Welcome

Bicycle Maintenance and Repair I
Harford Community College
Continuing Education & Training
Spring Semester 2014

Course Overview

Purpose (the means)
Thought process of repair
Understanding the principle of operation

Objective (the ends)
Knowledge of basic tool use
Knowledge of basic definitions

The Four “T”s Outline

Types
Tools
Tips
Trouble
The Four “T”s - Types

Metallurgic composition
Intended use
Mechanical design
Current trends

The Four “T”s - Tools

Required to have to do the job
Nice to have for efficiency
Ways around the lack of proper tool

The Four “T”s - Tips

Basic preventative maintenance
Complete overhaul / rebuilding
Tricks of the trade
The Four “T”s - Trouble

Unfixable designs
Most frequent problems
Prevention of frequent problems

Review for each Topic:

Advantages
Disadvantages
Ideal features
Optimized performance methods
Theoretically perfect design

Week One Tasks

Look thru handouts
Establish groups
Vocabulary
Right Fit
Tire repair
Threading definitions
Weeks Two to Four Tasks

Books and tools
New topic - derailleurs, brakes . . .
Over an hour of hands-on practice
    Every class period
    Every person
    Variety of bicycles

“Shifting Gears”

The Right Fit slide show
Purpose:
    Vocabulary illustration
    Show how proper fit is the first step of a correctly maintained bicycle
    Thought provoker - how you purchased your last bicycle
Concepts - Tires and Tubes

Tire types
- Wire-on / Clincher
- Tubular
- “Airless”
- “Tubeless”

Tire styles
- Width
- Tread
- Weight
- Belting

Conventional & ISO measurements
- xx width – xxx bead seat diameter
- compare 26, 26, 700C, 27, 27.5, 29

Concepts - Tires and Tubes

Valve Operation
- Presta
- Schrader

Tube materials
- Rubber
- Latex
- Polyethylene

Concepts - Tire Repair

Removing the wheel
Getting the tire off
Finding the hole
- pinch flats
- sharp object cuts
- blowout
Concepts - Tire Repair

- Patching the hole
  - rough surface
  - apply glue
  - allow glue to dry
  - apply patch
- Reinstall tube in tire
- Remount tire on rim
- Put wheel back in frame

Concepts - Fasteners

Types
- Nut and Bolt
- Rivet
- Nail

Threading Directions
- Left hand
- Right hand

Concepts - Fasteners

Threading Dimensions
- Thread pitch
- Hole size
- Included Angle

Threading Designations
- Metric
- English
- Machinist
Concepts - Fasteners

Class of Fit
A- made to fit, preferred fit
B - can fit, not preferred
C - looks like it fits, but does not

Concepts - Brakesets

Movable inner cable in a rigid outer mount
Importance of “clean” cable ends
Method to move inner cable
Attachment to mechanism
Move brake pads onto rim
Apply pressure in controlled fashion
**Concepts - Brakesets General**

- **Leverage Importance**
  - Pivot point
  - Ratio of length of lever arms

- **Combination of Locations**
  - (at both ends of cable for):
    - Pivot point
    - Cable attachment
    - Brake pads or hand (depending on which end)

**Concepts - Brake Mechanisms**

- **Type**
  - Single pivot / side pull
  - Double pivot / center pull
  - Double pivot / side pull
  - Articulated brake arms

**Concepts - Brake Mechanisms**

- **Techniques for adjustment**
  - Brake pad height
  - Brake pad toe
  - Brake pad alignment with angled side of rim
  - Spacing between rim and pad
  - Straddle cable angle
  - Cable length
Concepts - Brake Levers

Type
- Straight bar (ATB) mount
- Curved bar, non-aero cable routing
- Curved bar, aero cable routing

Techniques for adjustment
- Hand size
- Wrist alignment
- Cable length

Concepts - Brakesets

Tools: wrench, 3rd and 4th hands
Tips: during lab exercise
Troubles:
- Hub adjustment & rim true
- Three directions on one bolt

Lab Exercises

Each person to complete:
- Adjust brake pads in all axis
- Properly position brake lever
- Replace / lubricate cable
Concepts - Derailleurs General

- Parallelogram principle
- Movement
  - Cable function
  - Return spring
- Purpose of set screws

Concepts - Rear Derailleur

- Styles
  - Standard parallelogram
  - Slant Pantogram
  - Double Spring
  - Double parallelogram
- Position of Jockey / Tension Pulley
- Determiner of capacity
Concepts - Front Derailleur

- Cage Shape
  - Double Road / Triple Road
  - Triple ATB / hybrid
- Throw distance
- Normal position
  - High
  - Low
- Throw position
  - Top
  - Bottom

Concepts - Shift Lever

- Type - by mounting position
  - Down tube
  - End of Handlebar - Barcon
  - End of Handlebar - Grip Shift
  - Stem Mount
  - Bar Mount
  - Brake Lever
- Barrel diameter effects

Concepts - Derailleur Systems

- Tools: screwdriver, wrench
- Tips: during lab exercise
- Troubles:
  - System approach & interchangeability
  - Availability of shift lever repair parts
Lab Exercises

Each person to complete:
- Adjust set screws
- Adjust cable length
- Lubricate / Replace cable

Concepts - Chains

- Master link or not
- Distance between pins
- Width between sides
- Shaping the sideplates
- Chain wear
- Getting the rivet out
Concepts - Chainwheels

Styles of chainring attachment
Three arm
Five pin
Five arm
- Evenly spaced on same circle
- Different bolt circle distance on one
Four arm
- Evenly spaced
- Irregularly spaced

Range of teeth / Minimum size
Styles/Numbers of chainrings
Single
Double
Triple
Quadruple

Styles of crankarm manufacture
Cold forged
Hot forged
CAM / CNC
Carbon Fiber layup

Manufacturing debates
Steel versus Aluminum rings
Method of attaching spider to arm
Titanium lightening bolts
Concepts - Freewheels/Freehubs

- Conceptual differences: fw-fh
- Numbers of Cogs Available
- Between cog spacing
- Hub FW thread / Cassette FH splines
- Dimension A on freewheels
- Freehub respacing

Concepts - Gear Ratios

- Historic bicycles
- Equivalent inch wheel diameter
- Metric / Rollout measurement
- Customizing tips for your style

Concepts - Gear Ratios

- Cross over concepts
  - Corncob
  - Equally spaced chainrings
  - Halfstep with granny

- Diagramming gears
  - Read from chart
  - Write program for calculator
  - Plot on log paper
Concepts - Review for Maintenance I

Importance of the “Right Fit”
Many definitions
Four “T”s
Types
Tools
Tips
Trouble

Concepts - Review for Maintenance I

Tires and Tubes
Fasteners
Derailleurs
Brakesets
Chains
Chainwheels / Freewheels / Gear Ratios

Concepts - Preview Maintenance II

Bearing Theory
Hubsets
Bottom Brackets
Pedals
Headsets
Frame alignment
Concepts - Preview Mainten. III & IV

Maintenance III - two evenings
  Front Suspensions
  Rear Suspensions
Maintenance IV - half day plus
  Wheel design
  Wheel building and truing

Other Notes

1. 
2. 
3. 
4. 
5. 

Tune up complete - Let's ride

Harford Community College
Bicycle Maintenance I
Dick Schwanke, Instructor