

California State University, San Bernardino

**CSUSB ScholarWorks**

---

Theses Digitization Project

John M. Pfau Library

---

2004

## Motorcycle fuel and emissions system repair: Curriculum for Victor Valley College

Toivo Fred Kent

Follow this and additional works at: <https://scholarworks.lib.csusb.edu/etd-project>



Part of the [Vocational Education Commons](#)

---

### Recommended Citation

Kent, Toivo Fred, "Motorcycle fuel and emissions system repair: Curriculum for Victor Valley College" (2004). *Theses Digitization Project*. 4362.

<https://scholarworks.lib.csusb.edu/etd-project/4362>

This Project is brought to you for free and open access by the John M. Pfau Library at CSUSB ScholarWorks. It has been accepted for inclusion in Theses Digitization Project by an authorized administrator of CSUSB ScholarWorks. For more information, please contact [scholarworks@csusb.edu](mailto:scholarworks@csusb.edu).

MOTORCYCLE FUEL AND EMISSIONS SYSTEM REPAIR:  
CURRICULUM FOR VICTOR VALLEY COLLEGE

---

A Project  
Presented to the  
Faculty of  
California State University,  
San Bernardino

---

In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts  
in  
Education:  
Career and Technical Education

---

by  
Toivo Fred Kent  
June 2004

MOTORCYCLE FUEL AND EMISSIONS SYSTEM REPAIR:

CURRICULUM FOR VICTOR VALLEY COLLEGE

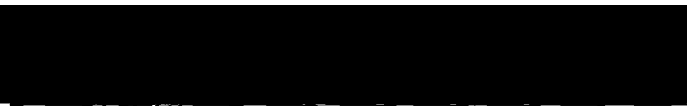
---


A Project  
Presented to the  
Faculty of  
California State University,  
San Bernardino

---

by  
Toivo Fred Kent  
June 2004

Approved by:

  
Joseph Scarcella, Ph.D., First Reader

  
Ronald K. Pendleton, Ph.D., Second Reader

5/4/04  
Date

© 2004 Toivo Fred Kent

## ABSTRACT

### *Motorcycle fuel and Emission Systems Repair:*

*Curriculum for Victor Valley College* is a thesis project that exemplifies a step-by-step procedure of research documentation. This research documentation procedure was necessary as a precursor to the implementation of a course at Victor Valley College (VVC) for motorcycle fuel and emission systems repair.

This thesis project begins with addressing the high desert motorcycle industry needs for trained entry-level motorcycle technicians, as well as the acknowledgement of the necessity of proper curriculum formatting for VVC Curriculum Committee's subsequent submission approval.

Next, the thesis project follows with a discussion of how the research was done in accomplishing the motorcycle fuel and emission systems repair curriculum. Two main themes emerge: the first theme deals with the issue of compiling objectives and course content for review by Advisory Board members for inclusion in the developed curriculum. The secondary theme showed what research was done for the overall curriculum to meet the criteria of VVC Curriculum Committee, for approval by that committee.

Following the compilation of objectives and content is a discussion of the methodology used in developing the

course content and overall curriculum for fuel and emission systems repair, as submitted for approval by the VVC Curriculum Department. The methods for validation of the two themes are also given.

Lastly, the conclusions and recommendations for this project, including the project, itself. Complete with terms identified and references listed, this thesis project would be useful for anyone needing to create and teach a course in motorcycle fuel and emission systems repair.

## ACKNOWLEDGMENTS

Tim Thelander

Joseph Scarcella, Ph.D.

Victor Valley Community College

Los Angeles Trade Tech College

Ronald R. Price

John Sweet

Gary Menser

Jim Barnes

Steven Coultas

## DEDICATION

My Wife Kathy

Your tolerance and trust throughout my educational quest has given me the freedom necessary to excel. Your love and support makes all things possible. With all my love, thank you.



## TABLE OF CONTENTS

ABSTRACT .....	iii
ACKNOWLEDGMENTS .....	v
CHAPTER ONE: BACKGROUND	
Introduction .....	1
Purpose of the Project .....	1
Context of the Problem .....	2
Significance of the Project .....	3
Assumptions .....	4
Limitations and Delimitations .....	4
Limitations .....	5
Delimitations .....	5
Definition of Terms .....	6
Organization of the Thesis .....	6
CHAPTER TWO: REVIEW OF THE LITERATURE	
Introduction .....	8
Content Sourcing .....	8
Curriculum Format Sourcing .....	15
Summary .....	16
CHAPTER THREE: METHODOLOGY	
Introduction .....	18
Curriculum Development .....	18
Course Objectives .....	18
Content and Curriculum Validation .....	21
Population Served .....	22

Summary .....	23
CHAPTER FOUR: CONCLUSIONS AND RECOMMENDATIONS	
Introduction .....	24
Conclusions .....	24
Recommendations .....	25
Summary .....	25
APPENDIX: MOTORCYCLE FUEL AND EMISSIONS SYSTEM	
REPAIR: CURRICULUM FOR VICTOR VALLEY	
COLLEGE .....	26
REFERENCES .....	77

## CHAPTER ONE

### BACKGROUND

#### Introduction

The contents of Chapter One presents an overview of the project. The contexts of the problem are discussed followed by the purpose, significance of the project, and assumptions. Next, the limitations and delimitations that apply to the project are reviewed. Finally, definitions of terms are presented.

#### Purpose of the Project

The purpose of the project was to develop a motorcycle fuel and emission systems repair curriculum for a course to be offered at Victor Valley College (VVC). This curriculum is one of four curriculums written for a Certificate of Completion in Motorcycle Repair Mechanics.

The Automotive Advisory Committee and high desert motorcycle industry states there is a need for trained motorcycle technicians. They also report there is no formal training available within a reasonable commuting distance.

## Context of the Problem

The context of the problem was to address the lack of adequate training for motorcycle repair technicians in the VVC and high desert area of Southern California.

The VVC, in conjunction with local automotive and motorcycle business interests determined that more than 25 local motorcycle-related businesses were, at that time, unable to fill the demand for skilled technicians. More new businesses were expected, as the high desert population was expanding at rapid rate.

Adding to the this need for personnel was from business generated at the local-area level from outside of the high desert, due to the large number of motorcyclists recreating in the area. While the recreation use has traditionally been a part of the High Desert, statewide closing of many alternative areas increased the numbers of motorcyclists coming into the high desert supported area. There was, at that time, only one school that had a motorcycle repair course offered in the area and Barstow College's course was considered wholly inadequate in course content and skills-level taught to be significant in producing entry-level motorcycle technicians.

## Significance of the Project

The significance of the project was due to a lack of trained personnel combined with an increasing demand for trained motorcycle technicians within the high desert area. The lack of training available demanded a need for a motorcycle repair program At VVC. An "up-to-date" curriculum for a motorcycle fuel and emission systems repair course was needed, as one of the four courses for the motorcycle repair program deemed necessary to train entry-level motorcycle technicians.

A motorcycle fuel and emission systems repair curriculum was to provide the foundation information for a course to be reviewed by the Curriculum Committee of VVC. Once approved, this course in motorcycle fuel and emission systems repair would be included in the college catalogue and opened for enrollment for students. Completion of this, and the three other curriculums in motorcycle repair technologies would provide the high desert motorcycle industry prospective entry-level motorcycle technicians.

## Assumptions

The following assumptions were made regarding the project:

1. It was assumed that this curriculum is needed.
2. It was assumed this curriculum content would be up-to-date and relevant to high desert motorcycle industry needs.
3. It was assumed Victor Valley College would approve this curriculum for implementation.
4. It was assumed the high desert motorcycle industry needed technicians trained in the course outlined.
5. It was assumed that the students enrolled in this course are intending to use the acquired skills in motorcycle-related employment.
6. It was assumed that the curriculum would include specifics that relate only to Victor Valley College.

## Limitations and Delimitations

During the development of the project, a number of limitations and delimitations were noted. These limitations and delimitations are presented in the next section.

### Limitations

The following limitations apply to the project:

1. The curriculum was developed for the purpose of training students enrolled at Victor Valley College.
2. The curriculum was applicable to motorcycle fuel and emission systems repair.
3. The financial cost considerations of implementing a course in motorcycle fuel and emission systems repair for Victor Valley College is a separate project, not included within the curriculum.

### Delimitations

The following delimitations apply to the project:

1. The curriculum can be adapted to any community college automotive department.
2. The curriculum can be revised to meet the needs of the motorcycle industry.
3. The curriculum can be revised to meet the needs of the motorcycle technician/ student.

## Definition of Terms

The following terms are defined as they apply to the project:

*Entry-level* - Possessing minimal skills for employment  
(Sweet, 2001).

*High desert* - The Southern California desert region  
pertaining to the Victor Valley (Kent, 2001).

*Smog-technician* - A person that performs emission-testing  
pertaining to California Air Resources Board  
guidelines (S. Coultas, 2001).

*Techbook* - A textbook for technicians (Haynes, 2000).

*Up-to-date* - Current and relevant (Sweet, 2001).

## Organization of the Thesis

The thesis portion of the project was divided into five chapters. Chapter One provides an introduction to the context of the problem, purpose of the project, significance of the project, limitations and delimitations and definitions of terms. Chapter Two consists of a review of relevant literature. Chapter Three documents the steps used in developing the project. Chapter Four presents conclusions and recommendations drawn from the development of the project. The Appendix for the project consists of:  
*Appendix Motorcycle Fuel and Emissions System Repair:*



*Curriculum for Victor Valley College.* Finally, the Project references.

## CHAPTER TWO

### REVIEW OF THE LITERATURE

#### Introduction

Chapter Two consists of a discussion of the relevant literature. Specifically, Chapter Two discussed the interviews and discussions relating to the creation of a motorcycle fuel and emission systems repair curriculum and the various literature resources researched for content. Two main goals of this review were to first: gather information for formatting a curriculum consistent with VVC curriculum committee guidelines, and second: course content and objectives would be current, relevant, and consistent with equivalent courses offered at similar institutions.

#### Content Sourcing

The Automotive Department advisory board of VVC had decided that a motorcycle repair program was needed. The contents for coursework needed to be researched and refined. Initially, in an interview with the Department Chair of the VVC Automotive Department (Sweet, personal communication, November 19, 2000), it was indicated that a textbook, student workbook and instructor's manual set had been chosen to encompass a one-semester course in

motorcycle repair. *Motorcycles -Fundamentals, Service, Repair* textbook-set was to be utilized in the motorcycle repair program as required text materials. Though representative of a complete course in motorcycle repair, it was for a far more basic course that would not fulfill all of the needs for motorcycle technician skill-level requirements, which the high desert motorcycle industry was asking for.

The Instructor's Manual for Motorcycles coordinates teaching and learning styles for the text and workbook. The Motorcycles textbook describes the basic operation, service, and repair of the motorcycles, all terrain vehicles (ATVs), and scooters. It teaches not only how each system works, but also why it is needed, and its role in overall operation...Motorcycles textbook, workbook, and Instructor's Manual will provide a valuable supplement to your curriculum. (Johns B., Edmunson D., Hurt R., 1999c, p 5).

By their own admission, the authors indicate that this textbook-set should not be the final word in the coursework for a course or courses in motorcycle repair and should be considered as a supplement to, and basic framework for such coursework. It does contain a basic format and lesson plans that are complete with objectives and evaluations. Also, this text-set would be in compliance of VVC curriculum committee textbook

1  
requirement (Menser, personal communication, November 19, 2000).

In order to supplement the laboratory portion of a course in motorcycle fuel and emission systems repair, a video collection by the *VMS Inc.* was obtained and reviewed. These videos are in use by the Suzuki motorcycle company, Inc. for training of motorcycle technicians at the private school *Motorcycle Mechanics Institute (MMI)*, at Phoenix Arizona and Orlando Florida locations. These video taped demonstrations and lessons would be useful for students to see examples of motorcycle repair procedures that would be difficult to duplicate in the VVC motorcycle laboratory, due to budget and resource considerations. Each video in the series includes subject-related quiz questions. Sweet and the Automotive Department, thru the VVC library resources, obtained this approved resource.

From an Interview with Price (personal communication, January 23, 1997), the motorcycle Repair Technologies instructor at Los Angeles Trade Technical College (LATTC), it was noted that the California Air Resource Board (ARB), in conjunction with the California Department of Motor Vehicles (DMV) and the California Bureau of Automotive Repair (BAR) had pending legislation relating to bi-annual emission testing for motorcycles. Since the 1998 ARB

Standards could not be implemented due to the ARB oversight in defining "smog technician" qualifications that would include motorcycle emission systems repair and testing, it seemed obvious that a course on motorcycle fuel and emission systems would logically include familiarity on how current emission testing and concepts were to be done by a motorcycle technician.

Coultas, Advisory Board member, VVC "Smog Tech" instructor, and emission test station owner, agreed with this concept of motorcycle technicians needing to be familiar with "smog technician" issues, stating that he had been informed of recent additions to the State inspection manual pertaining to motorcycle bi-annual emission testing. (Coultas, personal communication, September 4, 1997.) This information was confirmed from the BAR *Basic Program Inspection Manual*.

Currently, the following types of vehicles are exempt: 1965 and older vehicles, vehicles with engines less than 50 CID, diesel vehicles, motorcycles and electric vehicles. The law allows for the inclusion of diesel-powered vehicles and motorcycles at a later date if deemed feasible. ("Exempted Vehicles," 1996, p. 4)

A later consultation with Menser and Sweet, (Menser, Sweet, personal communication, February 11, 2001), concluded that this "emission testing" issue should be

included in the content of the course. A review for content that would benefit a course in motorcycle fuel and emission systems repair was done using the State of California *Basic Program inspection Manual*; BAR *Laws and Regulations*; BAR *Smog Check Diagnostic and Repair Manual*; Department of Consumer Affairs (DCA) *Clean Air Car Course Training Manual*; and DAR *Clean Air Car Course Student Workbook*.

To achieve a motorcycle repair technologies program that would address the needs of the motorcycle industry of the high desert, interviews with Barnes, (personal communications, February 11, 2001 and February 18, 2001 former motorcycle technician, current owner of B and B Cycles, and member of the Automotive Advisory Committee were done. This resulted in a list of skills and skill-levels that were sought after by an operational business in the high desert.

Barnes stated: "One major problem with keeping the technicians I've hired is that is that half of the ones I get are very limited in their knowledge and skills and don't last. The other half may have high skill levels, but have a terrible work record when it comes to showing up for work. It seems that they don't realize that they need to show up every day -and on time! Some disappear after

they get their first paycheck. Is there a way to teach these guys some professionalism?" (Barnes, personal communication, February 18, 2001.)

Also noted by these interviews was that motorcycle fuel and emission systems repair knowledge and skills were a particularly weak point with nearly all entry-level, and some journeyman-level, motorcycle technicians.

In order to gain a wider perspective of current motorcycle repair programs, coursework from the *International Correspondence School (ICS) School of Motorcycle Repair* (1986) and *Professional Career Development Institute (PCDI) Motorcycle Repair Program* (1992) were compared and contrasted in order to find similarities and differences between these two resources. Similarly, the LATTC motorcycle repair program's required text materials were gleaned. LATTC uses *MMI The Complete Guide to Motorcycle Mechanics* (1994) for the basic text, and supplements this text with *Haynes Motorcycle Fuel Systems Techbook* (2000.)

It should be noted that MMI also uses *The Complete Guide to Motorcycle Mechanics* at the Phoenix, Arizona and Orlando Florida motorcycle schools.

From The ICS and PCDI coursework that pertains to fuel and emission systems repair, basic carburetion, fuel

injection, and emission systems principles and repair procedures were presented similarly to the other reviewed materials and texts. These principles and repair procedures were sufficient for introductory portions of course objectives and lessons, but the MMI text and Haynes techbook contained the most advanced and detailed information to be incorporated into a motorcycle fuel and emissions systems repair course. Concepts from these sources were compared to United States Department of Labor *Dictionary of Occupational Titles: Motorcycle Repairer* (automotive service) DOT 620.281-054 job descriptions, for verification of course content standards. Then the concepts were compared to the equivalent LATTC motorcycle carburetor and fuel systems course objectives, contained in the LATTC 2000-2001 Catalogue of classes in order to keep the VVC motorcycle repair course outlines comparable to motorcycle repair coursework of LATTC program.

Since LATTC has the oldest recognized motorcycle repair program that dates from 1949. Nearly all of the other reviewed programs have ties to LATTC in either curriculum development or instruction personnel. During the development process of the motorcycle repair curriculums, The Advisory Board deemed it prudent to use



the LATTC program as a model for the VVC program as LATTC had a State of California compliant certification program.

Concepts of motorcycle emission systems developed from the BAR, DAR, and DCA literature review were synthesized and incorporated into the content and objectives of this curriculum.

#### Curriculum Format Sourcing

In order to meet the requirements of the VVC Curriculum Committee, researched content has to be organized and presented in a concise and usable manner. To accomplish this motorcycle fuel and emission systems repair curriculum (and the three other curriculums for the complete motorcycle repair program) a crash-course in curriculum writing was begun. Consultations with VVC Curriculum Committee member Menser, and with VVC Automotive Department Chair and Instructor Sweet, provided written materials addressing basic teaching concepts. These concepts included the three domains of learning and the concepts of goals, objectives and evaluations. To supplement these written handouts, a thorough investigation of *Major Categories in the Taxonomy of Educational Objectives* (Bloom 1956) was performed to enhance the curriculum writing procedure.

(<http://faculty.washington.edu/krumme/guides/bloom.html>, 1995).

From the LATTC website, the *Curriculum Handbook* for LATTC was examined. This was compared with the Curriculum Template from VVC Curriculum Department.

From a study of these resources and after repeated consultations with Sweet and Menser, a complete curriculum for motorcycle fuel and emission systems was created using the VVC Course Outline template and submitted to the Curriculum Committee for approval on August 29, 2002. The Curriculum Committee approved the course outline (with corrections) on Sept 12, 2002.

### Summary

The literature important to the project was presented in Chapter Two. The literature important to the project was presented in Chapter Two. In summary, the process of developing the motorcycle fuel and emission systems repair curriculum required a two-fold investigative approach. The first approach was investigating the needs requested by the Advisory Board and high desert motorcycle industry for a motorcycle program that included the coursework of a fuel and emission systems repair course. Sources were compared, contrasted and discussed to formulize the

contents of the course. The second part required was the investigation of formatting issues necessary for the curriculum to meet the requirements of the VVC Curriculum Committee for approval.

This research resulted in the successful approval of the curriculum and subsequent implementation of the motorcycle fuel and emission systems repair course, at VVC.

## CHAPTER THREE

### METHODOLOGY

#### Introduction

Chapter Three documents the steps used in developing the project. Specifically, the curriculum development process, including the course contents and critical thinking validation is discussed. Next, population served was discussed. Then, as it was presented to the VVC Curriculum Committee, the curriculum, followed by the validation process was presented. A summary concludes the chapter.

#### Curriculum Development

The next section of the project provides an overview of the curriculum development process. Specifically, the course objectives and content, and the content validation are reviewed.

#### Course Objectives

*The student will be able to:*

1. Identify safety hazards in an motorcycle shop.
2. Service-write a shop work order.
3. Describe motorcycle fuel and emission system principles.

4. Read and analyze fuel system charts and service manuals.
5. Demonstrate and explain the correct techniques for motorcycle fuel and emission system diagnosis.
6. Identify fuel and emission system motorcycle components.
7. Disassemble, inspect, repair, and reassemble motorcycle fuel and emission systems.
8. Disassemble, inspect, repair, and reassemble motorcycle supercharging and turbocharging systems.
9. Demonstrate the use of motorcycle diagnostic tools.
10. Analyze the quality/success of a motorcycle ignition/emission system repair.

#### Course Content

##### Module 1: Shop safety and hazardous waste handling.

1. Motorcycle shop safety.
2. OSHA Standards and Regulations.
3. Hazardous waste materials handling and State environmental protection laws.

##### Module 2: Tools, shop equipment and service writing.

1. Manuals, service charts, and service writing.

2. Tools, measuring instruments and shop.
- Module 3. Introduction to the motorcycle industry.
1. Motorcycles, all-terrain vehicles and scooters.
  2. Role of qualified technicians.
- Module 4. Fuel systems
1. Carburetion principles.
  2. Carburetor types.
  3. Fuel injection principles.
  4. Supercharging principles.
  5. Turbo charging principles.
  6. Fuel tank systems.
  7. Diagnostic techniques for fuel systems.
- Module 5. Emissions Systems
1. Emissions control principles.
  2. Emission control components.
  3. Emission self-diagnostic modules.
  4. Emission systems diagnostic methods.
- Module 6. Exhaust systems.
1. Two-stroke exhaust principles.
  2. Four-stroke exhaust principle.
  3. Exhaust systems performance diagnosis.
  4. Evaluation of fuel and emission systems repair.

## Content and Curriculum Validation

This course content was developed in alignment with the skills sets required of entry-level motorcycle technicians. Research identified that there was not any training systems in place, within a reasonable commuting distance of the high desert. Through careful review of current job requirements, and projected future needs, skill sets required were identified and listed. The skill sets identified as essential to maintaining meaningful employment were included in the course outline. Through consensus of VVC Advisory Board and high desert motorcycle industry business the following outline of objectives and content was developed for inclusion in the motorcycle fuel and emission systems repair course outline.

The method of validation applied to this curriculum was to expand on the course objectives and content to a complete formatted curriculum proposal. This was accomplished by consultations with the VVC Automotive Department Chairperson and with VVC Curriculum Committee members. The curriculum was compared with current VVC approved curriculums for consistency and completeness. Then the curriculum was finalized using a VVC outline proposal template from the VVC Curriculum Department. Finally, the curriculum was submitted to the VVC

Curriculum Board final approval. This curriculum was approved for implementation on September 12, 2002.

#### Population Served

The Project was developed to meet the needs of entry-level motorcycle service technicians, seeking job training for high desert motorcycle industry employment. Training would be through a motorcycle repair technology program at VVC. It is recommended that this program and, particularly, the motorcycle fuel and emission systems course would receive adequate support resources from the VVC Automotive Department and high desert motorcycle industry. These support resources should include, but not limited to, classroom and laboratory facilities, appropriate tools and diagnostic equipment, library, and text materials. It should be noted that costs and procurement for support resources for the program are not addressed within this curriculum project.

This curriculum is appropriate to use as a guideline for any California community college "in school" motorcycle repair program, but has not been submitted, due to budget restrictions and facility approval issues, for State approval to date. The curriculum was developed with the cooperation of The VVC Community College Automotive



Department and Advisory Board, LATTC Motorcycle Repair Program instructor, and the VVC Curriculum Committee. This cooperation included the current Automotive Department Chairperson, high desert motorcycle and automotive community representatives and the VVC Curriculum Committee members.

### Summary

The steps used to develop this project were outlined. The target population for this curriculum is entry-level motorcycle service technicians seeking job training for high desert motorcycle industry employment. The curriculum development process including objectives and contents pertaining to high desert industry needs was presented, as well as VVC Curriculum Committee curriculum formatting requirements.

## CHAPTER FOUR

### CONCLUSIONS AND RECOMMENDATIONS

#### Introduction

Included in Chapter Four was a presentation of the conclusions gleamed as a result of completing the project. Further, the recommendations extracted from the project are presented. Lastly, the Chapter concludes with a summary.

#### Conclusions

The conclusions extracted from the project follows.

1. During the research for this project, the conclusion was made that since no current training within a reasonable commuting distance existed, a motorcycle fuel and emission systems repair course for entry-level motorcycle technicians has been created. This course curriculum was created as necessary for implementation of that course.
2. Curriculums of this type are needed for most community college course implementation.

## Recommendations

The recommendations resulting from the project follows.

1. It is recommended that this curriculum be approved for implementation for a course in motorcycle fuel and emission systems repair at VVC.
2. Continued development and updating of this curriculum content is recommended to incorporate the needs changes within the high desert motorcycle industry regarding training for entry-level motorcycle technicians at VVC.

## Summary

Chapter Five reviewed the conclusions extracted from the project. Lastly, the recommendations derived from the project were presented.

APPENDIX

MOTORCYCLE FUEL AND EMISSIONS SYSTEM REPAIR:  
CURRICULUM FOR VICTOR VALLEY COLLEGE

## Table of Contents

Victor Valley College Curriculum Outline .....	28
Module 1: Shop Safety and Hazardous Waste Handling. ....	30
Module 2: Tools/ Equipment/ Service Writing.....	30
Module 3: Intro to the Motorcycle Industry.....	30
Module 4: Fuel Systems. ....	30
Module 5: Emission Systems.....	30
Module 6: Exhaust Systems. ....	31
Texts and Equipment .....	33
Modules and Lesson Plans.....	36
Sample Test.....	73
Handout Example .....	76

## Victor Valley College Curriculum Outline

1. Need/Justification:

The Automotive Advisory Committee and high desert motorcycle industry states there is a need for trained motorcycle technicians. They also report there is no formal training available within a reasonable commuting distance.

2. Course Number and Title:

Motorcycle Fuel and Emission Systems Repair.

3. Title 5 Category: (check one 

☒ Associate Degree Applicable

☐ Associate Degree Non-applicable

4. Certificate Applicable:

☐ Yes

☒ No

5. Number of Units: 4.0

6. Number of weeks course meets: 18

7. Contact hours per week:

3.0 Lecture

3.0 Lab

       Independent Study

       Individualized Instruction

8. Special Topics:

☐ Yes

☒ No

9. Grading: (check one 

☒ Graded

☐ Grade Option

☐ CR/NC

10. Concurrent Course Number and Title: None

11. Repeatability: 1

12. Catalog/Schedule Description: (✍ approx. 50 words)

This course provides the student with the knowledge necessary to diagnose and repair motorcycle fuel and emission systems. Information covered will include a study of carburetor types, construction, and operating principles, fuel injection principles, supercharging and turbocharging principles, two and four-stroke motorcycle exhaust principles, motorcycle emission control principles, diagnosis and repair, fuel and emission system performance analysis.

13. Prerequisite(s): None

14. Co requisite(s): None

15. Recommended Preparation: None

16a. Course Objectives and Critical Thinking:

*The student will be able to:*

1. Identify safety hazards in an motorcycle shop
2. Service-write a shop work order
3. Describe motorcycle fuel and emission system principles
4. Read and analyze fuel system charts and service manuals
5. Demonstrate and explain the correct techniques for motorcycle fuel and emission system diagnosis
6. Identify fuel and emission system motorcycle components
7. Disassemble, inspect, repair, and reassemble motorcycle fuel and emission systems
8. Disassemble, inspect, repair, and reassemble motorcycle supercharging and turbocharging systems
9. Demonstrate the use of motorcycle diagnostic tools
10. Analyze the quality/success of a motorcycle fuel and emission system repair

**16b. Course Content:**

**Module 1: Shop Safety and Hazardous Waste Handling.**

1. Motorcycle Shop Safety.
2. OSHA Standards and Regulations.
3. Hazardous Waste Materials Handling and State Environmental Protection Laws.

**Module 2: Tools/ Equipment/ Service Writing.**

1. Manuals, Service Charts, and Service Writing.
2. Tools, Measuring Instruments and Shop Equipment.

**Module 3: Intro to the Motorcycle Industry.**

1. Motorcycles, All-terrain Vehicles and Scooters.
2. Role of Qualified Technicians.

**Module 4: Fuel Systems.**

1. Carburetion Principles.
2. Carburetor Types.
3. Fuel Injection Principles.
4. Supercharging Principles.
5. Turbocharging Principles.
6. Fuel Tank Systems.
7. Diagnostic Techniques for Fuel Systems.

**Module 5: Emission Systems.**

1. Emissions Control Principles.
2. Emission Control Components.
3. Emission Self-diagnostic Modules.
4. Emission Systems Diagnostic Methods.



**Module 6: Exhaust Systems.**

1. Two-stroke Exhaust Principles.
2. Four-stroke Exhaust Principles.
3. Exhaust Systems Performance Diagnosis.
4. Evaluation of Fuel and Emission Systems Repair.

**16c. Assignments:**

1. Reading assignments: Textbook-reading assignments will be given to assist students in:
  - a. Completion of homework, end-of-chapter and lab manual questions.
  - b. Performing lab assignments of the diagnosis and repair of motorcycle fuel and emission systems.
2. Writing assignments:
  - a. The student will access the textbook to answer lab manual questions pertaining to motorcycle fuel and emission systems.
  - b. Lab procedure service-writing assignments will be given to document students' lab performance.
3. Laboratory assignments: The students will use a shop environment to inspect, identify, diagnose, and repair motorcycle fuel and emission systems using the textbook, lab diagnostic sheets and service manuals.

**16d. Methods of Instruction:**

1. Lecture presentations on shop safety.  
Objective # 1.
2. Lecture presentations on diagnosis, inspection, and repair of motorcycle fuel and emission systems.  
Objective # 2, 3, 4, 5, 6, 7
3. Laboratory demonstrations pertaining to motorcycle fuel and emission systems repair.  
Objective # 4, 5, 6, 7, 8, 9, 10

16e. **Methods of Evaluation:**

Students will be evaluated based on:

1. Written homework, end-of-chapter, lab manual and service-writing assignments for content and correctness.
2. Performance demonstration of lab techniques, tool and equipment use and the success of fuel and emission systems diagnosis and repair.
3. Written and computational exams covering course objectives.

17. **Text and Other Materials:**

- a. Johns, A., Edumndson, D., Hurt, J., (1999). *Motorcycles, Fundamentals, Service and Repair*. Tinley Park, IL: The Goodheart-Willcox Company, Incorporated.
- b. Johns, A., Edumndson, D., Hurt, J., (1999). *Motorcycles, Fundamentals, Service and Repair Work book*. Tinley Park, IL: The Goodheart-Willcox Company, Incorporated.

# Texts and Equipment

Victor Valley College

© Copyright 2004 Toivo F. Kent  
Motorcycle Fuel and Emission Systems Repair

## 2003 MOTORCYCLE FUEL AND EMISSION SYSTEMS REPAIR STANDARD TEXTBOOK LIST

REQUIRED TEXT (S)	LOANER PROGRAM	APPROX. PRICE	ANCILLARY/ REFERENCE MATERIALS (FOR IN-CLASS USE ONLY)
<p><i>Motorcycles, Fundamentals, Service and Repair</i>, Bruce A. Johns, David D. Edumndson, Robert Scharff; Tinley Park, Illinois ISBN: 1-56637-479-0</p> <p><i>Workbook: Motorcycles, Fundamentals, Service and Repair</i>, Bruce A. Johns, David D. Edumndson, Robert Scharff; Tinley Park, Illinois ISBN: 1-56637-480-4</p>	<p>P</p> <p>C</p>	<p>\$52.00</p> <p>\$14.00</p>	<p>Victor Valley College Automotive Technology Department, Rules and Procedures. Sweet, 2003</p> <p>U.S. Department of Labor Occupational Safety Health Administration, Fact Sheet. 2002</p> <p>U.S. Department of Labor Occupational Safety Health Administration Guidance Manual for Hazardous Waste Site Activities. 1998, NIOSH OSHA USCG EPA</p> <p>Victor Valley College Automotive Technology Department, Safety Video. 2004</p> <p>Instructors manual: <i>Motorcycles, Fundamentals, Service and Repair</i>, Bruce A. Johns, David D. Edumndson, Robert Scharff; Tinley Park, Illinois. 1999</p> <p>1. Instructors Manual ISBN: 1-56637-481-2</p> <p>VMS-Suzuki Technical series 5-89</p> <p>1. Fuel systems troubleshooting No. 1</p> <p>2. Carburetor troubleshooting No. 2</p> <p>3. Introduction to EFI No. 22</p> <p>Haynes Fuel Systems Techbook, John Robertson; Newberry Park, California. 2000 ISBN:1-85960 514 1</p>

L = Loaner

N/C = No Cost

C = Consumable

P = Purchased

I = In-Class Set

O = Optional

Victor Valley College

© Copyright 2004 Toivo F. Kent  
Motorcycle Fuel and Emission Systems Repair  
Equipment and Materials

Motorcycle Repair tools and related equipment:

- Motorcycle lift
- 2-stroke cycle demonstration motorcycle
- 4-stroke cycle demonstration motorcycle
- Exhaust-gas analyzer
- Carburetor synchronizer gauges
- Hand impact driver set
- Air compressor
- Compression tester
- Leak down cylinder tester
- Vacuum gauges
- Safety Glasses
- Rubber Gloves
- 3/8-drive ratchet
- 3/8-drive extensions, short, medium
- 3/8-drive universal joint
- 3/8-drive 6-point sockets; 8, 9, 11, 11, 12, 13, 14, 15, 17 & 19mm
- 3/8-drive Sparkplug sockets; 5/8, 13/15 in., 18mm (deep)
- Combination Wrenches, 8, 9, 10, 11, 12, 13, 14, 17 & 19mm
- Adjustable Wrench – large
- Hex Keys; 2, 3, 4, 5, 6, 8 & 10mm (socket mounted optional, handy)
- Impact Driver
- Philips Impact Driver Bits, #2 & #3
- Ball Peen Hammer – 16 oz.
- Dead Blow Hammer
- Philips Screwdrivers, #0, #1, #2 & #3
- Slot Blade Screwdrivers, narrow, wide, variety of lengths
- Pliers
- Flat Feeler Gauge Set, .002" minimum – brass
- Needle Nose Pliers
- Slip-Joint Pliers (Channel Locks)
- Snap Ring Pliers, inside, outside (smallest size available)
- Diagonal Cutters
- Wire Strippers
- Ring Wrench
- Vice Grips
- Torque Wrench
- Multimeter
- Soldering Iron (with 60/40 electrical solder)
- X-Acto Knife
- Solderless Crimping Tool (wire stripper, cutters & pliers)
- ½-in drive socket set

- 1/4-inch drive socket set
- Test Light
- Air Gun
- Air Impact Wrench
- Die Grinder
- Special Tools (as needed)
- Oversize Wrenches and Sockets (as needed)
- Tire Pressure Gauge

Miscellaneous Equipment:

- Transparency projector
- Computer
- LCD projector
- Projection screen
- TV/VCR
- Power Point software

Materials:

- Transparencies
- Gasket paper
- Gasket cement

Supplies:

- Carburetor cleaner (spray can)
- Cleaning solvent
- Gasoline
- 2-stroke oil
- 4-stroke oil (various weights)
- Hypoid gear oil
- Disposable Gloves
- Shop rags
- Paper towels

## Modules and Lesson Plans

### Lesson Plan 1

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Motorcycle shop safety

Module 1: Shop safety and hazardous waste handling

Hours: 2 of 108

**Student Performance Objective:** By the end of the unit, given information on motorcycle shop safety rules and Occupational Safety Health Administration standards, each student will be able to:

- Identify safety hazards in a motorcycle shop.
- Identify motorcycle shop safety equipment and protective clothing/eyewear as required for access to the laboratory.

#### **Anticipatory Set or Mental Readiness:**

Instructor will ask students to write a brief description of a shop accident that they observed and what could have been done to prevent it. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

#### **Instructional Components:**

- Lecture and video presentation on motorcycle shop safety.
- Tour of the motorcycle laboratory for locating safety equipment.
- Laboratory demonstration and practice on the proper use of safety equipment, clothing, and eyewear.

#### **Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to describe the potential hazards in a motorcycle shop and explain strategies for reducing accidents. Students will demonstrate the proper use of safety equipment, clothing, and eyewear and asked to draw a diagram indicating the location of safety equipment, particularly, fire extinguishers to be kept in their personal lab notebooks.

#### **Closure:**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Safety video tape
- Textbook/Workbook
- Instructor's manual

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by oral presentation to the class, a demonstration of safety procedures and a written safety test given at the end of the module with 100% accuracy.

## Lesson Plan 2

Instructor: Toivo Fred Kent

Subject: Motorcycle Fuel and Emissions System Repair

Topic: OSHA Standards and Regulations

Module 1: Shop safety and hazardous waste handling

Hours: 2 of 108

<p><b>Student Performance Objective:</b> By the end of the unit, given information on motorcycle shop safety rules and Occupational Safety Health Administration standards, each student will be able to:</p> <ul style="list-style-type: none"><li>• Identify OSHA standards, regulation bulletins, requirements and contacts used in motorcycle shops, comprehensively.</li><li>• Describe built-in machinery/equipment safeguards required by the state.</li></ul>
<p><b>Anticipatory Set or Mental Readiness:</b></p> <p>Instructor will ask students to write a brief description of what they know or think that the "extra" prong on an electrical shop tool is used for. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.</p>
<p><b>Instructional Components:</b></p> <ul style="list-style-type: none"><li>• Lecture on OSHA standards, regulation bulletins.</li><li>• Lecture on machinery/equipment safeguards.</li><li>• Tour of the motorcycle laboratory for locating OSHA bulletins and contact phone numbers</li></ul>
<p><b>Check for Understanding and/or Guided Practice and Independent Practice:</b></p> <p>At the end of this session students will be asked to describe what OSHA regulations and bulletins are, and how they apply to the student in a motorcycle shop. Students will describe the types and purposes the of machinery/equipment safeguards. Students will be asked to draw a diagram indicating the location of OSHA bulletins and the phone numbers of contacts.</p>
<p><b>Closure:</b></p> <p>Students will be asked to review the concepts learned in this session.</p>
<p><b>Materials Needed:</b></p> <ul style="list-style-type: none"><li>• Blackboard/chalk</li><li>• TV/VCR</li><li>• Whiteboard with dry erase markers</li><li>• Textbook/Workbook</li><li>• Instructor's Manual</li></ul>
<p><b>Method of Evaluation</b></p> <p>Students will be evaluated for mastery of learning objectives by oral presentation to the class, a demonstration of safety procedures, and a written safety test given at the end of the module with 100% accuracy.</p>



### Lesson Plan 3

Instructor: Toivo Fred Kent

Subject: Motorcycle Fuel and Emissions System Repair

Topic: Hazardous waste materials handling and State environmental protection laws.

Module 1: Shop safety and hazardous waste handling

Hours: 2 of 108

**Student Performance Objective:** By the end of the unit, given information on motorcycle shop safety rules and Occupational Safety Health Administration standards, each student will be able to:

- Describe the types and handling procedures for hazardous waste materials as required by state environmental protection laws.

**Anticipatory Set or Mental Readiness:**

Instructor will ask students to write a list of hazardous waste byproducts, to be discussed in class. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

**Instructional Components:**

- Lecture on types of hazardous wastes.
- Lecture on safe handling of hazardous waste by-products
- Lecture on environmental protection laws.
- Tour of the motorcycle laboratory for locating hazardous waste disposal.
- Laboratory demonstration/practice on the proper disposal of hazardous waste by-products.

**Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to describe types of hazardous waste by-products in a motorcycle shop and explain strategies for protecting the environment. Students will demonstrate the safe and proper disposal of hazardous waste by-products and will be asked to draw a diagram indicating the location of lab disposal sites for their personal lab notebooks.

**Closure:**

Students will be asked to review the concepts learned in this session.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's Manual

**Method of Evaluation:**

Students will be evaluated for mastery of learning objectives by oral presentation to the class, a demonstration of safety procedures, and a written safety test given at the end of the module with 100% accuracy.

## Module Two: Lesson 4

### Lesson Plan 4

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Manuals, service charts, and service writing

Module 2: Tools, shop equipment and service writing

Hours: 6 of 108

Student Performance Objective: By the end of the unit, given information and instructor's workbook handout examples of motorcycle service charts, shop manuals, service writing forms, each student will be able to:

- Explain the use of Motorcycle service charts and shop manuals.
- Describe the duties of a service writer.
- Explain the warranty policies that come from the bike manufacturer.
- Service-write a legal work order.

Anticipatory Set or Mental Readiness:

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

Instructional Components:

- Lecture and demonstration on the use of motorcycle service charts and shop manuals.
- Lecture on service writing and warranty policies.
- Laboratory demonstration and practice on the use of charts and manuals.
- Laboratory demonstration and practice of service writing.

Check for Understanding and/or Guided Practice and Independent Practice:

At the end of this session students will be asked to explain the use of service manuals, charts and warranty policies. Students will describe the duties of the service writer. Students will demonstrate the proper use of charts and manuals and write a practice service writing work order covering warrantee policies.

Closure:

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual handouts
- Service writing forms
- Warrantee forms
- Service charts
- Shop manuals

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by student demonstration of service writing procedures and a written test given at the end of the module.

## Lesson Plan 5

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Tools, measuring instruments and shop equipment

Module 2: Tools, shop equipment and service writing

Hours: 6 of 108

Student Performance Objective: By the end of the unit, given information and instructor's workbook handouts and guided practice, each student will be able to:

- Identify the most common hand tools and equipment used by a motorcycle technician.
- List the safety rules for hand tools and equipment.
- Convert figures between conventional and metric measuring systems.
- Identify common measuring tools.
- Select the appropriate measuring tool for the job.
- Perform measurements using precision measuring tools.
- List the most common motorcycle parts cleaning techniques.
- List safety rules for machining, cutting, drilling, welding, and other special operations.

Anticipatory Set or Mental Readiness:

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

Instructional Components:

Lectures on:

- The most common hand tools and equipment used by a motorcycle technician.
- The safety rules for hand tools and equipment.
- Converting figures between conventional and metric measuring systems.
- Common measuring tools.
- The most common motorcycle parts cleaning techniques.
- Safety rules for machining, cutting, drilling, welding, and other special operations.
- Laboratory demonstration and practice on:
  - Selecting the appropriate measuring tool for the job.
  - Performing measurements using precision measuring tools.

**Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to:

- Identify the most common hand tools and equipment used by a motorcycle technician.
- List the safety rules for hand tools and equipment.
- Convert figures between conventional and metric measuring systems.
- Identify common measuring tools
- Select the appropriate measuring tool for the job.
- Perform measurements using precision measuring tools.
- List the most common motorcycle parts cleaning techniques.
- List safety rules for machining, cutting, drilling, welding, and other special operations.

**Closure:**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual
- Common hand tools
- Electrical testing and service tools
- Measuring tools
- Special service tools
- Cleaning tools
- Power hand tools
- General shop equipment
- Machining equipment

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by oral presentation to the class, a demonstration of procedures and a written test given at the end of the module with.

## Lesson Plan 6

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Motorcycles, all-terrain vehicles and scooters

Module 3: Introduction to the motorcycle industry

Hours: 3 of 108

Student Performance Objective: By the end of the unit, given information and instructor's workbook handouts, each student will be able to:

- Describe the basic functions of ATVs.
- Name the eight styles or types of motorcycles.
- Explain the various motorcycle systems.
- Identify the important parts of a motorcycle.
- List common motorcycle design differences.

Anticipatory Set or Mental Readiness:

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

Instructional Components:

Lectures and Laboratory presentations on:

- The basic functions of ATVs.
- The eight styles or types of motorcycles.
- The various motorcycle systems.
- The important parts of a motorcycle.
- Common motorcycle design differences.

Check for Understanding and/or Guided Practice and Independent Practice:

At the end of this session students will be asked to:

- Describe the basic functions of ATVs.
- Name the eight styles or types of motorcycles.
- Explain the various motorcycle systems.
- Identify the important parts of a motorcycle.
- List common motorcycle design differences.

Closure:

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual
- Lab motorcycle and ATV examples

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by a written test given at the end of the module.

## Lesson Plan 7

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Role of qualified technicians

Module 3: Introduction to the motorcycle industry

Hours: 3 of 108

**Student Performance Objective:** By the end of the unit, given information and instructor's workbook handouts, each student will be able to:

- Describe the role of the professional technician in servicing motorcycles.
- Describe the various career opportunities available to the qualified technician.
- Explain the job classifications available to the qualified service technician.

**Anticipatory Set or Mental Readiness:**

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

**Instructional Components:**

Lectures on:

- The role of the professional technician in servicing motorcycles.
- The various career opportunities available to the qualified technician.
- The job classifications available to the qualified service technician.

**Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to:

- Describe the role of the professional technician in servicing motorcycles.
- Describe the various career opportunities available to the qualified technician.
- Explain the job classification available to the qualified service technician.

**Closure:**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual



**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by a written test given at the end of the module.

## Lesson Plan 8

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Carburetion principles

Module 4: Fuel systems

Hours: 9 of 108

Student Performance Objective: By the end of the unit, given information and instructor's workbook handouts and guided practice, each student will be able to:

- Describe the basic chemistry and combustion principles of internal combustion engines.
- Describe: Energy levels.
- Describe: Boyle's Law.
- Describe: Bernoulli's theorem.
- Describe: Charles's law.
- Identify carburetor components.
- Describe carburetor circuits.
- Perform fundamental carburetor service and repair procedures.

Anticipatory Set or Mental Readiness:

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

Instructional Components:

Lectures on:

- Describe the basic chemistry and combustion principles of internal combustion engines.
- Describe: Energy levels.
- Describe: Boyle's Law.
- Describe: Bernoulli's theorem.
- Describe: Charles's law.
- Identify carburetor components.
- Describe carburetor circuits.

Laboratory demonstrations and guided practice on:

- Performing fundamental carburetor service and repair procedures.

Check for Understanding and/or Guided Practice and Independent Practice:

At the end of this session students will be asked to:

- Describe the basic chemistry and combustion principles of internal combustion engines.
- Describe: Energy levels.
- Describe: Boyle's Law.
- Describe: Bernoulli's theorem.
- Describe: Charles's law.
- Identify carburetor components.
- Describe carburetor circuits.
- Perform fundamental carburetor service and repair procedures.

Closure :

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

Materials Needed:

- Blackboard/chalk
- TV/VCR/computer
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual handouts
- Lab carburetor

Method of Evaluation:

Students will be evaluated for mastery of the learning objectives by a written test given at the end of the module.

## Lesson Plan 9

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Carburetor types

Module 4: Fuel systems

Hours: 6 of 108

**Student Performance Objective:** By the end of the unit, given information and instructor's workbook handouts and guided practice, each student will be able to:

- Identify, disassemble, diagnose, repair, assemble, and preliminary adjust:
  1. Slide carburetors.
  2. Vacuum carburetors.
  3. Butterfly carburetors.

**Anticipatory Set or Mental Readiness:**

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

**Instructional Components:**

Lecture and video presentation on:

- Identifying, disassembly, diagnosis, repair, assembly, and preliminary adjustment of:
  1. Slide carburetors.
  2. Vacuum carburetors.
  3. Butterfly carburetors.

Laboratory demonstration and guided practice on:

- Identifying, disassembly, diagnose, repair, assembly, and preliminary adjustment of:
  1. Slide carburetors.
  2. Vacuum carburetors.
  3. Butterfly carburetors.

**Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to:

- Identify, disassemble, diagnose, repair, assemble, and preliminary adjust:
  1. Slide carburetors.
  2. Vacuum carburetors.
  3. Butterfly carburetors.

**Closure:**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR/computer
- Whiteboard with dry erase markers
- Safety video tape
- Textbook/Workbook
- Instructor's manual handouts
- Lab carburetors

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by oral presentation to the class and a written test given at the end of the module.

## Lesson Plan 10

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Fuel injection principles

Module 4: Fuel systems

Hours: 9 of 108

**Student Performance Objective:** By the end of the unit, given information and instructor's workbook handouts, each student will be able to:

- Identify fuel injection system components.
- Explain the basic principles of electronic fuel injection.
- Describe the operation of an engine integrated control system.
- Describe the operation of an air feedback control system.

**Anticipatory Set or Mental Readiness:**

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

**Instructional Components:**

Lectures and video presentation on:

- Fuel injection system components.
- The basic principles of electronic fuel injection.
- The operation of an engine integrated control system.
- The operation of an air feedback control system.

**Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to:

- Identify fuel injection system components.
- Explain the basic principles of electronic fuel injection.
- Describe the operation of an engine integrated control system.
- Describe the operation of an air feedback control system.

**Closure:**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR/computer
- Whiteboard with dry erase markers
- VMS Suzuki video tape No. 22 *Introduction to EFI*
- Textbook/Workbook
- Instructor's manual
- Lab fuel injection component demonstration board
- Haynes fuel systems techbook

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by a written test given at the end of the module.

## Lesson Plan 11

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Supercharging principles

Module 4: Fuel systems

Hours: 3 of 108

Student Performance Objective: By the end of the unit, given information and instructor's workbook handouts, each student will be able to:

- Identify supercharging system components.
- Describe supercharging system operation and principles.

Anticipatory Set or Mental Readiness:

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

Instructional Components:

Lectures on:

- Supercharging system components.
- Supercharging system operation and principles.

Check for Understanding and/or Guided Practice and Independent Practice:

At the end of this session students will be asked to:

- Identify supercharging system components.
- Describe supercharging system operation and principles.

Closure:

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

Materials Needed:

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual handouts
- Haynes fuel systems techbook

Method of Evaluation:

Students will be evaluated for mastery of the learning objectives by oral presentation to the class, a demonstration of safety procedures and a written test given at the end of the module.



## Lesson Plan 12

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Turbo charging principles

Module 4: Fuel systems

Hours: 3 of 108

Student Performance Objective: By the end of the unit, given information and instructor's workbook handouts, each student will be able to:

- Identify turbo charging system components.
- Describe turbo charging system operation and principles.

Anticipatory Set or Mental Readiness:

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

Instructional Components:

Lectures on: and video presentation on motorcycle shop safety.

- Turbo charging system components.
- Turbo charging system operation and principles.

Check for Understanding and/or Guided Practice and Independent Practice:

At the end of this session students will be asked to:

- Identify turbo charging system components.
- Describe turbo charging system operation and principles.

Closure :

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

Materials Needed:

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Safety video tape
- Textbook/Workbook
- Instructor's manual handouts
- Haynes fuel systems techbook

Method of Evaluation:

Students will be evaluated for mastery of the learning objectives by oral presentation to the class, a demonstration of safety procedures and a written test given at the end of the module.

## Lesson Plan 13

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Fuel tank systems

Module 4: Fuel systems

Hours: 3 of 108

**Student Performance Objective:** By the end of the unit, given information and instructor's workbook handouts, each student will be able to:

- Identify fuel tank components.
- Explain fuel tank automatic shut-off functions.
- Describe integrated fuel pump systems operation.

**Anticipatory Set or Mental Readiness:**

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

**Instructional Components:**

Lectures on:

- Fuel tank components.
- Fuel tank automatic shut-off functions.
- Integrated fuel pump systems operation.

**Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to:

- Identify fuel tank components.
- Explain fuel tank automatic shut-off functions.
- Describe integrated fuel pump systems operation.

**Closure :**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual handouts
- Haynes fuel systems techbook

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by oral presentation to the class and a written test given at the end of the module.

## Lesson Plan 14

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Diagnostic techniques for fuel systems

Module 4: Fuel systems

Hours: 9 of 108

**Student Performance Objective:** By the end of the unit, given information and instructor's workbook handouts and guided practice, each student will be able to:

- Summarize the Procedures for diagnosis of carburetor malfunctions.
- Summarize the procedures for diagnosis of electronic fuel injection system malfunctions.
- Perform fuel systems diagnostic procedures using motorcycle shop diagnostic equipment.

**Anticipatory Set or Mental Readiness:**

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

**Instructional Components:**

Lectures on:

- The Procedures for diagnosis of carburetor malfunctions.
- The procedures for diagnosis of electronic fuel injection system malfunctions.
- Laboratory demonstration and guided practice on:
- Performing fuel systems diagnostic procedures using motorcycle shop diagnostic equipment.

**Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to:

- Summarize the Procedures for diagnosis of carburetor malfunctions.
- Summarize the procedures for diagnosis of electronic fuel injection system malfunctions.
- Perform fuel systems diagnostic procedures using motorcycle shop diagnostic equipment.

**Closure:**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR/computer
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual Handouts
- Haynes fuel systems techbook
- VMS Suzuki video No. 1 *Fuel system troubleshooting*
- VMS Suzuki video No. 2 *Carburetor troubleshooting*

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by a demonstration of procedures and a written test given at the end of the module.

## Lesson Plan 15

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Emissions control principles

Module 5: Emission systems

Hours: 9 of 108

Student Performance Objective: By the end of the unit, given information and instructor's workbook handouts, each student will be able to:

- Describe the duties of a motorcycle smog-technician.
- Describe the purpose of emission control system functions.
- Explain the relationship between emission control systems and environmental protection concerns.
- Describe the operation of a typical electronically controlled three-way catalytic converter.
- Explain the limitations of servicing the noise control system.

Anticipatory Set or Mental Readiness:

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

Instructional Components:

Lectures on:

- The duties of a motorcycle smog-technician.
- The purpose of emission control system functions.
- The relationship between emission control systems and environmental protection concerns.
- The operation of a typical electronically controlled three-way catalytic converter.
- Explain the limitations of servicing the noise control system.

Check for Understanding and/or Guided Practice and Independent Practice:  
At the end of this session students will be asked to:

- Describe the duties of a motorcycle smog-technician.
- Describe the purpose of emission control system functions.
- Explain the relationship between emission control systems and environmental protection concerns.
- Describe the operation of a typical electronically controlled three-way catalytic converter.
- Explain the limitations of servicing the noise control system.

**Closure:**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR/computer
- Whiteboard with dry erase markers
- Textbook/Workbook
- Haynes fuel systems techbook
- Instructor's manual handouts

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by oral presentation to the class and a written test given at the end of the module.

## Lesson Plan 16

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Emission control components

Module 5: Emission systems

Hours: 3 of 108

<p>Student Performance Objective: By the end of the unit, given information and instructor's workbook handouts, each student will be able to:</p> <ul style="list-style-type: none"><li>• Identify motorcycle emission system control components.</li></ul>
<p>Anticipatory Set or Mental Readiness:</p> <p>Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.</p>
<p>Instructional Components:</p> <p>Lecture on:</p> <ul style="list-style-type: none"><li>• Motorcycle emission system control components.</li></ul>
<p>Check for Understanding and/or Guided Practice and Independent Practice:</p> <p>At the end of this session students will be asked to:</p> <ul style="list-style-type: none"><li>• Identify motorcycle emission system control components.</li></ul>
<p>Closure:</p> <p>The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.</p> <p>A summary of lesson(s) will be given at the end of this textbook chapter.</p>
<p>Materials Needed:</p> <ul style="list-style-type: none"><li>• Blackboard/chalk</li><li>• TV/VCR</li><li>• Whiteboard with dry erase markers</li><li>• Textbook/Workbook</li><li>• Instructor's manual handouts</li><li>• Haynes fuel systems techbook</li></ul>
<p>Method of Evaluation:</p> <p>Students will be evaluated for mastery of the learning objectives by oral presentation to the class and a written test given at the end of the module.</p>



## Lesson Plan 17

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Emission self-diagnostic modules

Module 5: Emission systems

Hours: 3 of 108

**Student Performance Objective:** By the end of the unit, given information and instructor's workbook handouts, each student will be able to:

- Identify the two basic electronically controlled self-diagnostic modules.
- List the different procedures required for acquiring trouble code data from each module type.

**Anticipatory Set or Mental Readiness:**

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

**Instructional Components:**

Lectures on:

- The two basic electronically controlled self-diagnostic modules.
- The different procedures required for acquiring trouble code data from each module type.

**Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to:

- Identify the two basic electronically controlled self-diagnostic modules.
- List the different procedures required for acquiring trouble code data from each module type.

**Closure:**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual handouts
- Haynes fuels system techbook

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by a written test given at the end of the module.

## Lesson Plan 18

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Emission systems diagnostic methods

Module 5: Emission systems

Hours: 9 of 108

**Student Performance Objective:** By the end of the unit, given information and instructor's workbook handouts and guided practice, each student will be able to:

- Identify the different types of test equipment for emission control systems used in a motorcycle shop.
- Describe how accessed trouble codes are used in diagnosis of emission system failures.
- Perform diagnostic emission systems checks on non-self diagnostic systems.
- Access and interpret self-diagnostic ECM trouble codes.

**Anticipatory Set or Mental Readiness:**

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

**Instructional Components:**

Lectures on:

- The different types of test equipment for emission control systems used in a motorcycle shop.
  - How accessed trouble codes are used in diagnosis of emission system failures.
- Laboratory demonstrations and guided practice on:
- Performing diagnostic emission systems checks on non-self diagnostic systems.
  - Accessing and interpreting self-diagnostic ECM trouble codes.

**Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to:

- Identify the different types of test equipment for emission control systems used in a motorcycle shop.
- Describe how accessed trouble codes are used in diagnosis of emission system failures.
- Perform diagnostic emission systems checks on non-self diagnostic systems.
- Access and interpret self-diagnostic ECM trouble codes.

**Closure:**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual handouts
- Haynes fuel systems techbook

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by oral presentation to the class, a demonstration of procedures and a written test given at the end of the module.

## Lesson Plan 19

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Two-stroke exhaust principles

Module 6: Exhaust systems

Hours: 3 of 108

Student Performance Objective: By the end of the unit, given information and instructor's workbook handouts, each student will be able to:

- Describe two-stroke exhaust system construction.
- Explain basic two-stroke exhaust system performance theory.

Anticipatory Set or Mental Readiness:

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

Instructional Components:

Lectures on:

- Two-stroke exhaust system construction.
- Basic two-stroke exhaust system performance theory.

Check for Understanding and/or Guided Practice and Independent Practice:

At the end of this session students will be asked to:

- Describe two-stroke exhaust system construction.
- Explain basic two-stroke exhaust system performance theory.

Closure :

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

Materials Needed:

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual handouts
- Haynes fuels systems techbook

Method of Evaluation:

Students will be evaluated for mastery of the learning objectives by a written test given at the end of the module.

## Lesson Plan 20

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Four-stroke exhaust principles

Module 6: Exhaust systems

Hours: 3 of 108

Student Performance Objective: By the end of the unit, given information and instructor's workbook handouts, each student will be able to:

- Describe four-stroke exhaust system construction.
- Explain basic four-stroke exhaust system performance theory.

Anticipatory Set or Mental Readiness:

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

Instructional Components:

Lectures on:

- Four-stroke exhaust system construction.
- Basic four-stroke exhaust system performance theory.

Check for Understanding and/or Guided Practice and Independent Practice:

At the end of this session students will be asked to:

- Describe four-stroke exhaust system construction.
- Explain basic four-stroke exhaust system performance theory.

Closure :

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

Materials Needed:

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual handouts
- Haynes fuel systems techbook

Method of Evaluation:

Students will be evaluated for mastery of the learning objectives a written test given at the end of the module.

## Lesson Plan 21

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Exhaust systems performance diagnosis

Module 6: Exhaust systems

Hours: 6 of 108

Student Performance Objective: By the end of the unit, given information and instructor's workbook handouts and guided practice, each student will be able to:

- Perform exhaust system inspections, diagnostics, disassembly, service, repairs, and reassembly on two-stroke and four-stroke motorcycles.

Anticipatory Set or Mental Readiness:

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

Instructional Components:

Lecture and laboratory guided practice on:

- Performing exhaust system inspections, diagnostics, disassembly, service, repairs, and reassembly on two-stroke and four-stroke motorcycles.

Check for Understanding and/or Guided Practice and Independent Practice:

At the end of this session students will be asked to:

- Perform exhaust system inspections, diagnostics, disassembly, service, repairs, and reassembly on two-stroke and four-stroke motorcycles.

Closure:

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual handouts
- Haynes fuel systems techbook
- Lab two and four-stroke motorcycles
- Exhaust gas analyzer
- Motorcycle basic hand tools
- Motorcycle lift

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by a demonstration of procedures and a written test given at the end of the module.



## Lesson Plan 22

Instructor: Toivo Fred Kent

Subject: Motorcycle fuel and emissions system repair

Topic: Evaluation of fuel and emission systems repair

Module 6: Exhaust systems

Hours: 6 of 108

**Student Performance Objective:** By the end of the unit, given information and instructor's workbook handouts and guided practice, each student will be able to:

- Describe the correct diagnostic procedures.
- Analyze fuel and emission system problems.
- Perform integrated fuel and emission system diagnostics using correct diagnostic tools and equipment.
- Evaluate the success or failure of fuel and emission control repairs.
- List recommendations for a motorcycle repair shop customer's safe operation of a repaired motorcycle.

**Anticipatory Set or Mental Readiness:**

Instructor will ask students to write the answer to a randomly picked end-of-chapter textbook question. A daily Knowledge test (affective domain) question is given at beginning of each class session during roll call.

**Instructional Components:**

Lecture and laboratory demonstrations and guided practice on:

- The correct diagnostic procedures.
- Analyzing fuel and emission system problems.
- Performing integrated fuel and emission system diagnostics using correct diagnostic tools and equipment.
- Evaluating the success or failure of fuel and emission control repairs.
- Listing recommendations for a motorcycle repair shop customer's safe operation of a repaired motorcycle.

**Check for Understanding and/or Guided Practice and Independent Practice:**

At the end of this session students will be asked to:

- Describe the correct diagnostic procedures.
- Analyze fuel and emission system problems.
- Perform integrated fuel and emission system diagnostics using correct diagnostic tools and equipment.
- Evaluate the success or failure of fuel and emission control repairs.
- List recommendations for a motorcycle repair shop customer's safe operation of a repaired motorcycle.

**Closure :**

The Closure portion of this Lesson is incorporated in the guided practice: Each group will receive information on job related use of this lesson tool and clarification of instructor prompted questions from individual students.

A summary of lesson(s) will be given at the end of this textbook chapter.

**Materials Needed:**

- Blackboard/chalk
- TV/VCR
- Whiteboard with dry erase markers
- Textbook/Workbook
- Instructor's manual handouts
- Haynes fuel systems techbook
- Lab two and four-stroke motorcycles
- Exhaust gas analyzer
- Motorcycle basic hand tools
- Motorcycle lift

**Method of Evaluation:**

Students will be evaluated for mastery of the learning objectives by a demonstration of procedures and a written test given at the end of the module.

## Sample Test

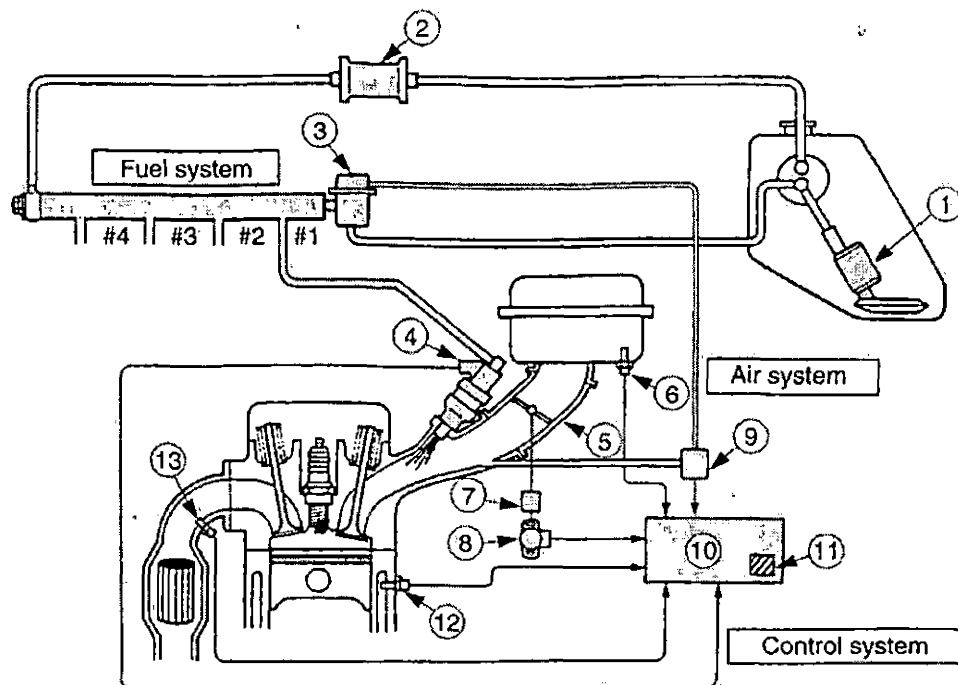
### Chapter 7 – Fuel Systems

1. A fuel tank must be vented to prevent a buildup of vacuum or pressure.
2. When is a fuel pump needed on a motorcycle?  
When fuel tank is located too low for gravity flow to feed fuel to the carburetor.
3. What is a typical carburetor's air-fuel ratio at cruising? a. 14.7:1
  - a. 14.7: 1
  - b. 3:1
  - c. 17:1
  - d. 7:1
4. List the eight systems or circuits of a slide carburetor.
  - 1) Float circuit.
  - 2) Pilot circuit.
  - 3) Slide cutaway system.
  - 4) Needle circuit.
  - 5) Main fuel circuit.
  - 6) Slow circuit.
  - 7) Accelerator pump circuit.
  - 8) Starter circuit.
5. The d. Needle circuit circuit controls air-fuel mixture from one-quarter to three-quarter throttle.
  - a. Pilot circuit
  - b. Off-idle circuit
  - c. Main circuit
  - d. Needle circuit
6. Which of the slide carburetor circuits controls the air-fuel mixture at wide-open throttle? Main fuel circuit
7. Turn a carburetor pilot fuel screw in to richen the mixture and out to lean the mixture.
8. What must be done if rust or water is present in the carburetor? d. All of the above
  - a. Carburetor rebuilt.
  - b. Fuel filter replacement.
  - c. Drain and flush the fuel system.
  - d. All of the above.
9. List three precautions when using a cold soak cleaner.
  - 1) Wear safety glasses.
  - 2) Wear rubber gloves.
  - 3) Thoroughly rinse in warm water – dried with compressed air.

10. When one vacuum gauge reads too high during synchronization, this indicates that the carburetor slide is too closed.
11. Which of the following is *not* monitored by the electronic fuel injector ECM?  
a. Airflow.  
b. Air temperature.  
c. Fuel pressure.  
d. Engine rpm.
12. List the three parts of a motorcycle's electronic control system.  
1) Fuel injection control.  
2) Ignition system control.  
3) Self-diagnostics.
13. What is the function of the coolant temperature sensor in an EFI system?  
To provide input to the engine control system.
14. Oxygen sensors use the principle of oxygen's conductivity with a. zirconium.  
a. Zirconium  
b. Titanium  
c. Gold  
d. None of the above.
15. How does the ECM's self-diagnostic system function?  
It provides self-diagnostics to the EFI system – using fault codes.
16. Name the two job opportunities most offered to service technicians.  
1. Dealership technician.  
2. Independent service shop technician.
17. The b. service writer usually greets customers at a service center.  
a. Service technician  
b. Service writer  
c. Service manager  
d. Parts manager
18. List five motorcycle systems that can be damaged by improper storage.  
Damage to:  
1) Lubrication system.  
2) Fuel system.  
3) Ignition system.  
4) Exterior appearance.  
5) Suspension.
19. *True or false?* It best to store a motorcycle with used oil and then change the oil in the spring after the first ride.  
False – old oil contains contaminants.

20. *True or false?* You should add distilled water to a battery in storage.  
True.
21. What is added to gasoline to prevent deterioration and condensation?  
Gasoline stabilizer.
22. Which of the following is *not* done when storing a motorcycle?  
c. Tie the suspension in the compressed position.  
a. Cover the motorcycle.  
b. Squirt oil in spark plug holes.  
c. Tie the suspension in the compressed position.  
d. Inflate tires to specifications.
23. *True or false?* Tune-up adjustments may be necessary before removing a motorcycle from storage.  
True.
24. List four conditions that made a motorcycle unsafe.  
1) Condition of tires & wheels.  
2) Chain condition.  
3) Operation & condition of brakes.  
4) Operation of lights & horn.
25. Which of the following would *not* be an example of normal wear?  
c. Cracked frame.  
a. Final drive chain stretch.  
b. No tread on tires.  
c. Cracked frame.  
d. Thin brake pads.
26. How can aftermarket add-on accessories alter the safety of a motorcycle?  
Change aerodynamics, suspension geometry, unsafe handling & stability.
27. If a possible safety defect is present on a certain model motorcycle, a  
d. Manufacturer recall will notify the customer or dealer of the problem and needed repair.  
a. Service manual.  
b. Owners manual.  
c. Indicator light.  
d. Manufacturer recall.
28. What is the function of release form or statement?  
To release the technician and/or shop from potential liability claims.

## Fuel Injection Delivery System



- |                      |                                   |                               |
|----------------------|-----------------------------------|-------------------------------|
| ① Fuel pump          | ⑥ Intake air temperature sensor   | ⑪ Atmospheric pressure sensor |
| ② Fuel filter        | ⑦ Fast idling system              | ⑫ Water temperature sensor    |
| ③ Pressure regulator | ⑧ Throttle sensor                 | ⑬ O <sub>2</sub> sensor       |
| ④ Fuel injector      | ⑨ Intake pressure sensor          |                               |
| ⑤ Throttle body      | ⑩ ECM (Electronic Control Module) |                               |

## REFERENCES

- Bureau of Automotive Repair. (1996). *Laws and Regulations*. Sacramento, CA: Department of Consumer Affairs.
- Bureau of Automotive Repair. (1996). *Smog Check Diagnostic and Repair Manual*. Sacramento, CA: Department of Consumer Affairs.
- Department of Air Resources. (1996). *Training Manual; Clean Air Car Course Student Workbook*. Sacramento, CA: Department of Consumer Affairs.
- Department of Consumer Affairs. (1996). *Clean Air Car Course*. Sacramento, CA: Department of Consumer Affairs.
- Johns, B., Edmunson, D., Hurt, J. (1999a). *Motorcycles: Fundamentals, Service, and Repair Instructor's Manual*. Tinley Park, IL: The Goodheart-Willcox Company, Incorporated.
- Johns, B., Edmunson, D., Hurt, J. (1999b). *Motorcycles: Fundamentals, Service, and Repair Student Workbook*. Tinley Park, IL: The Goodheart-Willcox Company, Incorporated.
- Johns, B., Edmunson, D., Hurt, J. (1999c). *Motorcycles: Fundamentals, Service, and Repair Textbook*. Tinley Park, IL: The Goodheart-Willcox Company, Incorporated.
- Krumme, G., (1995). *Major Categories in the Taxonomy of Educational Objectives (Bloom 1956)*.  
<http://faculty.washington.edu/krumme/guides/bloom.html>
- Los Angeles Trade Technical College. (2001). *Catalogue of Programs. 2000-2001*.  
[http://www.lattc.edu/lattc/catalog/catalog\\_ed\\_programs\\_mcyckmek\\_c.htm](http://www.lattc.edu/lattc/catalog/catalog_ed_programs_mcyckmek_c.htm)
- Los Angeles Trade Technical College. (2001). *Curriculum Handbook*.  
<http://www.lattc.edu/dept/handbook/curriculum%20handbook.htm>