Teaching Plan

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Wed: 7:00 – 9:50 pm @ LT 10 Hands-on Practice Wed: 7:00 – 9:50 pm @ MAE CAE Lab1

Lecture Number	Week Number	Date	Lecturer	Topic
1	1	17-Jan-24	XZ	Introduction to Automation and Robotics in Industries
2	2	24-Jan-24		Types of Automation and Robotics in Industries
3	3	31-Jan-24		Robotic Perception 1
4	4	7-Feb-24		Robotic Perception 2
5	5	14-Feb-24		ROS Basics
6	6	21-Feb-24	AK	Motion Planning and Inverse Kinematics 1
7	7	28-Feb-24	AK	Motion Planning and Inverse Kinematics 2
Recess Week: 04 Mar – 08 Mar				
8	8	13-Mar-24	XZ	ROS advanced
9	9	20-Mar-24		Hands-on Session: ROS MoveIt and URDF Practice
10	10	27-Mar-24		Robotic Navigation
11	11	3-Apr-24		Hands-on Session: ROS Navigation Practice
12	12	10-Apr-24		System Architecture and System Integration
13	13	17-Apr-24		Ethical and Societal Implications of AI and Robotics in Industries

Overall Assessment:

1. CAs: 40% (2 Quizzes + Practice Assignments)
2. Final Examination: 60% (Restricted Open-book, 3.0 hours)

Text Book:

- "Robotics: Modelling, Planning and Control" by Bruno Siciliano and Lorenzo Sciavicco. Springer

Reference Textbooks:

- "Artificial Intelligence and Robotics in Manufacturing" by Paul O'Leary, Wiley, 2021.
- "Robotics and Automation in the Food Industry" by Darwin G. Caldwell
- "Artificial Intelligence and Manufacturing" by Chang Liu
- "Introduction to Autonomous Robots: Mechanics and Control" by Nikolaus Correll, et al.

- "Robotics: Control, Sensing, Vision, and Intelligence" by C.S.G. Lee, et al. Choset, H., Lynch, K. M., Hutchinson, S., Kantor, G., Burgard, W., Kavraki, L. E., & Thrun, S. (2005).
- Principles of robot motion: theory, algorithms, and implementations. MIT press

Journals and proceedings:

- IEEE Transactions on Robotics
- International Journal of Robotics Research
- Robotics and Computer-Integrated Manufacturing
- Journal of Intelligent Manufacturing
- International Conference on Intelligent Robots and Systems (IROS)
- International Conference on Robotics and Automation (ICRA)

Quizzes and Assignment:

Quiz 1 (CA 1):
Week 5: NTULearn online quiz (15%)
Details: The initial quiz will be accessible from 7 pm on February 14, 2024, and you will have one week to complete Quiz 1 (until 11:59 pm on February 21). Quiz 1 consists of 30 multiple-choice and multiple-answer questions, with a time duration of 60 minutes

Quiz 1 (CA 2):
Week 12: NTULearn online quiz (15%)
Details: Quiz 2 will be made available after 7 pm on April 10, 2024, and will remain accessible for one week (until 11:59 pm on April 17). Quiz 2 consists of 30 multiple-choice and multiple-answer questions, with a time duration of 60 minutes

Assignments (CA 3) :
Week 9: Assignment task from Practice Session 1 (5%)
Week 11: Assignment task from Practice Session 2 (5%)

This engineering course will cover the following key topics of robotics:

1. **Introduction to Automation and Robotics in Industries (3 hours)**
    - Overview of Automation and Robotics in Manufacturing
    - History and evolution of Automation and Robotics in Manufacturing

2. **Types of Automation and Robotics in Industries (3 hours)**
    - Boston Dynamics
    - Industrial Robots
    - Collaborative Robots (Cobots)
    - Autonomous Guided Vehicles (AGVs)
    - Autonomous Mobile Robots (AMRs)
    - Mobile Manipulator
    - AS/RS (Automated Storage and Retrieval Systems)
    - Artificial Intelligence (AI) and Machine Learning (ML)
    - Augmented Reality (AR)/ Virtual Reality (VR)

3. **Robotic Perception (6 hours)**

- Sensor types and sensor identification for specific applications
- Pre-processing and postprocessing of data
- Segmentation and classification for perception data
- 2D vs 3D data
- Commercially available tools

4. ROS (6 hours)

- ROS1 VS ROS2
- ROS installation
- Catkin Build vs Catkin Make
- Core Components of ROS
- Tools and Utilities
- tf transformation
- URDF

5. Motion Planning and Inverse Kinematics (6 hours)

- Introduction to motion planning
- Forward Kinematics
- Inverse Kinematics (IK)
- Motion planning algorithms

6. ROS Hands-on Session (6 hours)

- MoveIt and URDF Practice
- ROS Navigation Practice

7. Robotic Navigation (3 hours)

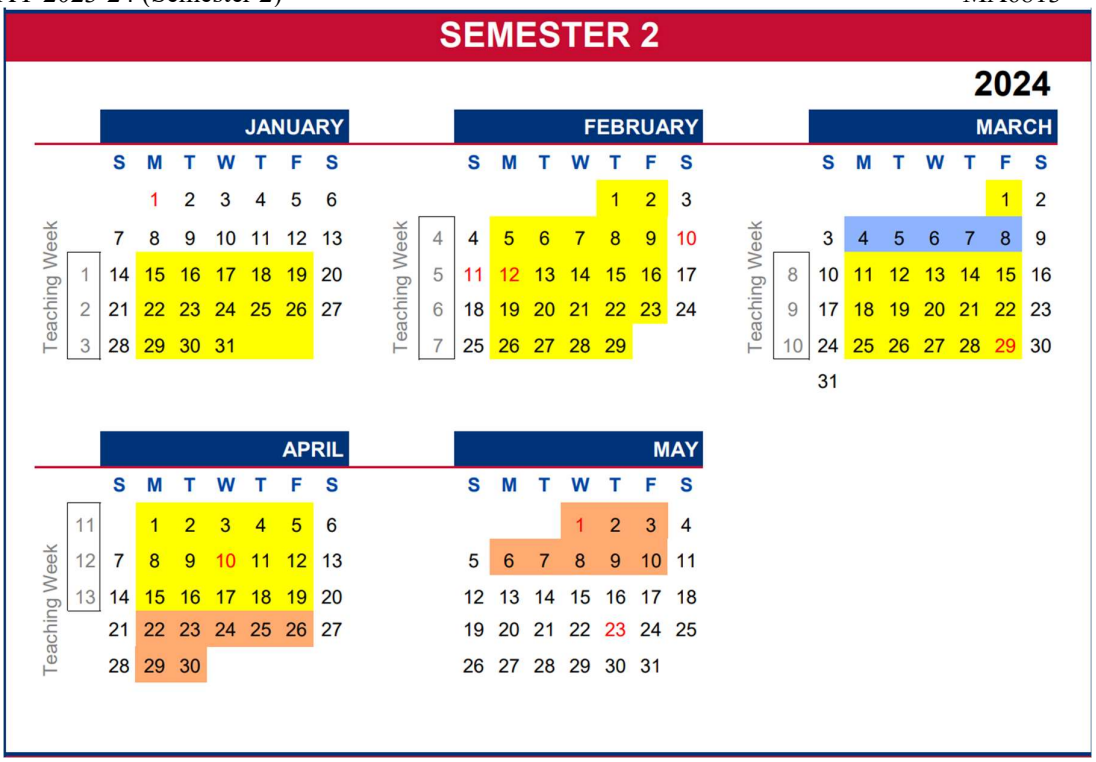
- Concept and design of

8. System Architecture and System Integration (3 hours)

- System architecture design
- Subsystem integration and communications
- System integration and System Engineering

9. Ethical and Societal Implications of AI and Robotics in Industries (3 hours)

- Privacy and Security
- Job Displacement and Retraining
- Equity and Fairness


SEMESTER 2
2024
JANUARY
S M T W T F S
1 2 3 4 5 6
Teaching Week
1 7 8 9 10 11 12 13
2 14 15 16 17 18 19 20
3 21 22 23 24 25 26 27
28 29 30 31
FEBRUARY
S M T W T F S
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4 4 5 6 7 8 9 10
5 11 12 13 14 15 16 17
6 18 19 20 21 22 23 24
7 25 26 27 28 29
MARCH
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8 10 11 12 13 14 15 16
9 17 18 19 20 21 22 23
10 24 25 26 27 28 29 30
31
APRIL
S M T W T F S
11 1 2 3 4 5 6
12 7 8 9 10 11 12 13
13 14 15 16 17 18 19 20
21 22 23 24 25 26 27
28 29 30
MAY
S M T W T F S
1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31