IPMBA
583 Frederick Road, Suite 5B, Baltimore, MD 21228 Phone: 410-744-2400 Fax: 410-744-5504 Email: info@ipmba.org Website: www.ipmba.org

IPMBA Maintenance Officer Certification Course Curriculum Overview

Thank you for your interest in the IPMBA Maintenance Officer Certification Course. This document contains the following to familiarize you to the IPMBA curriculum:

IPMBA Maintenance Officer Certification Course Fact Sheet: this is an overview of the various components which comprise the course.

IPMBA Maintenance Officer Certification Course Model Schedule: this is the model schedule for the 40-hour Maintenance Officer Certification Course. The schedule may be changed at the discretion of the instructor.

IPMBA Unit Plans: this contains Unit Plans for each unit of instruction comprising the IPMBA Maintenance Officer Certification Course.

IPMBA Maintenance Officer Certification Course Required Materials & Equipment Checklist: this provides a list of material and equipment generally required of all students enrolling in the IPMBA Maintenance Officer Certification Course.

Please contact IPMBA at www.ipmba.org, events@ipmba.org or 410-744-2400 with questions, more information, or for assistance in locating an IPMBA Maintenance Officer Certification Course (typically offered only during the IPMBA Conference).

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IPMBA Maintenance Officer Certification Course Fact Sheet

Course	Maintenance Officer Certification Course
Length	40 hours
Intended Audience	Public safety personnel or civilians who are responsible for maintaining public safety bicycles and fleet management. All candidates must possess basic bike maintenance skills and mechanical aptitude. Candidates are not required to be public safety cyclists if they are civilian employees of/contractors to the department and responsible for bike maintenance (e.g., fleet mechanics), nor are they required to have completed the IPMBA Police, EMS, or Security Cyclist Course.
Skills Practiced	• Wheel, Tire, and Tube Removal and Installation • Removal, Service, and Installation of Rear Cassettes • Removal, Service, and Installation of Hubs • Removal and Replacement of Spokes, Wheel Truing • Removal, Service, and Installation of Crankset, Bottom Brackets, Chain Rings • Removal, Service, and Installation of Chains • Removal, Service, and Installation of Pedals and Retention • Removal, Service, and Installation of Derailleurs, Cables/Housing, and Shifters • Brake Service (Disc and Rim) • Handlebar, Stem, Saddle, and Seatpost Adjustments • Removal, Service, and Installation of Headsets • Frame and Fork Inspection • Suspension Inspection and Tightening • Diagnosing Problems
Equipment and Materials	• See *Required Tool and Equipment Checklist* • Student Handouts • Park Tool's *Big Blue Book of Bicycle Repairs*, current edition
Successful Completion	IPMBA MOCC Certificate of Completion is available to those who: • Score a minimum of 76% on the written test. • Pass the practical test. • Miss no more than 10% of the class time. • Be a member of or join IPMBA. • Submit the certificate application and fee.

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IPMBA Maintenance Officer Certification Course Model Schedule

Day One	
0800-1230	Introductions, Class Outline and Procedures
	Basic Mechanical Skills
	Tires and Tubes
	Rear Sprockets
1230-1330	Lunch
1330-1730	Hubs
	Wheel Truing
	Review

Day Two	
0800-1100	Review of Day 1, Pedals
	Chains
	Crankset and Bottom Brackets
1100-1200	Lunch
1200-1730	Derailleur Systems
	Rear and Front Derailleur, E Shifting, Shimano 12s, SRAM Trans
	Review

Day Three	
0800-1100	Review of Day 2
	Brake Systems (mechaincal systems)
1100-1200	Lunch
1200-1730	Hydraulic Brakes
	Headsets
	Brake and Shift Lab
	Review

Day Four	
0800-1200	Review of Day 3
	Handlebars, Grips, Saddles, Stem, Dropper Seat Post
1200-1300	Lunch
1300-1730	
	New Bike Build, E-Bike, Testing

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UNIT PLAN 1
CHAPTER 1: BASIC MECHANICAL SKILLS

Learning Goal: The purpose of this unit of instruction is to introduce the basic concepts necessary for routine maintenance, repair, assembly, and troubleshooting.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Identify and describe the anatomy of a bicycle (bicycle nomenclature).
2. Compare and contrast tension and torque.
3. Explain the importance of fully tightening fasteners.
4. Define and describe lubricants, threadlockers, and cleaners.
5. Identify two types of bearing systems.
6. Describe effective methods of troubleshooting problems.
7. Identify bicycle-specific tools and their uses.
8. Explain the importance of using the correct tools for the repair.
9. Set up an efficient and effective workstation.
10. List ways to maximize workplace safety and minimize the risk of injury.

Methods of Instruction: Lecture

Time Allotted: 90 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Pen and highlighter
- Public safety bicycle

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 2
CHAPTER 2: TIRES AND TUBES

Learning Goal: The purpose of this unit of instruction is to teach students how to service, inspect, repair, and replace tires and tubes as well as tubeless systems. It will identify the common causes of flat tires and tube failures. Knowing how to service a tire is essential for ensuring a smooth ride with minimal interruptions caused by flats.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. List the causes of flat tires and tire and tube failures.
2. Demonstrate the correct way to inspect inner tubes and explain why it is important.
3. Demonstrate how to repair an inner tube using a vulcanizing patch.
4. Demonstrate removal and installation of both front and rear wheels, using standard axles and thru axles.
5. Explain how to install tubeless tires.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 90 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Axle wrench (if bicycle does not have a quick release wheel)
- Tire levers (2)
- Pump
- Patch kit

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 3
CHAPTER 3: REAR SPROCKETS

Learning Goal: The purpose of this unit of instruction is to teach students how to remove the cassette from the rear wheel, identify issues with the cogs which may cause mechanical problems, and address these problems while using the appropriate tools.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Define, describe, and identify cog, cassette, and sprocket.
2. Explain the functions of the rear cogs.
3. Remove and install the rear cassette and freewheels using the correct tools.
4. Explain and demonstrate how to clean the cogs and cassette.
5. Define spacing, shifting, ramps, hardness, and interchangeability as they relate to rear sprockets.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 60 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Freewheel remover or cassette lockring tool compatible with the bicycle
- Sprocket tool (chain whip)
- Adjustable wrench
- Rags
- Cleaning brushes
- Solvent

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 4
CHAPTER 4: HUBS

Learning Goal: The purpose of this unit of instruction is to teach students how to service wheel hub bearings for maximum performance, how the wheel hub functions, and how to diagnose problems associated with bearing systems. Proper hub performance is critical for smooth wheel rotation.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Describe the function of a cup-and-cone bearing system.
2. Service and adjust a rear cup-and-cone hub.
3. Diagnose wear problems associated with bearing systems.
4. Compare and contrast cup-and-cone and cartridge bearing hubs.
5. Identify at least one type of cartridge bearing hub.
6. Service a rear freehub.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 90 minutes

Student Equipment:

- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Wheel with adjustable hub (if the bike does not have adjustable hubs)
- Cone wrenches
- Wrench for cone locknuts
- Grease
- Rags
- Solvent
- Cleaning brushes
- Hub spacers

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 5
CHAPTER 5: WHEEL TRUING

Learning Goal: The purpose of this unit of instruction is to enable students to recognize when a wheel is out of true and employ the correct tools and techniques to adjust the spoke tension so the wheel spins straight. Straight, round wheels provide a good braking surface, improve handling and tracking, a safe wheel and long spoke life, and a smooth ride.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Explain the theory of wheel truing.
2. Identify the parts of wheel and spokes.
3. Define lateral true, radial true, rim centering (dish), and spoke tension.
4. Recognize and diagnose wheel and spoke damage.
5. List the common causes of wheel and spoke damage.
6. Explain the importance of using the correct size of spoke wrench.
7. Be able to true a wheel within the proper variances.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 120 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Spoke wrench to fit spoke nipples
- Light lubricant
- Rags
- Dishing tool (min one per two students)
- Truing stand

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 6
CHAPTER 7: CRANKSETS

Learning Goal: The purpose of this unit of instruction is to introduce the crankset and bottom bracket. Due to the complexity of crank systems, this unit will emphasize the importance of identifying the types of crank and bottom bracket bearing system prior to servicing the crankset and/or the bottom bracket.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. List the three components that comprise the crankset.
2. Name and describe the two basic types of crank systems.
3. Remove the crankset, inspect it, and replace or re-install it.
4. List the parts of the bike that comprise the bottom bracket.
5. Determine if the bottom bracket bearings are worn or have developed play.
6. Identify threaded and non-threaded bottom bracket shells and name several of each type.
7. Remove and install threaded bottom bracket bearings.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 90 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Crank remover
- Crank bolt wrench
- Torque wrench with bits
- Grease/anti-seize
- Threadlockers
- Bottom bracket tools: various types
- Adjustable type bottom bracket tools (as needed)
- Wrench to turn bottom bracket tool

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 7
CHAPTER 8: CHAINS

Learning Goal: The chain is a critical component of the drivetrain. The purpose of this unit of instruction is to teach students ways to minimize the risk of chain failure and reduce the frequency of replacement.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Describe the role of the chain in driving the bicycle.
2. List the four component parts of the chain.
3. Name the two ways chains can be connected.
4. Diagnose if a chain is too long or too short.
5. Use a chain tool to correctly size and install a new chain.
6. Remove and install a chain on a derailleur bike.
7. Identify and address chain wear and damage.
8. Clean a chain.
9. Select a suitable lubricant and lubricate a chain properly and at appropriate intervals.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 60 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Chain tool
- Chain lubricant
- Rags

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 8
CHAPTER 9: PEDALS

Learning Goal: The purpose of this unit of instruction is to teach students how to remove and install pedals and to familiarize them with different types of pedals and pedal retention systems. Pedals are one of the bicycle's most important contact points and it is critical that they are properly secured to the crank.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. List the different types of pedals and retention systems approved by IPMBA.
2. Remove pedals.
3. Identify left and right-side pedals.
4. Install pedals to the appropriate level of tightness.
5. Install approved pedal retention systems.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 30 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Pedal wrench
- 8 mm hex wrench
- Grease/anti-seize

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 9
CHAPTER 10: DERAILLEUR SYSTEMS

Learning Goal: The purpose of this unit of instruction is to explain how derailleur systems work, identify factors that can cause poor performance, and teach strategies for maximizing performance while changing gears under various conditions.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Define and describe a derailleur system.
2. Name and define the four components that comprise a mechanical derailleur system.
3. List the three components that comprise the cable system.
4. Position the shift lever on the handlebars correctly.
5. Determine which housing to use and how to cut it properly.
6. Install the shifter cable.
7. Mount the front derailleur and adjust the height, rotation, limit screw settings, and index setting.
8. Mount and adjust the rear derailleur using the limit screws and the barrel adjuster.
9. Describe the function of the limit screws.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 180 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Hex wrenches
- Cable cutter
- Screwdriver (typically #2 cross tip)
- Lubricant
- Rags

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 10
CHAPTER 13: CALIPER DISC BRAKE SYSTEMS

Learning Goal: The purpose of this unit of instruction is to introduce mechanical and hydraulic caliper disc brake systems, which provide reliable performance but require tighter tolerances than rim brakes. Topics include brake pads, rotors, levers, and hydraulic brake fluid.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Explain how caliper disc brake systems mechanically function.
2. List the differences between mechanical and hydraulic caliper disc brake systems.
3. Identify three frame mounting standards to secure the calipers to the frame and fork.
4. Remove, install, and adjust brake pads.
5. List the pros and cons of the various brake pad materials.
6. Install and "burn-in" disc brake rotors.
7. Bleed hydraulic brake lines.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 120 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle with disc brakes (partner with another student if the bicycle is equipped with rim brakes)
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Torx T-25 screwdriver for rotor bolts
- Hex wrenches
- Flashlights and white background
- Safety glasses and protective gloves

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 11
CHAPTER 14: CALIPER RIM BRAKE SYSTEMS

Learning Goal: The purpose of this unit of instruction is to introduce the caliper rim brake system and how to maintain it for optimal braking performance. Properly adjusted brakes provide the rider with the means to not only stop, but also to control and modulate speed and improve handling.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. List the components that comprise the caliper rim brake system.
2. Explain how the cable system functions.
3. Install cables.
4. Lubricate the cables and explain the importance of lubrication.
5. Adjust the pads to the rims and center the calipers.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 120 minutes

Student Equipment:

- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle with rim brakes (partner with another student if the bicycle is equipped with disc brakes)
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Hex wrenches
- Cable cutters
- File (if performing cable installation lab)
- Rubber bands to assist in toe for threaded stud pads
- Light lubricant
- Rags

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 12
CHAPTER 15: HANDLEBARS, STEMS, SADDLES, & SEATPOSTS

Learning Goal: The purpose of this unit of instruction is to teach students how to adjust the handlebar, stem, saddle and seat post to fit the rider. The security and integrity of these components are essential for safe, injury-free operation of the bicycle.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Fit the handlebar into the stem.
2. Adjust the handlebars
3. Fit the stem to the bike and adjust the stem.
4. Fit the seat post to the frame and adjust the seat post.
5. Fit the saddle to the post and adjust it correctly.

Methods of Instruction: Lecture, demonstration and practice

Time Allotted: 60 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 13
CHAPTER 16: HEADSETS

Learning Goal: The purpose of this unit of instruction is to explain the role of the headset in ensuring a smooth feeling in the steering and handling of the bike as well as prepare the students to service headsets.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Define a headset and explain its function.
2. List the different types of headsets and their distinguishing characteristics.
3. Adjust a headset.
4. Overhaul a headset.
5. Install a headset.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 180 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)
- Hex wrench
- Headset wrenches (for threaded)
- Grease
- Rags
- Solvent

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 14
CHAPTER 17: FRAME AND FORK

Learning Goal: The purpose of this unit of instruction is to introduce various frame materials, components and construction, and types of forks, which will help with the identification of potentially injury-causing damage.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Name the component parts of the frame.
2. Inspect the frame and fork.
3. Recognize damage to the frame and fork from crashing and routine wear-and-tear.

Methods of Instruction: Lecture and demonstration

Time Allotted: 60 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)

Method of Evaluation:
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UNIT PLAN 15
CHAPTER 18: SUSPENSION

Learning Goal: The purpose of this unit of instruction is to familiarize students with the principles of suspension with the goal of enabling them to recognize problems. Most suspension systems are proprietary and should only be serviced by trained technicians. Students will learn what can be adjusted in-house and what requires professional service.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Define bicycle suspension.
2. Name the six parts of a suspension fork.
3. List the two types of return spring systems used in rear shocks.
4. Describe the concept of damping and energy loss and check the damping system.
5. Identify the suspension linkages.
6. Explain the concept of the linkage movement.
7. Identify the parts that wear from movement and test them for wear and/or play.
9. Inspect the fork for leaks.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 60 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 16
CHAPTER 19: ON-RIDE REPAIR (DIAGNOSTICS)

Learning Goal: Mechanical problems frequently occur while riding. The purpose of this unit of instruction is to familiarize students with common on-ride problems and the tools and techniques that can be employed to temporarily fix the problem, until the bike can be fully repaired.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Identify the best way to prevent on-ride mechanical problems.
2. List the most useful tools for on-ride repairs.
3. List some of the most common on-ride mechanical problems.
4. Diagnose and repair shifting problems.
5. Diagnose and address braking problems.
6. Recognize frame damage and explain the importance of not riding a bike with a damaged frame or fork.
7. Diagnose and fix drive train problems.
8. Recognize the dangers of both riding a damaged bicycle and attempting to fix something beyond their capabilities.

Methods of Instruction: Lecture and demonstration

Time Allotted: 120 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)

Method of Evaluation:
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UNIT PLAN 17
APPENDIX L: NEW BICYCLE ASSEMBLY

Learning Goal: The purpose of this unit of instruction is to introduce students to the method of assembling a new bicycle out of the box. Assembly is an essential process and the ability to competently assemble a new bicycle is essential to rider safety and comfort.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Identify all parts and tools needed for assembling a new bicycle.
2. Unpackage and inspect a new bicycle.
3. Assemble all parts as shipped from manufacturer.
4. Identify and address problems with the parts and components shipped by the manufacturer.
5. Perform an A-B-C Quick Check and conduct a test ride.
6. Diagnose and correct assembly problems.

Methods of Instruction: Lecture and demonstration

Time Allotted: 120 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 18
FLEET MANAGEMENT

Learning Goal:

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. Set up and stock an in-house shop.
2. Create a periodic maintenance schedule.
3. Establish a system of tracking repairs and routine maintenance.
4. Establish an inventory control system for bicycles and parts.

Methods of Instruction: Lecture

Time Allotted: 60 minutes

Student Equipment:

- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter

Method of Evaluation:
Informal evaluation based on class participation.

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UNIT PLAN 19
TROUBLESHOOTING TABLES: DIAGNOSING PROBLEMS

Learning Goal: The purpose of this unit of instruction is to enable students to recognize and diagnose problems arising from mechanical failures. The students will learn how to apply the essentials of "look, listen, and feel" to troubleshoot bicycles that are functioning incorrectly and identify the most appropriate course of action.

Unit Objectives:
After successful completion of this unit of instruction, students will be able to:

1. List the symptoms of common mechanical problems.
2. Identify potential causes of the symptoms related to mechanical problems.
3. Diagnose problems and identify appropriate solutions.
4. Determine the best approach to addressing the problems.

Methods of Instruction: Lecture, demonstration, and practice

Time Allotted: 180 minutes

Student Equipment:
- Park Tool *Big Blue Book of Bicycle Repair*, current edition
- Pen and highlighter
- Public safety bicycle
- IPMBA Maintenance Officer Course tool kit (including bicycle workstand)

Method of Evaluation:
Informal evaluation based on class participation.