Course Plan of 34760 Safety and Reliability in Robotic and Automation Systems

Plan of the course "Safety and Reliability in Robotic and Automation Systems" **Every Wednesday 1.00-4.30. p.m., at B306-A032, 2026**			
Date	**Topic(s)**	**Content** **(subtopic (s))**	**Note and Comments** **(N and C)**
4.2	Course structure and requirements	1. Course structure 2. Assignments and Final project	
	What is safety and reliability engineering in relation to robotic and automation system	History, facts, general definitions, disciplines within safety and reliability engineering, etc.	**Assignment 1.1** Read the article: *A Teaching Framework for Safety and Reliability of Robotic and Automation Systems* DOI:10.3850/978-981-18-5183-4_S10-04-211-cd
	Safety requirements	The machinery regulation and CE marking, and Q&A	**Guest lecture** by Pernille Bengtsen and Torben Dalsgaard from Dansk Standard **Assignment 1.2:** Using the e-learning tool for reviewing and testing your understanding of today's guest lecture. (https://standardsandmachinery.ds.dk/#/)
11.2	Fundamental concepts and terminology	1. Accident-Causation Theories 2. Safety consideration in life cycle of system 3. Human-machine Interaction and "Trust" 4. Functional safety and its standards 5. Risk and Risk Criteria 6. Barrier theories 7. Exercise	**Assignment 2.1** Making presentations for the exercise
18.2		Presentations by students	**Assignment 3.1** Improve the answers for the assignment 2.1
25.2	Hazard Identification Risk Estimation Risk Evaluation	1. Identify the limits 2. Hazard zones 3. Tasks and Hazard Identification 4. Risk Estimation 5. Risk Evaluation	**Assignment 4.1** Identify the limits of the robot and divide hazard zones for the robot **Assignment 4.2** Identify the tasks and hazards of the robot **Assignment 4.3** Risk evaluation of the robot
4.3	Risk reduction	1. Risk reduction procedure 2. Physical safeguards 3. Exercise	**Assignment 5.1** Watch the videos of FTA, HAZOP
11.3	Safety analysis	1. FTA exercise 2. HAZOP exercise 3 . Assignment 6.1	**Assignment 6.1** 1. Build a fault tree of the top event 2. Safety analysis
18.3	Reliability analysis	1. Diversity and redundancy 2. Reliability formulas and configuration 3. Mathematics of probability 4. FTA quantitative analysis	**Assignment 7.1** Improve assignment 6.1 and calculate the top event probability based on the improved fault tree reliability calculations
25.3	Functional safety in the industry	Feedback on assignment 7.1 and, Guest lecture from AgriRobot: 1. AgriRobot intro 2. Safety standards in Agriculture 3. Developing safe products-Process 4. Determining performance level for safety functions 5. Developing safety functions-Design 6. Developing safety functions-Process	**Guest lecture** by Tommy Ertbølle Madsen and Christian Metz from AgriRobot **Assignment 8.1** Propose risk reduction for all identified hazards based on assignment 4.3, for the safety-related parts of control systems that you propose for the risk reduction, please give the required performance level for those safety functions

	Easter holiday		
8.4	Functional safety in the industry	1. Feedback on assignment 8.1 2. IT guest lecture	**Guest lecture** by Kristen Nørgård Mogensen from Texas Instruments **Assignment 10.1** Digital twin assignment
15.4	Digital twin	Digital twin	**Guest lecture** by Haiyan Wu from Novo Nordisk from my PhD student, Linna Li
22.4 29.4 6.5	Final project	1. Final project requirements 2. Q&A	