ETUA32182B: ROBOTICS AND APPLICATIONS

Unit.No	Unit Name	Resource		Topics
1	Introduction to Autonomous Robot Systems and Applications		1	Robots: Definition, Types of robot: Manual, Semi Auto, Fully Autonomous.
			2	Application Workspaces: Under water, ground, Arial,
			3	Arial, Static, Dynamic, uncertain,
			4	Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc.
			5	Vision applications.
			6	Robot Actuation Systems: Electric, Hydraulic and Pneumatic
			7	Timing Belts and Bearings,
			8	Parameters for selection of actuators Robotics and Automation for Industry 4.0
2	Introduction to ROSPY programming and Simulation		1	What is Robot Operating System:
			2	Definition, Working with ROS and Python 2.7 stable version,
			3	Pythons Introduction programming
			4	Working with different ROS Module: raspy, code reusability
			5	Unix-based platforms (Ubuntu) Stable Platform, ROS components, ROS concepts
			6	Computation graph and naming conventions, programming and simulating the first robot through ROSPY on Linux
			7	Programming ROSPY
3	Robot Localization with Environment Mapping		1	Introduction to SLAM,

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	ROS		
			2 Different types of SLAM Sensor classification,
			3 Characterizing sensor performance, Sensor selection criteria for SLAM (four different criteria),
			4 Utilization of different sensors in SLAM Range Sensors [Contact Type : Touch sensor, Non-contact Type: IR, LiDAR, Ultrasonic, Laser, Vision based],
			5 Utilization of different sensors in SLAM Range Sensors continue
			6 3D camera, Workspace relative and absolute position sensors, Global Positioning System (GPS), Sensor Networks,
			7 RFID, Blue tooth beacons, Case Study : Indoor SLAM System, Outdoor SLAM System
			8 Case Study : Indoor SLAM System, Outdoor SLAM System
4	Path Planning Algorithm (AI)		1 Static workspace PPA: A*,
			2 Visibility graph Cell decomposition,
			3 Probabilistic Roadmaps methods,
			4 Rapidly-exploring random tree
			5 D* PPA
			6 JPS, Dynamic PPA
			7 Path Optimization methods : GA,
5	Mobile Robot Navigation		1 Open loop vs closed loop robot controllers
			2 different types of drives,
			3 PID controllers, Path retention,

Unit.No	Unit Name	Resource	Topics	
			4	Linear and Nonlinear controls,
			5	Case Study: Unmanned under water vehicles,
			6	Unmanned ground vehicles and Unmanned aerial vehicles Application
			7	Unmanned aerial vehicles Application continue
6	Robot Safety and Social Robotics		1	Safe navigation,
			2	subordinate safety,
			3	human aware environment,
			4	collision avoidance in multi agent system,
			5	Human-Robot Interaction basics. Implicit vs explicit interaction.