

YOSEMITE REGIONAL OCCUPATIONAL PROGRAM

FARM EQUIPMENT OPERATION AND MAINTENANCE

CBEDS Codes: 4035

<u>JOB TITLES</u>	<u>DOT NO.</u>
Farm Equipment Operator	409.883-010
Farm Worker – Grain	401.683-010
Field Hauler	409.683-014
Farm Worker – Field Crop	404.687-010
Farm Worker – Fruit	403.683-010
Farm Worker – Machine	409.686-010
Farm Worker – Vegetable	402.663-010
Horticulture Worker I	405.684-014
Farm Machinery Operator	409.683-010
Farm Worker – Small Field Crop	404.161-010
Farm Worker – Vegetable II	402.687-010

Course description:

This course is designed to prepare students for entry level employment in Farm Equipment Maintenance and Operation. Students will learn proper techniques in machinery maintenance and repair. Safety and hands-on practical application of equipment operation will be stressed.

All students are required to pass a safety test before being allowed to work in the shop. Safety glasses are required in the shop at all times.

Prerequisites:

Student will read at 7th grade level.

Student will complete 5th grade math (fractions, division)

Instructor approval required

DURATION: up to 180 total hours

CREDIT: 10

MEETS UNIVERSITY OF CALIFORNIA ENTRANCE REQUIREMENTS: No

MEETS CALIFORNIA STATE UNIVERSITY REQUIREMENTS: No

ARTICULATED WITH POSTSECONDARY INSTITUTIONS:

<i>High School</i>	<i>College</i>	<i>College Course Articulated</i>
Orestimba High School ROP	Modesto Junior College	(in progress)
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Instructional Content

Instruction will include:

Student Outcomes

At the end of instruction, the student will be able to

Hours

CL=Classroom

L= Lab

<p>1. Farm Power and Machinery Overview.</p> <ol style="list-style-type: none"> 1. Components of Ag Power 2. Tractor and equipment design and types. 2. Review Careers/Job Market/Employability 3. Leadership/management. 4. System analysis & problem-solving. 	<p>Goal: The student will understand the general principles of Farm Power and Machinery</p> <ol style="list-style-type: none"> A. Understand components of the agriculture industry B. Recognize agriculture as a business. C. Understand the operation of farm machinery advancement D. Define & demonstrate Careers/Job Market/Employability. E. Participate in leadership/management. F. Understand the need for leadership & management in the field. G. Analyze systems within the field, solve problems. 	<p>ANCHOR/CR A4.2 A9.13 A9.10 A3.4 A3.5 A9.1 A9.2 A9.3 A9.7 A9.4 A3.8 A3.3</p> <p>CR1 CR7 CR3.4 CR2 CR5.9</p>	<p>CTE</p>	<p>CL: 5</p>	<p>L: 1</p>
<p>2. Safety.</p> <ol style="list-style-type: none"> 1. General shop safety. 2. Proper clothing & grooming. 3. Safe use of hand & power tools. 4. Restraint systems. 5. Emergency fire & disaster procedures. 6. OSHA rules & regulations. 7. Waste & material disposal. 8. Safe operation of tractors and farm equipment. 	<p>Goal: Student will understand the health hazards, safety practices, & environmental hazards related to their work in the shop.</p> <ol style="list-style-type: none"> A. Comply with shop safety. B. Wear eye protection. C. Describe proper clothing & grooming. D. Use hand & power tools safely. E. Understand the relationship safety factors, seat belts, roll guard in cabs. F. Follow emergency fire & disaster procedures. G. Comply with OSHA rules & regulations. H. Handle & dispose of materials safely. 	<p>A6.1- A6.7 A8.1 A8.4</p> <p>CR7.6 CR7.9 CR7.8</p>	<p>B1.1 B1.2 B1.3</p>	<p>CL: 3</p>	<p>L: 2</p>
<p>3. Tools, Equipment & Supplies.</p> <ol style="list-style-type: none"> 1. Review basic hand tools, operation & maintenance. 2. Review basic power tools, operation & maintenance. 3. Review basic supplies storage & maintenance. 4. Review basic equipment storage & maintenance. 5. Pertinent business practices. 	<p>Goal: The student will understand how specific tools are used to perform maintenance & repair operations, & will select & use the correct tools & equipment for repair procedures</p> <ol style="list-style-type: none"> A. Identify, select, operate, store, & maintain hand & power tools. B. Identify select, store, maintain supplies & equipment. C. Follow business practice, i.e., planning, management, budget. 	<p>A11.1 A11.2</p> <p>CR9.8</p>	<p>B2.1 B4.1 B5.1 B6.1 B7.2 B8.1 B8.2 B9.2 B10.2 B11.1 B12.1</p>	<p>CL: 2</p>	<p>L: 3</p>

Instructional Content	Student Outcomes	Hours			
Instruction will include:	At the end of instruction, the student will be able to:	CL=Classroom			
		L=Lab			
<p>4. Scientific Principles.</p> <ol style="list-style-type: none"> 1. Math related to agricultural field. 2. Measurement scales & systems used in calibration of acreage and spray applications 3. Physics, power, & energy related to the agricultural field. 5. Review issues related environmental safety & health issues. 6. Basic principles of electricity & electronics . 	<p>Goal: The student will understand scientific principles in relation to physical & chemical functions in agricultural energy systems.</p> <ol style="list-style-type: none"> A. Demonstrate agricultural related math. B. Understand measurement scales & systems used in agricultural operations. C. Follow industry-approved standards when using the measuring tools & measurement systems required in diagnostic & adjustment procedures. D. Describe related physics, power, & energy E. Understand & describe the potential application of alternative power sources.. F. Understand the effects of agricultural vehicles on the environment. G. Understand & use the basic principles of electricity, electrical power, & electronics. 	<p>ANCHOR/CR A4.1 A4.2 A5.4 A10.3 A8.3 A6.6 A6.3 A6.4</p> <p>CR1 CR11 CR4 CR5 CR10 CR12</p>	<p>CTE</p> <p>B2.1 B3.2 B3.3 B3.4 B3.5</p>	<p>CL:</p> <p>8</p>	<p>L:</p> <p>2</p>
<p>5. Communication Skills.</p> <ol style="list-style-type: none"> 1. Applying written communication skills in agricultural industry, including appointments, cost estimates, work orders, and using service manuals. 	<p>Goal: The student will be able to apply verbal communication skills in the agricultural industry.</p> <ol style="list-style-type: none"> A. Schedule appointments. B. Prepare cost estimates. C. Prepare work orders. D. Prepare & close repair orders. E. Use service manuals & other information retrieval systems for diagnostic procedures. F. Understand the need for maintenance & document maintenance procedures. G. Understand fault diagnosis & the steps that lead to fault diagnosis, & inspect & analyze the cause of component failure. H. Understand the business practices of a shop, & generate & maintain service records in a manner consistent with current legal & industry requirements. 	<p>A2.1–A2.6 A4.1– A4.7 A10.2 A10.5</p> <p>CR1 CR2 CR4 CR5.4 CR6 CR11</p>	<p>B2.2</p>	<p>CL:</p> <p>5</p>	<p>L:</p> <p>2</p>
<p>6. Engine Systems</p> <ol style="list-style-type: none"> 1. Engine types and output 2. Internal engine parts 3. Engine power development 4. Intake and Exhaust systems 5. Fuel system 6. Lubrication 7. Cooling systems 8. Electrical systems 	<p>Goal: The student will understand basic Engine parts and operation</p> <ol style="list-style-type: none"> A. Understand basic components of engine operation B. Discuss and demonstrate internal combustion engine parts C. Understand basic systems of the power component including: fuel, lubrication, cooling, and electrical 	<p>A5.1 A5.2 A5.3 A5.4 A11.1 A11.2</p> <p>CR1 CR5 CR9 CR12</p>	<p>B5.0 B9.0 B10.0 – B10.5 B11.0 – B11.5</p>	<p>CL:</p> <p>8</p>	<p>L:</p> <p>8</p>
<p>7. Power Train</p> <ol style="list-style-type: none"> 1. Clutches 2. Mechanical transmissions 3. Hydraulic-assist transmissions 4. Differentials 5. Final Drives 6. PTO 7. Lubrication of power transmission 	<p>Goal: The student will understand the interrelationships of the components of the power train</p> <ol style="list-style-type: none"> A. Describe and identify basic parts of the power train from transmission to the final drive B. Determine gear ratio knowing drive gear or driven gear speeds C. Understand basic service requirements of components of the power train 	<p>A4.1 A4.2 A4.3 A5.1 A2.1 A11.1-A11.5 A10.1 – A10.4</p> <p>CR1</p>	<p>B10.0 – B10.6 B11.0 – B 11.6</p>	<p>CL:</p> <p>10</p>	<p>L:</p> <p>5</p>

Instructional Content Instruction will include:	Student Outcomes At the end of instruction, the student will be able to:	Hours CL=Classroom L=Lab			
8. Hydraulics 1. Power deliver methods 2. Types of hydraulic systems 3. Hydraulic System Components 4. Hydraulic motors, cylinders	Goal: The student will understand basic hydraulic components and functions A. Define and identify basic hydraulic components B. Understand open-center/close-centered hydraulics systems C. Distinguish differences between hydraulic motors and pumps	ANCHOR/CR A4.1 A4.2 A4.3 A5.1 A2.1 A11.1-A11.5 A10.1 – A10.4 CR2	CTE B10.0 – B10.6 B11.0 – B 11.6	CL: 10	L: 5
9. Components 1. Steering system 2. Brake system 3. Drawbar/hitches 4. Tread width/wheels/tires 5. Tractor weight 6. Dual tires 7. Operator protection/comfort	Goal: The student will understand the functions of essential components not associated with engine or power train A. Identify and describe basic components of the steering and brake system B. Determine the tread width as related to crop and production C. Determine the necessity for dual tires D. Understand importance of operator protection	A4.1 A4.2 A4.3 A5.1 A2.1 A11.1-A11.5 A10.1 – A10.4 CR1 CR10 CR12	B10.0 – B10.6 B11.0 – B 11.6	CL: 4	L: 5
10. Controls/Instruments 1. Instrument panel 2. Tractor-movement controls 3. Tractor-implement controls 4. Tractor driving	Goal: The student will the importance of monitoring tractor operation and technique A. Determine various styles of instruments B. Understand the correct use of hydraulic controls C. Importance of selecting correct gear for job D. Monitor instrument panel for safe operation of equipment E. Proper starting procedure of equipment F. Tractor driving skills	A4.1 A4.2 A4.3 A5.1 A2.1 A11.1-A11.5 A10.1 – A10.4 CR1 CR5 CR6 CR12	B10.0 – B10.6 B11.0 – B 11.6	CL: 3	L: 1 0
11. Attaching and Removing Equipment 1. Equipment to drawbar 2. PTO 3. 3-point hitch 4. Removal of equipment from tractor	Goal: The student will understand correct procedures for attaching and removing implements to a tractor A. Practice proper techniques hitching an implement to a drawbar B. Hands on practice attaching 3-point hitch and removal C. Correct procedure to attach power take- off shaft to tractor	A4.1 A4.2 A4.3 A5.1 A2.1 A11.1-A11.5 A10.1 – A10.4 CR1 CR6 CR6.2 CR9	B10.0 – B10.6 B11.0 – B 11.6	CL: 3	L: 5
12. Field Operation. 1. Preparing for operation 2. Implement adjustment 3. Selecting gears and engine speed 4. Starting tractor movement 5. Driving the tractor	Goal: The student will know the basic procedure needed for proper operation of farm tractors. A. Develop and use a pre-start check list B. Determine correct implement adjustments for job C. Understand the relationship between ground speed and engine speed D. Develop good tractor operating skills	A4.1 A4.2 A4.3 A5.1 A2.1 A11.1-A11.5 A10.1 – A10.4 CR4 CR5 CR6 CR12	B10.0 – B10.6 B11.0 – B 11.6	CL: 5	L: 4

Instructional Content Instruction will include:	Student Outcomes At the end of instruction, the student will be able to	Hours CL=Classroom L=Lab			
13. Safety and Transport 1. Pre-operation safety 2. Operating safety 3. Transport of farm equipment	Goal: The student will understand proper transportation safety while moving farm machinery A. Setting implement safety features for proper transport B. Understand laws and regulations regarding tractor safety while moving on highways or public roads C. Practice safety techniques in equipment transport	ANCHOR/CR A4.1 A4.2 A4.3 A5.1 A2.1 A11.1-A11.5 A10.1 – A10.4 CR5 CR6 CR8 CR12	CTE B10.0 – B10.6 B11.0 – B 11.6	CL: 3 L: 1 0	
14. Maintenance and Storage 1. General maintenance 2. Daily maintenance 3. Periodic maintenance and service 4. Engine tune-up 5. Storage	Goal: The student will understand the importance of a regular maintenance schedule of farm equipment A. Develop a maintenance schedule for farm tractors B. Demonstrate proper maintenance and service techniques, including: oil and water, addition and removal C. Determine signs of engine failure and necessity of engine tune-up D. Techniques to prepare equipment for long term storage	A4.1 A4.2 A4.3 A5.1 A2.1 A11.1-A11.5 A10.1 – A10.4 CR4, CR5 CR6, CR8	B10.0 – B10.6 B11.0 – B 11.6	CL: 5 L: 5	
15. Batteries 1. State of charge diagnosis. 2. Battery capacity measurement. 3. Three minute charge test. 4. Cables, connectors, & clamps maintenance. 5. Battery removal & installation.	Goal: The student will understand battery operation, testing, & servicing procedures. A. Diagnose state of charge. B. Measure battery capacity (load test) C. Complete three minute charge test. D. Maintain & replace cables, connectors, & clamps.	A5.0-A5.4 A4.4 A4.7 A11.11 A11.5 CR8		CL: 2 L: 3	
16. Troubleshooting 1. Engine fails to start 2. Brake failure 3. Hydraulic problems	Goal: The student will understand the importance of diagnosing problems A. Learn to understand the procedure necessary to troubleshoot farm machinery	CR1 CR5 CR10	B10.1 B10.2 B10.3 B10.4 B10.5 B10.6 B11.0 B11.6	CL: 5 L: 5	
17. Electrical Systems: Diagnosis & Repair of Charging Systems. 1. Drive belts, pulleys, & fans. 2. Connectors & wires. 3. Charging system output tests. 4. Maintenance of voltage regulators. 5. Maintenance of alternators.	Goal: The student will understand the operation of, testing of, & repair procedures for charging systems. A. Assess drive belts, pulleys & fans. B. Assess connectors & wires. C. Analyze charging system output tests. D. Measure/repair voltage regulators. E. Test/maintain/repair alternators.	CR1 CR8 CR4 CR5 CR10	B10.1 – B10.6 B11.1 – B11.6 B3.1 – B3.6	CL: 3 L: 3	
18. Electrical Systems: Diagnosis & Repair of Lighting Systems. 1. Headlight maintenance. 2. Wiring circuits maintenance. 3. Dash lights maintenance. 4. Emergency lights maintenance.	Goal: The student will understand the operation, diagnosis, & repair of automotive lighting systems. A. Assess/maintain/repair/replace headlights. B. Assess/maintain/repair/ headlight assemblies. C. Assess/maintain/repair/replace wiring circuits. D. Assess/maintain/repair/replace emergency lights.	A5.1 A5.2 A4.1 A4.2 A4.3 A4.7 CR1 CR4 CR5	B3.1 – B3.6	CL: 2 L: 3	

Instructional Content	Student Outcomes	Hours			
Instruction will include:	At the end of instruction, the student will be able to:	CL=Classroom L=Lab			
19. Electrical Systems: Diagnosis & Repair of Driver-Information Systems. 1. Gauges maintenance. 2. Sending units maintenance.	Goal: The student will understand the operation of & diagnostic procedures for meters, gauges, warning lamps & devices, relays & related electrical circuits. A. Operate/maintain/assess/install gauges. B. Operate/maintain/assess/install sending units.	ANCHOR/CR A5.1 A5.2 A4.1 A4.2 A4.3 A4.7 CR5	CTE B3.1 – B3.6	CL: 2	L: 2
20. Engine Repair: Diagnosis of Lubrication & Cooling Systems. 1. Oil pressure testing & inspection. 2. Oil pump assemblies inspection. 3. Pressure test cooling system examination. 4. Drive belts & hoses assessment & testing	Goal: The student will understand how to diagnose lubrication & cooling systems. A. Inspect & test oil pressure. B. Inspect oil pump assemblies. C. Examine pressure test cooling system. D. Assess & test drive belts & hoses.			CL: 3	L: 3
21. Engine Repair: Bolt-on Installation. 1. Water pump installation. 2. Thermostat replacement. 3. Starter installation. 4. Alternator placement. 5. Intake & exhaust manifold installation. 6. Fuel delivery system placement.	Goal: The student will understand the installation of bolt-on installation in engine repair. A. Install water pump. B. Replace thermostat. C. Demonstrate starter installation. D. Display alternator placement. E. Perform intake & exhaust manifold installation. F. Complete fuel delivery system placement.			CL: 2	L: 2
22. Communication, Leadership and Opportunities for Occupational Growth 1. Develop leadership skills 2. Develop communication skills 3. Develop interpersonal and intrapersonal skills 4. Develop interview skills 5. Demonstrate a positive self- image 6. Create a career seeking portfolio	Goal: Student will, through the National FFA Organization, learn leadership skills in interviewing, portfolio development, work and professional attire. They will develop growth in interpersonal and intrapersonal skills working with others and alone. The students will learn the ability to solve problems and think critically on group and individual projects and assignments.	1, 2, 4, 9, 10, 11, 9.0 CR1, CR2, CR2, CR7, CR8, CR9, CR10, CR12	FID A2.1 A2.2		