

TECH CRAFTSMAN CAREER BUILDING TRADE SCHOOL

CURRICULUM GUIDE for

MOTORCYCLE/ATV/SMALL ENGINE REPAIR TECHNOLOGY
ALL-TERRAIN VEHICLE (ATV)

TECHNOLOGY CURRICULUM

TECHNOLOGY

2016

Interim Director, Proprietary School Certification
Missouri Department of Higher Education
PO Box 1469
Jefferson City, MO 65102-1469

Tech Craftsman Career Building Trade School

A Certified State of Missouri Proprietary School Trade School Certifications
offering

Associate/Bachelor Degrees : Advance Technology Career University

TABLE OF CONTENTS	2
MO Department of Higher Education Division Proprietary School Certification	1
Introduction	3-4
Definitions of Program:	5
Employment Outlook	6-
Different Types of Motorcycles	6-7
Different Types of ATVS	7-8
Unit 1 - Starting Your Program	9
Unit 2 - Introduction to Motorcycle and ATV Repair	9
Motorcycle and ATV Engine Configurations	9
Practical Exercise 1	9
Unit 3-A - Four-Stroke Internal-Combustion Engine	9
Unit 3-B - Two-Stroke Internal-Combustion Engine	10
Unit 4-Lubrication and Cooling Systems	10
Fuel Systems	10
Clutches, Transmissions, and Drives	11
Unit 5-Two-Stroke Engine Top End Inspection	12
Two-Stroke Engine Lower End Inspection	11
Four-Stroke Engine Top End Inspection	12
Four-Stroke Engine Lower End Inspection	12
Unit 6-Electrical Fundamentals	13
Charging and Ignition Systems	13
DC Circuits for Motorcycles and ATVs	13
Exercise 5-Additional Unit Material	14
Unit 7-Frames, Steering, and Suspension	14
Brakes, Wheel Assemblies, and Tires	14
Practical Exercise 6	14
Unit 8-Motorcycle Maintenance	15
Motorcycle Troubleshooting	16
Practical Exercise 7	16
Supplement	16

INTRODUCTION

Degree Plan:

Tech Craftsman Career Building Trade School Certificate/Degree in:
TCCBTS's Motorcycle/ATV/Small Engines Repair Technology

TCCBTS's goal is train motorcycle/ATV/small engines repair technology, according to:

- “Career Planner” Excellent job opportunities are projected because of the large number of older workers who are expected to retire in the next 10 to 15 years.
- Repairers need good reading ability and basic mathematics and computer skills to use print and digital technical manuals.

Government Labor Statistics and Job Outlook:

- Employment of small engine mechanics is projected to grow 4 percent from 2014 to 2024, slower than the average for all occupations. Growth rates will vary by specialty.
- Since the number of registered motorcycles has increased steadily in recent years, there will continue to be a need for motorcycle repair services. As a result, employment of motorcycle mechanics is projected to grow 6 percent over the next 10 years, about as fast as the average for all occupations.
- Because boat engines and engines and parts for outdoor power equipment have become more sophisticated and efficient, there will continue to be demand for repair services as people are less able to repair and service their own equipment. Employment of motorboat mechanics and service technicians is projected to grow 3 percent, slower than the average, while employment of outdoor power equipment and all other small engine mechanics is projected to grow 5 percent, about as fast as the average for all occupations.

Because there is a need for those programs, TCCBTS's 24 month, 8 hour days, 5 day week program will build master technicians to fill any job market. Tech Craftsman Career Building Trade School's motorcycle/ATV/small engines repair technology certificate

program is designed in conjunction the industry to produce a highly knowledgeable, start out as skilled entry level collision repair technician. This program covers all aspects of motorcycle/ATV/small engines repair technology repair shop management.

TCCBTS program will follow the Automotive Service Excellence (ASE) and the National Automotive Technician Education Foundation (NATEF) curriculum standards. Upon completion of this program TCCBTS's interns/apprentices will receive a certificate and may be eligible to take the Automotive Service Excellence (ASE) certification test.

Since Tech Craftsman Career Building Trade School is a Missouri Proprietary School's being a "Trade School" and "University", after completion of this certificate plan this certificate can be applied toward the Associate of Applied Science Degree in Advance Technology Career University or a certificate in Trade School Technical Studies.

Tech Craftsman Career Building Trade School will offer a degree plan in Motorcycle/ATV/Small Engines Repair Technology including, custom built bikes/ATV technology

Definitions of Program:

Motorcycle's Duel, Single Stroke Engines, and ATV Technology Curriculum

TCCBTS goal is to build a customer service reliable force, our #1 goal and, through our hard work and dedication, we to grow to meet industry needs. The successful intern/apprentice candidates will be one who is capable of working in a variety of areas in any company. While mechanic/installer of trike conversion kits will be instructed, operation of CNC machines may be instructed as well. TCCBTS is looking for a flexible interns/apprentices to perform the following duties upon completion of our programs:

- Provide prompt, dependable, high quality, service to customers.
- Provide clear documentation of work performed.
- Complete repair work within scheduled/allotted time periods.
- Proactively look for, and communicate, any additional service work needed.
- Request parts for the job as early as possible, when needs are anticipated.
- Perform work in accordance to factory specifications.
- Tag and properly store parts and products, as well as track inventory needs.
- Keep work areas as clean as possible.
- Keep customers' motorcycle/trike cleaner than when it was dropped off.
- Focus on quality and ensuring customer satisfaction.
- At conclusion of project ensure proper completion and filing of paperwork.
- Be a team player.
- Communicate with customers from time to time on technical or sales questions.

Program Goals and Outcomes

To prepare interns/apprentices to gain entry-level employment as motorcycle repair technicians by studying the components, systems, and troubleshooting procedures used in the motorcycle and ATV industry.

Upon completion of the program, interns/apprentices will be able to:

List and describe the employment opportunities available in the motorcycle industry, (see below)

Employment Outlook

According to the U.S. Bureau of Labor Statistics (BLS), employment for motorcycle mechanics was predicted to grow at a slower than average rate of six percent between 2012 and 2022 (www.bls.gov). Due to the increase in registered motorcycles, there's a need for trained professional mechanics. Most motorcycle mechanics earned between \$20,930 and \$53,330 in May 2013, the BLS reported. If you acquire specialized skills and training, you may have increased salary and career opportunities. You may also have better employment prospects if you have postsecondary training. However, because motorcycle use is seasonal, you may work fewer hours during the winter. But because of cold weather and winter season, bikers may wish to have needed work on their motorcycles.

Identify the different types of motorcycles and ATVs, and define the uses and advantages of each type, (see below)

Different types of motorcycles

- **Standards**, also called naked bikes or roadsters are versatile, general purpose street motorcycles
- **Cruisers** are styled after American machines from the 1930s to the early 1960s, such as those made by Harley-Davidson, Indian, and Excelsior-Henderson
- **Sport** bikes emphasize top speed, acceleration, braking, handling and grip on paved roads,
- **Touring** although any motorcycle can be equipped and used for touring, touring motorcycles are specifically designed to excel at covering long distances.
- **Sport touring** motorcycles combine attributes of sport bikes and touring motorcycles
- **Dual-sports**, sometimes called dual-purpose or on/off-road motorcycles, are street legal machines that are also designed to enter off-road situations.
- **Scooter engine** sizes range smaller than motorcycles, 50–850 cc (3.1–51.9 cu
- ü in), and have all-enclosing bodywork that makes them cleaner and quieter than motorcycles
- **Off-road KTM dirt bike** with a paddle tire. There are various types of off-road motorcycles, also known as dirt bikes, specially designed for off-road events.

→ Name the various hand, power, and specialized tools you'll use when working with motorcycles and ATVs, and describe the safe work practices that must be observed

→ Identify the different types of motorcycle and ATV engine designs and configurations, including how manufacturers determine engine sizes and power ratings

- List the major components and engine configurations of two- and four-stroke engines
- Understand the theory behind the operation of motorcycle and ATV engines, including two- and four-stroke engines
- Identify the types of lubricants and lubrication systems used in motorcycles and ATVs

Interns/Apprentices Must:

- ❖ Name the components of motorcycle cooling systems, and describe how they work
- ❖ Identify fuel and carburetion systems, including various fuel delivery and fuel injection systems
- ❖ Identify the transmissions and related components used in motorcycle and ATV engines, including the different gears, drive systems, and clutch types
- ❖ Name the procedures used to disassemble and assemble motorcycle two- and four-stroke engines, including the necessary preliminary steps and inspection process
- ❖ List the steps required to remove an engine from a chassis and install an engine into a chassis
- ❖ Describe the basics of electricity, including how it works and how it's measured
- ❖ Identify the different types of charging systems found on motorcycles and ATVs, and describe the operation and steps required for maintenance and troubleshooting
- ❖ Identify the components and operation of ignition and electric starter systems
- ❖ Name the different frame designs and suspension systems used by motorcycle and ATV manufacturers
- ❖ Identify the different brake systems and brake system components used on motorcycles and ATVs, and describe how to perform maintenance
- ❖ Recognize how to perform frame, wheel, and suspension system inspections and alignment procedures
- ❖ Recognize how to perform engine, emission system, and chassis maintenance procedures
- ❖ Identify how to diagnose and troubleshoot motorcycle and ATV problems, including engine, exhaust, ignition, electrical, and chassis problems

DIFFERENT TYPES OF ATVS

ATVs are as varied as their riders, all with different acceleration, rider and cargo capacities, handling characteristics, and ground clearance. With all these options, how do you keep it all straight? Fortunately, the ATV market is broken into some fairly straightforward segments.

UTILITY: If you are an avid hunter, camper, or own a ranch or farm, odds are you have spent some time on one of these big guys. The muscled up utility class is designed to be tough enough for serious work, and buyers responded by making this the most popular class of quads in North America. UTVs have a bigger engine than most other ATVs, which provides a ton of torque for crossing the worst terrain. UTVs can tow a trailer, pull another quad out of the mud with a winch, or take on any other number of accessories designed to get work done. Of course, it's not all work and no play, as taking a UTV over harsh terrain can be a blast.

SPORT: If you get why someone would drop serious coin on a Ferrari or build a drag boat, odds are you love sport ATVs. Think of a sport ATV as the answer for enthusiasts that wanted to see what a Gixxer would do on a muddy trail. Light and powerful, sport ATVs are designed with performance in mind. The suspension has lots of travel for high speed jumps, and they have a quicker acceleration than UTVs, while also having a higher top speed. Sport ATVs can also be modified, although instead of winches, you're more likely to find engine and suspension upgrades.

SIDE BY SIDE: If you want, or need, to take a buddy with you on your adventures, a side-by-side is for you. They are not the fastest or most capable, but the comfort and passenger capacity are hard to beat. Side by sides offers a car-like seating position, and rather than handle bars, the vehicle is controlled by a steering wheel. Some heavier models can tow, and there is a handful of sport side by sides, but really this one is about carrying people and all their stuff.

KIDS: Kids' quads look like the real deal, shrunk by about 50 percent. These little ATVs offer kids and novices the chance to get some experience riding, before they step up to something more powerful. The real world capability is limited by the smaller, lighter parts, so Junior won't be getting any big air on that 50cc quad.

OTHERS: There are a few other oddballs out there. AATVs are truly all terrain as they are amphibious, and you can buy ATVs with more than 4 wheels. There is considerable debate about the advantage of a 6x6 versus a 4x4, but the option exists, and the 6-wheelers have their fans. Electrics are on the way, mainly due to tightening emissions and noise requirements in certain areas. While they are still essentially off-road gold carts at the moment, electric torque has huge potential for enthusiast ATV riders.

Unit 1

Starting Your Program

Succeed by learning being part of Tech Craftsman Career Building Trade School programs as one of TCCBTS's "Interns/Apprentices".

Objectives:

- ★ Understand how to use your Student Portal, including your My Homepage and My Courses pages.
- ★ Access the Penn Foster Community and use it to find answers.
- ★ Connect with Penn Foster on various social media sites.

Unit 2

Introduction to Motorcycle and ATV Repair

Objectives:

- Learn about career opportunities available in the motorcycle industry.
- Identify the different types of motorcycles and ATVs.
- Describe the uses and advantages of each type of motorcycle and ATV.
- Identify the hand, power, and specialized tools you'll use when working with motorcycles and ATVs.
- Understand the safety concerns associated with hand and power tools.
- Describe safe work practices that you must observe when working on motorcycles and ATVs.
- Explain how good housekeeping habits contribute to a safe workplace.
- Identify the major classes of fires and describe how each should be extinguished.

Motorcycle and ATV Engine Configurations

Practical Exercise 1

In this practical exercise, you'll apply your newly acquired knowledge of motorcycles and ATVs to several useful activities, such as visiting a motorcycle dealership and designing a floor plan for your own repair shop.

Unit 3-A

Four-Stroke Internal-Combustion Engine

Objectives:

- Explain the physical laws associated with motorcycle and ATV engines.
- Understand the operation of a basic internal-combustion engine.
- Describe how fuel and air are used to make an engine operate.

- Identify the component parts used in a four-stroke engine.
- Explain the theory of operation for a four-stroke engine.

Unit 3-B

Two-Stroke Internal-Combustion Engine

Objectives:

- ➔ Identify the component parts used in a two-stroke engine including the piston, crankshaft, cylinder head, and cylinder.
- ➔ Explain the theory behind the operation of a two-stroke engine.
- ➔ Identify the different induction systems used on two-stroke engines.
- ➔ Understand how a two-stroke engine physically differs from a four-stroke engine.
- ➔ Identify the advantages and disadvantages of both the two- and four-stroke engines used in modern motorcycles and ATVs.

Practical Exercise 2

In this practical exercise, you'll apply your knowledge of motorcycle and ATV engine operation to some real-life examples.

Unit 4

Lubrication and Cooling Systems-Fuel Systems

Objectives:

- ★ Identify the four key purposes of lubrication.
- ★ Understand the types of oil and the way in which it's classified.
- ★ Explain why bearings, bushings, and seals are needed in an engine.
- ★ Identify the different types of bearings used in motorcycles and ATVs.
- ★ Describe the purpose of both two- and four-stroke engine lubrication systems.
- ★ Understand the different types of lubrication systems used in both two- and four-stroke motorcycle engines.
- ★ Explain how cooling systems work and why they're used.
- ★ Identify the components of motorcycle cooling systems and the various specialty lubricants used in lubrication system maintenance.

Fuel Systems

Objectives:

- Explain fuel octane ratings and the factors that affect these ratings.
- Understand the primary principles of carburetor operation.
- Identify various fuel delivery systems used on motorcycles.

- Describe the components of each type of carburetor, the operation of the circuits in each type of carburetor, and the base carburetor of an engine with multiple carburetors.
- Explain carburetor synchronization.
- Identify the components of an electronic fuel injection system. Clutches, Transmissions, and Drives

Clutches, Transmissions, and Drives

Objectives:

- ❑ Identify the different gears used in transmissions.
- ❑ Calculate gear and drive ratios correctly.
- ❑ Understand the functions of the primary drive systems.
- ❑ Describe the components that make up the primary drive systems.
- ❑ Identify different clutch types, clutch release mechanisms, and transmissions and shifting components.
- ❑ Describe the different types of final drive systems.

Practical Exercise 3

In this practical exercise, you'll apply your knowledge of motorcycle and ATV engine operation to some real-life examples.

Unit 5

Two-Stroke Engine Top End Inspection

Objectives:

- ➔ Explain why engine problem diagnosis is critical before you begin to disassemble an engine.
- ➔ Understand the necessity of proper engine component inspection.
- ➔ Understand the concept of the motorcycle and ATV two-stroke engine power valve.
- ➔ Identify the basic steps that can be used to disassemble and assemble a motorcycle or ATV two-stroke engine.

Two-Stroke Engine Lower End Inspection

Objectives:

- ❖ Understand the procedures used to disassemble the lower end of an air-cooled or a liquid-cooled two-stroke engine that has a vertical crankcase design.
- ❖ Identify the special tools used to disassemble the lower end of a two-stroke engine.
- ❖ Visually identify the components in the lower end of a two-stroke engine.
- ❖ Understand how to inspect the various parts of the crankshaft and transmission for damage or wear.
- ❖ Identify the procedures required to reassemble the lower end of a two-stroke vertical-split crankcase-design engine.
- ❖ Outline the steps required to install an engine into a chassis.
- ❖ Identify the checks you should make before starting a rebuilt engine.

Four-Stroke Engine Top End Inspection

Objectives:

- ★ Understand the procedures for removing a four-stroke engine from the chassis and for disassembling the top end of a four-stroke motorcycle or ATV.
- ★ Diagnose common problems related to four-stroke engine top-end failure.
- ★ Inspect the components of the top end of a four-stroke motorcycle or ATV.
- ★ Identify the procedures for reassembling the top end of a four-stroke motorcycle or ATV.

Four-Stroke Engine Lower End Inspection

Objectives:

- Identify the various components in a four-stroke engine lower-end assembly.
- Understand the procedures used to disassemble the lower end of a four-stroke engine.
- Identify the special tools used to disassemble a four-stroke engine lower-end assembly and the various inspections that should be conducted on a lower-end assembly.
- Inspect the various parts of a transmission for damage and wear.
- Explain how to diagnose basic engine problems based on their symptoms.
- Understand the procedures used to reassemble the lower end of a four-stroke engine and to install an engine into a chassis.
- Identify the steps to take before starting up an engine following a major rebuild.

- Describe the procedure for breaking in a rebuilt engine. Four-Stroke Engine Lower End Inspection

Practical Exercise 4

In this practical exercise, you'll apply your knowledge of motorcycle and ATV engine operation to some real-life examples.

Unit 6

Electrical Fundamentals

Objectives:

- ★ Understand how a basic circuit operates.
- ★ Describe the electron and conventional theories of electrical operation.
- ★ Explain the difference between voltage, current, and resistance in a circuit.
- ★ Use Ohm's law to calculate voltage, current, and resistance.
- ★ Understand how to use a multimeter to measure voltage, resistance, and current and how an electromagnet works.
- ★ Explain what a diode is and how it works.

Charging and Ignition Systems

Objectives:

- Explain why motorcycles and ATVs use charging systems and the theory behind a basic charging system.
- Use a wiring diagram to visually identify the different types of charging systems found on motorcycles and ATVs.
- Understand how alternators generate AC power and how a charging system changes alternating current into direct current.
- Identify the electrical system of motorcycles and ATVs that don't use a battery.
- Describe the steps required for maintenance and minor troubleshooting of a charging system.
- Read block diagrams for various DC electrical system circuits.

DC Circuits for Motorcycles and ATVs

Objectives:

- Explain how a spark plug is constructed and how it operates.
- Describe the components of the magneto, battery, and electronic ignition systems.
- Understand the basic operation of each type of ignition system.

- Identify the procedures involved in maintaining an ignition system.
- Understand the steps used in troubleshooting ignition systems.
- Explain how the electric starter systems used on motorcycles and ATVs operate.

Exercise 5

Additional Unit Material

Practical Exercise 5

In this practical exercise, you'll apply your knowledge of motorcycle and ATV engine operation to some real-life examples.

Unit 7

Frames, Steering, and Suspension

Objectives:

- Describe the different frame designs used by motorcycle manufacturers.
- Understand how to perform frame and wheel inspection and alignment procedures.
- Identify basic front-fork suspension components.
- Understand how to inspect and perform service procedures on front-fork components, rear-suspension components, and ATV steering and suspension systems.
- Identify rear-suspension systems used by motorcycle manufacturers and ATV steering and suspension systems.

Brakes, Wheel Assemblies, and Tires

Objectives:

- ★ Identify the different brake systems and brake system components used on motorcycles and ATVs.
- ★ Understand how to perform maintenance on brake systems.
- ★ Repair motorcycle spoke wheels.
- ★ Describe tube and tubeless tires.
- ★ Perform maintenance on wheel assemblies, including balancing tires and servicing wheel bearings.

Practical Exercise 6

In this practical exercise, you'll apply your knowledge of motorcycle and ATV engine operation to some real-life examples.

Unit 8

Motorcycle Maintenance

Objectives:

- Identify the different emission-control systems used on street-legal motorcycles.
- Understand how to perform emission-control system maintenance procedures and various engine and chassis maintenance procedures.
- Explain the correct procedures for storing motorcycles and ATVs.

Motorcycle Troubleshooting

Objectives:

- ❖ Describe the systematic approach to motorcycle and ATV problems.
- ❖ Understand how to troubleshoot the following problems: engine, lower-end and exhaust-system, carburetor, ignition-system, electrical-system, chassis, hydraulic-and mechanical-brake, and DC circuit-system.

Practical Exercise 7

In this practical exercise, you'll apply your knowledge of motorcycle and ATV engine operation to some real-life examples.

Supplement

Work Experience

Computer Specifications

Interns/Apprentices will need high-speed internet access to begin your program. interns/apprentices will need access to a Microsoft® Windows® based computer running Windows XP® or later or an Apple® Mac® computer running OS X® or later, and an email account to complete your program with Penn Foster.

TCCBYS reserve the right to change program content and materials when it becomes necessary.

Microsoft, Windows, and Windows XP are trademarks of Microsoft Corporation registered in the United States of America and/or other jurisdictions.

Apple, Mac, and OS X are trademarks of Apple, Inc registered in the United States of America and/or other jurisdictions.