INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITD&M) KANCHEEPURAM

Course Title	Mobile Robotics	Course No			
Specialization	Electronics Engineering	Structure (IPC)	3	0	3
Offered for	All streams of UG / DD / PG	Status	Core ☐	Elective ■	
Pre-requisite	ELE211 Control Engineering or Equivalent	To take effect from	Jan.-May 2016		
Objectives	To provide a hands-on introduction to design of mobile robots in different domains (field robots, underwater vehicles, and aerial vehicles), hardware, software, planning and navigation, and real-time control.				
Course Outcomes	Understand the fundamental concepts of mobile robots in different domains, viz., field/ground vehicles, underwater vehicles, and aerial vehicles Understand the basic principles of design of mobile robots, using mechanical system design, actuators, sensors, and controllers. Understand the fundamental algorithms used in mobile robot locomotion, sensing, localization and mapping, motion planning and control. Provide a hands-on experience in understanding laboratory mobile robot prototypes built for field, underwater, and aerial domains, and implement algorithms for autonomous mobility using sensor feedback.				
Contents of the course *(With approximate break up of hours)*	**Introduction**: History of mobile robots, types, applications, and trends [2] **Autonomous mobile robots (ground/field vehicles)**: mechanical design - wheeled and tracked platforms, kinematics - models and constraints; dynamics of wheeled vehicles; Perception - sensors for motion/speed, vision, active ranging (lidar) and inertial motion unit; Techniques for location with mapping, landmarks, and beacon systems; Path planning and obstacle avoidance; navigation architectures [15] **Underwater robots**: Basics of remotely operated vehicles, autonomous underwater vehicles, and autonomous surface vehicles; Modeling, kinematics and dynamics of underwater vehicles and manipulators; Hydrodynamic effects; underwater vehicle-manipulator systems; Comparison with ground robots [13] **Aerial robots**: Fundamentals of aerial vehicles: helicopter and multicopter types, actuators and sensors, modeling and controllers for sensor-based navigation, and autonomy. Comparison with ground robots [12]				
Text	1. R Siegwart, I. R. Nourobakhsh, Introduction to Autonomous Mobile Robots, MIT Press, Cambridge, 2nd Edn,2011, 2. G. Antonelli: Underwater Robots, 2nd Edition, Springer-Verlag, Berlin Heidelberg, 3rd Edn, 2014				
References	1. B Siciliano and O Khatib (Eds), Handbook of Robotics, Springer, 2008 2 K. Nonami, et al., Autonomous Flying Robots: Unmanned Aerial Vehicles and Micro Aerial Vehicles, Springer, 2010				