Course Number : AR505
Course Name : Principles of Robot Autonomy
Credit Distribution : 3-0-0-3
Intended for : UG, PG and PhD
Prerequisite : Consent of faculty advisor
Mutual Exclusion **:** None

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1. Preamble:

Students will be introduced to the main topics that cover the basic principles for endowing mobile autonomous robots with perception, planning, and decision-making capabilities. Students will learn algorithmic approaches for robot perception, localization, and simultaneous localization and mapping as well as robot control.

2. Course Modules with quantitative lecture hours:

Introduction: Brief overview along with motivation and potential applications. **(1 hours)**

Robotic Perception: Robotic sensors, robotic sensor calibration and its importance, robot vision vs computer vision, robot localization, artificial neural networks for robot perception. **(16 hours)**

Robot Motion Planning: Overview, Configuration space, Free space, Target space, obstacle space, traditional and machine learning based planning algorithms. **(14 hours)**

Robot control: P, PI, PD and PID controller, visual servoing, and multi-robot control. **(11 hours)**

3. Text Books:

1. Choset, Howie, Kevin M. Lynch, Seth Hutchinson, George A. Kantor, and Wolfram Burgard. *Principles of robot motion: theory, algorithms, and implementations*. MIT press, 2005.
2. Apolloni, Bruno, et al., eds. *Machine learning and robot perception*. Vol. 7. Springer Science & Business Media, 2005.

4. References:

1. Cuesta, Federico, and Aníbal Ollero. Intelligent mobile robot navigation. Vol. 16. Springer Science & Business Media, 2005.
2. Planning Algorithms by Steve LaValle (Cambridge Univ. Press, New York, 2006).
3. Mouha, Radouan Ait. "Deep Learning for Robotics." Journal of Data Analysis and Information Processing 9.02 (2021): 63.

5. Similarity with the existing courses:

(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.		None	None	None

6. Justification of new course proposal if cumulative similarity content is >30%: None