

YOSEMITE REGIONAL OCCUPATIONAL PROGRAM

SMALL ENGINE/MOTORCYCLE REPAIR 1-2

CBEDS Codes: 5661

JOB TITLES

Small Engine Mechanic
Motorcycle Mechanic

DOT NO.

625.281-034
620.281-054

Course description:

This course is designed to train students for entry-level jobs in the fast growing industry of small engine and motorcycle repair. There is a large demand for small engine mechanics in the area of lawn, garden, and farm equipment small motor repair. There is also a growing demand for quality motorcycle mechanics. Fuel costs have caused consumers to look for greater efficiency and more economical modes of transportation, and the motorcycle is filling this need. This course places emphasis on overhaul, repair, adjustment, and troubleshooting of small engines, lawnmowers, chainsaws, and motorcycles.

Prerequisites: None

DURATION: up to 350 total hours

CREDIT: 5-10 Units/Semester

RECOMMENDED GRADE LEVEL: 11-12, Adult

MEETS GRADUATION REQUIREMENTS IN: Practical Arts

MEETS UNIVERSITY OF CALIFORNIA ENTRANCE REQUIREMENTS: No

MEETS CALIFORNIA STATE UNIVERSITY REQUIREMENTS: No

Instructional Materials

Basic Text(s):

Small Engines, Jay Webster, American Technical, Latest Edition

Supplementary Text(s):

Motorcycle Handbook, Paul Depsey, Bob Clampett, Fawcett, 1987

Motorcycle Operations, Johns/Edmonson, Goodheart, 1987

Small Gas Engines, Alfred Roth, Ronald Baird, Goodheart-Willcox, 1985

The Complete Guide to Motorcycle Mechanics, Motorcycle Mechanics Institute Staff, Prentice Hall, 1984

Technical Manuals for Small Engine and Motorcycles

Practical Problems in Mathematics for Automotive Technicians, Delmar Publishers, Inc., 1990

Mathematics Through Auto Mechanics, Garold "Gary" Ellyson, Kenneth E. Clouse (KECC0), 1990

Instructional Content

Instruction will include:

Student Outcomes

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

Hours

CL=Classroom
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1. Career Opportunities/Leadership/ Gender Equity	Goal: The student will be able to demonstrate competency in lifelong career planning skills, develop leadership abilities, and develop an awareness of programs offered in higher education without regard to race, sex, national origin, or handicap as they relate to small engine/motorcycle repair.	Anchor/ CR	CTE	CL	CC
<ol style="list-style-type: none"> 1. Review desirable personal traits. 2. Review skills needed for employment in field. 3. Review possible careers in field. 4. Review opportunities offered through VICA (Vocational Industrial Clubs of America) 5. Demonstrate that opportunities in field are available without regard to race, sex, national origin or handicap. 6. Correct way to fill out a job application. 7. Resume' development 8. Employment outlook within the automotive field 9. Visit a local automotive firm and observe employees at work. 10. Explore areas or levels of education in which opportunities are available in automotive technology. 11. Review "Help Wanted" columns in the daily newspaper for a week. 12. Review the role of small engine mechanic in industry. 13. Demonstrate written and oral communication skills. 	<ol style="list-style-type: none"> A. Using reading materials, visual media, attendance at trade meetings, or by visiting automotive repair facilities. Complete a report about choosing a career within the field of automotive repair. B. Develop leadership abilities in educational, vocational, civic, recreational and social activities through involvement in student organizations such as Vocational Industrial Clubs of America (VICA). C. Identify personal traits (strengths, values and weaknesses). D. Listen to guest speaker on trade and technical education after high school. E. Identify at least three possible career choices in the small engine/motorcycle repair field. F. Perform the responsibilities of supervisor in charge of clean up assignments on a rotating basis. G. Perform as a lead person to assist students with less experience. H. Demonstrate that opportunities in the small engine/motorcycle repair field are available without regard to race, sex, national origin or handicap. I. Demonstrate an understanding of the role of a small engine mechanic in industry. J. Develop a resume and complete a job application K. Correctly fill out and use repair order forms. L. Write a career report on opportunities in the small engine field by reading materials or listening to speakers from trade schools or visiting repair facilities. 	<p>Trans 1.0 2.0-2.6 3.0-3.9 11.0</p> <p>CR 1-12</p>	<p>A1.0- A1.5</p>		

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Instructional Content	Student Outcomes	Anchor/CR	CTE	CL	CC
<p>2. Attitudes, behaviors and personal characteristics valued by employers.</p> <ol style="list-style-type: none"> 1. Positive attitudes and work ethics 2. Interpersonal skills 3. Ability to work in a team. 4. Personal traits that impact work performance. 	<p>Goal: The student will demonstrate attitudes, behaviors, and personal characteristics valued by employers.</p> <ol style="list-style-type: none"> A. Responsibility B. Dependability C. Promptness D. Willingness to learn new skills E. Attentiveness during instruction F. Getting along with others G. Respect for others H. Honest and integrity I. Pride in work J. Flexibility K. Not being defensive when corrected L. Working up to capacity M. Being pleasant and cheerful N. Showing strong motivation to succeed O. Good personal appearance P. Organized Q. Constructively assisting others 	<p>9.1 9.3 9.6 1.0 CR 1-12</p>	<p>A1.0- A1.6</p>		
<p>3. Safety and shop practices</p> <ol style="list-style-type: none"> 1. Review district's safety program 2. Administer shop safety tests and explain shop safety. 3. Parental acknowledgement of safety requirements and conduct expectations. 4. Appropriate site maintenance practices, leaning and appropriate storing and stacking of materials. 5. Administer tool and their use test. 	<p>Goal: The student will understand laboratory systems, safety, and tool use, consistent with industry requirements.</p> <ol style="list-style-type: none"> A. Satisfactorily complete the district's safety program. B. Passes shop safety tests and demonstrate shop safety. C. Obtain parental acknowledgement of safety requirements and conduct expectations D. Demonstrate the safe use of all power equipment. E. Follow cleanup and storage procedures F. Identify tools and their uses on a tool test. 	<p>1,0 6,0 6.3-6.7 CR 6 and 7</p>	<p>A1.0- A1.6 B1.0 B2.0 C2.2</p>		
<p>4. Theory</p> <ol style="list-style-type: none"> 1. Theory of inertia. 2. Types of engines and their design 3. Compute displacement 4. Discuss energy forms 5. Define force, torque, power and horsepower 6. Explain ratio 7. Explain atmosphere pressure 8. Define vacuum. 	<p>Goal: The student will understand physical science concepts related to small engine design and operation including energy forms, static inertia, dynamic inertia, force, torque, horsepower, power vacuum, and atmosphere pressure.</p> <ol style="list-style-type: none"> A. Explain theory of inertia. B. Identify types of engines by their design. C. Compute displacement. D. Explain energy forms E. Define force, torque, power and horsepower. F. Explain ratio G. Explain atmosphere pressure as it relates to engine operation H. Define vacuum. 	<p>5.0 10.1 1.0 CR 1,2, and 5</p>	<p>B5.0 B4.2 B3.5 B3.6</p>		

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5. Two and four stroke engines 1. Define the two and four stroke cycle 2. Describe the sequences of combustion	Goal: The student will understand two cycle and four-cycle engine operating principles. A. Explain the four stroke cycle B. Explain the two stroke cycle C. Demonstrate the four-stroke cycle on a shop engine and describe the sequences of combustion.	Anchor/ CR 1.0 10.1-10.3 11.1 11.2 6.0 CR 1,2, and 5	CTE C3.1	CL	CC
6. Basic systems. 1. Define the principles of a fuel system 2. Describe the principles of ignition and electrical system 3. Define fuel system parts and explain their function. 4. Define parts of a simple point ignition system and explain their function.	Goal: The student will understand the principles of fuel, electrical and ignition system. A. Explain the principles of the fuel system B. Explain the principles of the ignition and electrical system. C. Identify parts of a simple fuel system and explain their function. D. Identify the parts of a simple point ignition system and explain their function.	1.0 10.1- 10.3 11.1 11.2 6.0 CR 1,2, and 5	C3.5 C6.0		
7. Ignition systems. 1. Theory of basic magneto 2. Demonstrate a tune-up 3. Describe and overhaul a distributor 4. Capacitive discharge system 5. Spark plugs 6. Battery ignition system and the function of each part.	Goal: The student will understand the physical science of electricity, principles of magneto ignition, principles of battery ignition, and principles of spark plugs in a manner consistent with industry standards. A. Explain the theory of basic magneto system. B. Overhaul a magneto system and perform a tune-up C. Explain the workings of a distributor and be able to overhaul it. D. Demonstrate knowledge of how the capacitive discharge system works. E. Explain and perform a tune-up on a small engine ignition system F. Clean and gap a spark plug G. Identify the components of a battery ignition system and explain the function of each part.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2 and 5	C3.5 C7.1 C7.2 C7.3		
8. Fuel Systems 1. Define a fuel system and its parts. 2. Identify fuels 3. Theory of carburetor and circuits 4. Demonstrate a carburetor overhaul and identify the parts. 5. Overhaul and operation of a fuel pump 6. Venturi principle	Goal: The student will understand fuel types, two cycle fuel mixtures, fuel pumps and filters, physical science of fuel systems, diaphragms and float-type carburetion theory, troubleshooting and repair, air cleaner, servicing, and governor repair and adjustments consistent with related industry standards. A. Identify parts of a typical fuel system B. Identify different types of fuels used—unleaded, leaded, fuel mix. C. Explain carburetor theory and circuits D. Overhaul a basic carburetor and name the parts. E. Explain fuel pump operation and overhaul a fuel pump. F. Explain the Venturi principle and how it is used in carburetion.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4, and 5	C8.6 B8.1		

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8. Fuel Systems (Continued) 7. Diaphragm carburetor 8. Service fuel and air filters 9. Governor systems and their operation	G. Service a diaphragm type of carburetor and make all adjustments. H. Service fuel and air filters. I. Identify different types of governor systems and explain their operation. J. Adjust mixture (air-fuel)	Anchor/ CR	CTE	CL 5-10	CC 0
9. Components 1. Describe types of engines 2. Discuss parts of an engine 3. Demonstrate two and four stroke sequence of combustion	Goal: The student will understand the components of an engine. A. Identify different types of engines according to design. B. Identify component parts of an engine. C. Explain and describe the two and four stroke sequence of combustion.	1.0 10.1-10.3 11.1 11.2 CR 1,2,4,5, and 9	C3.1		
10. Valves 1. Valve train and stem clearance 2. Removal and installation of a valve 3. Valve inspection and cleaning 4. Grinding a valve and seta 5. Discuss valve types and valve keepers 6. Lapp a valve 7. Demonstrate valve clearance	Goal: The student will troubleshoot, repair, and replace valves, sets, valve guides, and springs consistent with industry skill level requirements. A. Service upper end and valve train and measure stem clearance. B. Demonstrate removal and installation of a valve. C. Inspect and clean a valve. D. Grind a valve and seat. E. Identify types of valve keepers F. Lapp a valve. G. Adjust valve clearance	1.0 10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	C6.1 B1.4		
11. Cylinders 1. Demonstrate a micrometer 2. Demonstrate cylinder repair 3. Use specifications for cylinder reconditioning.	Goal: The student will understand cylinder reconditioning process and techniques A. Use a micrometer to measure a cylinder B. Hone a cylinder C. Identify a cylinder in need of repair D. Look up specifications to be used in cylinder reconditioning	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	C6.1 B1.4		
12. Pistons 1. Demonstrate removal and replacement of pistons and rings. 2. Use of a micrometer to measure a piston 3. Describe function of piston ring 4. Identify piston types and keeper 5. Demonstrate removal and replacement of a piston pin. 6. Describe piston damage and process to replace. 7. Verify specifications to be used in piston and ring service.	Goal: The student will understand piston and piston ring construction, design and operation, troubleshooting, repair, and replacement with industry standards. A. Remove and replace pistons and rings and measure ring end gap. B. Measure piston with a micrometer. C. Identify piston ring by name and function. D. Identify piston pin types and keeper. E. Remove and replace a piston pin. F. Identify piston damage and determine if replacement is necessary. G. Look up specifications to be used in piston and ring service.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	C6.1 B1.4		

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		Anchor/ CR	CTE	CL	CC
13. Rods and Crankshaft 1. Demonstrate lower engine 2. Demonstrate engine measurements 3. Define types of rods 4. Define assembly marks 5. Discuss and define crankshaft operation and function 6. Describe piston/ring service specifications.	Goal: The student will understand connecting rod and crankshaft construction, design, inspection repair, and replacement consistent with industry standards. A. Service lower end of engine (bearings and crank). B. Perform engine measurements on crankshaft and connecting rods. C. Identify types of connecting rods. D. Identify assembly marks on rod caps. E. Explain how crankshaft operates and what its function is. F. Look up specifications to be used in piston and ring service.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	C6.1 B1.4		
14. Bearings and Seals 1. Define engine bearings 2. Demonstrate measurement/inspection of bearings. 3. Demonstrate torque-bearing caps. 4. Inspection/replacement of seals. 5. Define wheel bearings 6. Demonstrate repair/replacement of wheel bearing	Goal: The student will understand bearing and seal removal, inspection, measurement, and installation, consistent with industry skill level requirements. A. Identify types of engine bearings. B. Measure and inspect bearings. C. Install and torque bearing caps. D. Inspect seals. E. Replace seals. F. Identify types of wheel bearings. G. Repair and replace a wheel bearing.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	C6.1 B1.4		
15. Transmission and Clutch 1. Define transmission theory 2. Demonstrate gear ratios 3. Define transmission parts 4. Discuss theory of clutch 5. Define clutch system 6. Discuss transmission and power flow	Goal: The student will understand transmission and clutch operation, inspection and service. A. Explain basic transmission theory B. Compute gear ratios C. Identify parts of a transmission D. Explain theory of clutch E. Identify parts of clutch system F. Explain power flow and transmission rebuilding procedures	10.1 10.3 1.0 CR 1,2 and 5	C8.2 B1.4		
16. Lubrication 1. Define friction, viscosity and oil classifications. 2. Identify lubrication systems 3. Discuss two cycle oil systems.	Goal: The student will understand friction, viscosity, lubrication types and specifications, and two cycle and four-cycle lubrications systems in a manner consistent with industry standards. A. Explain friction, viscosity, and oil classification. B. Identify three types of lubrication systems. C. Explain how the two cycle oil system works.	10.1 10.3 1.0 CR 1,2, and 5	C6.2		

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17. Cooling 1. Discuss and define the parts and operation of a water cooled system. 2. Discuss and define the parts and operation of an air-cooled system. 3. Demonstrate an air and water system.	Goal: The student will understand heat transfer, air cooling, and water cooling fundamentals in a manner consistent with industry standards. A. Explain how a water cooled system operates. B. Identify the parts of a water-cooled system. C. Explain how an air-cooled system operates. D. Identify all the parts in an air-cooled system. E. Service water and air-cooled system.	Anchor/ CR 10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	CTE C6.2	CL	CC
18. Electrical system 1. Demonstrate a volt-ohm meter 2. Define electric starter system. 3. Demonstrate charge of a battery 4. Check a battery charge 5. Demonstrate servicing two systems. 6. Demonstrate servicing mechanical/electrical starter systems. 7. Troubleshoot a wiring system	Goal: The student will understand starter systems, wiring, battery service, electrical systems, and mechanical starter systems. A. Use a volt-ohm meter. B. Explain how an electric starter system operates. C. Charge a battery. D. Check a battery charge. E. Identify and service two different types of systems. F. Service mechanical and electrical starter systems. G. Troubleshoot the wiring system, starter system, and charging system.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	C7.1 C6.3 C6.4 B2.2		
19. Smog system 1. Define smog systems and their purpose. 2. Demonstrate servicing a smog system	Goal: The student will understand smog systems. A. Explain basic smog control systems and their purpose. B. Service smog systems.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	C1.3		
20. Project Rebuild 1. Demonstrate use of specifications book 2. Demonstrate engine disassembly by specification. 3. Grind valves 4. Replace rings 5. Use a micrometer 6. Reassemble engine 7. Replace gaskets/seals 8. Demonstrate rebuilding ignition 9. Service and rebuild carburetor 10. Demonstrate troubleshooting an engine. 11. Demonstrate a complete tune-up	Goal: The student will demonstrate an understanding of engine diagnosis, tune-up, carburetion repair, ignition repair, major engine repair, and drive system repair. A. Look up specifications in book. B. Disassemble engine according to specifications. C. Grind valves. D. Replace rings. E. Measure parts with micrometer. F. Reassemble engine, torquing all necessary parts. G. Replace all necessary gaskets and seals. H. Rebuild ignition system. I. Service and rebuild a carburetor. J. Troubleshoot an engine in the areas of carburetor ignition, starting, and compression.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	C3.5 C6.3 C6.4 C7.1 B2.2 B1.4		

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20. Project Rebuild (Continued)	K. Perform a complete tune-up. L. Make all necessary adjustments to the motor to make it run correctly	Anchor/ CR	CTE	CL	CC
21. Frame 1. Demonstrate frame maintenance. 2. Demonstrate service of belts, chains and blades.	Goal: The student will frame repair and maintenance and best transmission and blade service. A. Perform frame maintenance. B. Service belts and chains. C. Service blades.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	C8.1 C8.4 C8.5 C8.6		
22. Servicing 1. Demonstrate basic servicing of a small engine by: 2. Changing oil 3. Servicing filters 4. Changing and sharpening a blade. 5. Adjust and changing a blade 6. Grease zerk fittings.	Goal: The student will demonstrate entry-level skills in oil changing, lube servicing, filter service, blade and hub servicing, and chain servicing. A. Change oil on a motor. B. Service filters C. Sharpen a blade. D. Change a blade. E. Change and adjust a chain F. Grease zerk fittings on a motor and frame.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,4,5, and 9	C6.2		
23. Brakes. 1. Define brakes and their parts 2. Discuss drum brake system 3. Discuss disc brake system 4. Define brake fluid code 5. Demonstrate maintenance of master cylinder fluid.	Goal: The student will understand brake principles and operation A. Explain brakes and their related parts. B. Name parts of a drum brake system. C. Name parts of a disc brake system. D. Understand dot code for brake fluid E. Check and fill master cylinder fluid level.	10.1-10.3 11.1 11.2 6.0 1.0 CR 1,2,5	C8.3		
24. Consumer/Shop Practices 1. Discuss warranties 2. Demonstrate good consumer practices for quality and price.	Goal: The student will understand detail information required on work orders and how and where to shop for quality parts and service. A. Explain guarantee, prorated, warranty B. Demonstrate how to shop for best price and quality. C. Demonstrate how to purchase parts.	10.1-10.3 11.1 11.4 11.5 6.0 CR 1,2,4,5, and 9	A6.1 A6.2 A4.5		
25. Computer applications 1. Demonstrate industry computer usage as it relates to parts and service.	Goal: The student will understand computer usage in the field. A. Demonstrate computer applications in industry as they pertain to parts, service and inventory.	3.8 2.4 11.1 11.2 1.0 CR 1,2, and 4	A2.2 A2.3 A2.8		
26. Individual Projects 1. Complete pre-approved project.	Goal: The student will complete individual projects in addition to assigned class curriculum. A. Satisfactorily complete pre-approved individual projects.	10.1-10.3 11.1 11.4 11.5 6.0 CR 1,2,4,5, and 9	C2.5 C6.3 C6.4 C7.1-C7.3 C8.3 C6.2 C8.1 C8.4 C8.5 C.6 B1.4 B2.2		