**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**