper etiquette across gender and cultural groups.
- C. **THINKING AND PROBLEM-SOLVING SKILLS** - Students will exhibit critical and creative thinking skills, logical reasoning, and problem-solving. These skills include applying basic skills in order to calculate, estimate, measure; identify, locate, and organize information/data; interpret and follow directions from manuals, labels, and other sources; analyze and evaluate information and solutions.
1. Recognize the importance of good academic skills and implement a plan for self-improvement as needed.
 2. Read, write, and give directions.
 3. Exhibit critical and creative thinking skills and logical reasoning skills, and employ these skills for problem solving.
 - a. Work as a team member in solving problems.
 - b. Diagnose the problem, its urgency, and its causes.
 - c. Identify alternatives and their consequences.
 - d. Explore possible solutions.
 - e. Compare/contrast the advantages and disadvantages of alternatives.
 - f. Determine appropriate action(s).

- g. Implement action(s).
 - h. Evaluate results of action(s) taken.
- D. COMMUNICATION SKILLS** - Students will understand principles of effective communication. This standard includes effective oral and written communication, listening skills, following and giving directions, requesting and giving information, asking questions.
1. Use communication concepts in application of skills, techniques, and operations.
 - a. Prepare written material.
 - b. Analyze written material.
 2. Understand and implement written instructions, from technical manuals, written communications, and reference books.
 3. Present a positive image through verbal and nonverbal communication, and understand the power of body language in communication.
 4. Demonstrate active listening through oral and written feedback.
 5. Give and receive feedback.
 6. Demonstrate assertive communications (both oral and written).
 7. Demonstrate proper etiquette in workplace communications, including an awareness of requisites for international communications (languages, customs, time zones, currency and exchange rates).
 8. Demonstrate writing/editing skills as follows:
 - a. Write, proofread, and edit work.
 - b. Use correct grammar, punctuation, capitalization, vocabulary, and spelling.
 - c. Select and use appropriate forms of technology for communication.
 9. Exhibit a proficiency in the use of reference books.
 10. Research, compose, and orally present information for a variety of business situations utilizing appropriate technology.
- E. OCCUPATIONAL SAFETY** - Students will understand occupational safety issues, including the avoidance of physical hazards in the work environment. This includes the safe operation of equipment, proper handling of hazardous materials, appropriate attire and safety accessories, avoidance of physical injuries, interpretation of warning and hazard signs and terminology, and following and understanding safety-related directions.
1. Discuss and implement good safety practices, including the following (if applicable to course):
 - a. personal
 - b. lab
 - c. fire
 - d. electrical
 - e. equipment
 - f. tools
 - g. interpretation of Material Safety Data Sheets (MSDSs)
 - h. Environmental Protection Agency (EPA)
 - i. Occupational Safety and Health Administration (OSHA)
 - j. American Red Cross Standards (ARC)
 - k. Networking Safety Standards
 2. Apply sound ergonomic principles in organizing one's work space.
- F. EMPLOYMENT LITERACY** - Students will understand career paths and strategies for obtaining employment within their chosen field. This includes traditional job preparation skills, such as resumes, application forms, cover letters, sources of employment information, and interviewing skills, but also includes an overview of the industry and an understanding of labor market trends.
1. Explore career opportunities and projected trends; investigate required education, training and experience; and develop an individual education plan.
 2. Identify steps for setting goals and writing personal goals and objectives.

3. Examine aptitudes related to career options; relate personal characteristics and interests to educational and occupational opportunities.
4. Develop a career portfolio, including the following documents:
 - a. job application
 - b. resume(s)
 - c. appropriate cover and follow-up correspondence
5. Identify and demonstrate effective interviewing techniques.
- G. **TECHNOLOGY LITERACY** - Students will understand and adapt to changing technology by identifying, learning, and applying new skills to improve job performance. Students should understand the role of technology in their chosen field and should be able to use all appropriate technology. Students should also feel confident in their ability to learn new technology by generalizing from what they know, adapting skills to new situations, and identifying and using sources of information and of further learning.
 1. Demonstrate the ability to use personal computers for loading and retrieving data, information gathering, measurements, and writing.
 2. Identify the characteristics and explain the importance of adapting to changes, being flexible, and evaluating goals when working in the industry.
 3. Understand the importance of lifelong learning in adapting to changing technology.
- H. **IMPORTANCE OF ETHICS** – Students will understand proper ethics in the workplace.
 1. Discuss social and ethical responsibilities in the industry.
 2. Demonstrate ethical choices in workplace situations.