MIET2565 | MIET 2566
Systems Engineering Principles

Introduction to Systems Engineering – Tutorial – Electrical bicycle

RMIT UNIVERSITY

Electric Bicycle

Principles of systems engineering

Systems are created for specified purposes	A form of low-cost minimum effort transport for short distances (within 50 km radius)
Systems have users	1 person to ride-on travel
Systems interact with the environment around it	To be used in an inner city or urban area. Other traffic on the same road, e.g. cars. Need to watch out all directions during operation. Rural and remote areas may be difficult due to road conditions and long distances.
System boundary should be clearly defined	The bike with battery installed. Special charging station (pack) for promised speedy charging. Spare battery. Wiring for all connections. Note: power source is defined as grid power.
Systems are made by integrating components	Components: bike frame, motor, wheels, pedal and chain, controller, steering column, are assembled together. Battery charger is connected to the controller via supplied wire.
Systems are designed by the application of engineering science knowledge	System is stable only when it is running forward (Coriolis effect). No reverse motion. Extra support required when it is not going forward. Induction electric drive system. Constraints are that it can only travel on accessible paths, such as roads and footpaths.
Systems engineering tasks are often not repeating	Special design features required for specific users, e.g. goods basket, long object carriage, extra passenger (if legal). Mostly affecting frame and special components.
Systems development and operations are multi-disciplinary	Disciplines: mechanical, electrical, electronics

Describe the steps that a user operates this electric bicycle

1. Connect to the bike control. Authenticate to use.
2. Release the idle support. Hands to hold the handles.
3. Sit on the bicycle. Feet on ground to support bicycle.
4. One hand grab speed control.
5. When bicycle moves, lift feet on bicycle.
6. Steer by turning handle.
7. Turn speed control knob to accelerate.
8. Apply brake to decelerate and if necessary, stop the .
9. When bicycle stops, put feet on ground to support bicycle.

Components used on electric bicycle

1. Frame
2. Steering column
3. Battery
4. Wheels
5. Pedal
6. Chain
7. Motors
8. Throttle
9. Control System/Display of speed
10. Handlebars
11. Brake
12. Suspension (preferably dual for mountain biking)
13. Baskets