**Introduction to Robotics with**

**Lego Mindstorms NXT (or EV3)**

1. **Introduction to Robotics**
   1. What is a Robot?

It is a programmable, self-controlled system that is made up of electrical and mechanical components and is capable of performing a specified set of tasks repeatedly.

* 1. Parts of a Robot (Human analogy)
     1. Controller (Brain)
     2. Structural elements (bones)
     3. Motors (muscles)
     4. Sensors (senses – touch, eyes, ears)
     5. Power source (Heart)
  2. Some well known robots (Real and Fictional)
     1. R2D2 and C3P0 (Star wars)
     2. ASIMO by Honda
     3. Wall-E
     4. Roomba (Robotic Vacuum cleaner)
     5. Data (Star Trek)
     6. Robots in Automotive Manufacturing (Tesla)
  3. Demonstration of four robots with different capabilities
     1. Basic robot moving in a rectangle
     2. Robot that stops and changes direction when it detects an obstacle using ultrasonic sensor
     3. Line following robot using light sensor

1. **Introducing the NXT Mindstorms Kit**
   1. The NXT Brick
   2. Lego Structural elements
   3. NXT-G software
   4. Putting it all together
   5. Reference to EV3
2. **Building your first NXT Robot**
   1. 5 Minute bot
   2. Castor bot
   3. REM bot
3. **Direct control of NXT (without NXT-G program)**
   1. Motor control
   2. Sensor control
   3. Data logging
4. **NXT-G programming**
   1. Moving forward in a straight line
   2. Using degrees Vs seconds for movement
   3. Moving in Reverse
   4. Turning right
   5. Turning left
   6. Point and Pivot turns
5. **Touch sensor**
   1. Single touch
   2. Multi-touch
   3. Bumper bot example
6. **Color sensor**
   1. Light sensor mode
   2. Light sensor calibration
   3. Color sensor mode
   4. Line follower example
7. **Ultrasonic sensor**
   1. Sensitivity and range
   2. Obstacle course example
8. **Advanced programming**
   1. Variables
   2. Loops
   3. Switches
   4. Myblocks
9. **Skill building Challenge #1**
   1. Scooping mechanism
10. **Skill building Challenge #2**
    1. Push/Pull Arm
11. **Skill building Challenge #3**
    1. Target detection and collection
12. **Skill building Challenge #4**
    1. Placing an object at a designated spot
13. **Skill building Challenge #5**
    1. Elevator mechanism
14. **FIRST Lego League**
    1. FLL competition format and general rules
    2. Project - Theme of the season
    3. Core values
    4. Robot Design
    5. Robot game
15. **Trouble shooting NXT robots**
16. **Getting ready for the competition – 1**
17. **Getting ready for the competition – 2**
18. **Getting ready for the competition – 3**
19. **Final Competition**