Minnesota State College Southeast

BIKE 2070: Physics for Bikes

A. COURSE DESCRIPTION

Credits: 1

Lecture Hours/Week: 1

Lab Hours/Week: *.*

OJT Hours/Week: *.*

Prerequisites: None

Corequisites: None

MnTC Goals: None

This course covers the physics that control the operation of bicycles. The concepts of balance, momentum, rolling resistance, aerodynamics, and stability will be explored in theory and during lab work. Also covered will be how energy is expended by the rider and how this energy is transferred into motion of the bicycle in terms of efficiency and power. Power losses such as aerodynamic drag, friction, and frame flex, and ergonomics will be explored. How electric assist can impact power will also be discussed. Additionally, the thermodynamics and heat transfer of braking systems and how this energy transfer can impact frame and wheel design, and brake component performance will be explored in the classroom and the lab. The concepts relating to rider fit and position on the bicycle relative to power and efficiency will be covered. A discussion of how loads are applied to the frame and wheels, and typical failure points is also covered. (Prerequisite: none) (1 credits)

B. COURSE EFFECTIVE DATES: 02/27/2018 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. Physics concepts of stability, momentum, friction, aerodynamics
2. Energy and Power
3. Efficiency and energy, inputs and losses
4. Thermodynamics and heat transfer in braking systems
5. Design considerations for efficiency and heat transfer
6. Ergonomics and fit
7. Distribution of forces on frames and wheels, and failure modes

D. LEARNING OUTCOMES (General)

1. Understand what factors impact response, stability and tracking
2. Understand how momentum affects performance and control
3. Understand how friction contributes to energy loss
4. Understand the role aerodynamics plays in efficiency
5. Understand the concepts of wheel and tire design and their impact on efficiency
6. Understand the concepts of energy and power and how to measure and calculate
7. Understand the mechanisms of thermodynamics and heat transfer, conduction, convection, and radiation
8. Understand how heat can damage components and how to better manage heat
9. Understand how to measure heat transfer
10. Understand how rider fit and ergonomics while riding impacts efficiency and performance
11. Understand how loads are transferred from the rider to the bicycle frame, drive train and wheels
12. Understand key stress regions and failure modes of frames and wheels

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted