Semester:	7				
Course Code:	ME5100				
Course Name:	Intelligent Robotic Systems Laboratory				
Credits Value:	3 (Notional hours: 150)				
Pre-requisites:	ME2060 and ME3010 and ME3030				
Core/ Optional:	Optional				
Hourly Breakdown	Lectures (hours)	Tutorials (hours)	Practical classes (hours)	Assignments (hours)	Independent Learning & Assessment (hours)
	08		64	10	68

Course Aim:

To provide the students the opportunity to implement a few selected machine learning techniques to solve real robotics problems.

Intended Learning Outcomes:

On successful completion of the course, the students should be able to;

- **apply** image recognition for object tracking
- **apply** the method of Probabilistic Roadmaps for path planning
- **apply** Q-learning to solve a maze following problem
- **use** model predictive control for unknown disturbance rejection

Course Content:

- **Image based Object Tracking for Underwater Robots**: Image recognition, neural networks
- **Motion Planning For a Mobile Robots Using a Probabilistic Roadmaps**: Exposure to motion planning and probabilistic roadmaps
- **Maze following for a Balancing Robot**: Exposure to unsupervised learning, application of Q-learning
- **Model Predictive Disturbance Rejection for a Twin Rotor System**: Exposure to model predictive control

Teaching/ Learning Methods:

Classroom lectures, tutorials and in-class exercises and assignments

Assessment Strategy:

Continuous Assessment	**Final Assessment**
50%	50%

Details:	Theory (%)	Practical (%)	Other (%) Presentation and Viva
Assignments/Quizzes 50%			50%

Recommended Reading:

- S. R. Balaji and S. Karthikeyan (2017), *A survey on moving object tracking using image processing*, 11th International Conference on Intelligent Systems and Control (ISCO), pp. 469-474, doi: 10.1109/ISCO.2017.7856037.
- Disturbance Modeling and State Estimation for Predictive Control with Different State-Space Process Models, https://www.sciencedirect.com/science/article/pii/S1474667016444538
- Shihua Li, Jun Yang, Wen-Hua Chen, Xisong Chen, Boca Raton (2014), *Disturbance observer based control : Methods and applications*,: CRC Press, ISBN 978146651580
- L. E. Kavraki, P. Svestka, J. . -C. Latombe and M. H. Overmars (1996), *Probabilistic roadmaps for path planning in high-dimensional configuration spaces*, in IEEE Transactions on Robotics and Automation, vol. 12, no. 4, pp. 566-580, doi: 10.1109/70.508439.
- D. Osmanković and S. Konjicija (2011), *Implementation of Q — Learning algorithm for solving maze problem*, Proceedings of the 34th International Convention MIPRO, 2011, pp. 1619-1622.