Flexible automation with two cooperating industrial robots

Level: Bachelor/Master (1-2 students possible)
Duration: 2–3 months
Start: By agreement
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Institution: ETF Robotics

Overview and Technology: This robotic cell is a **flexible automation** workstation designed for pick-and-place, sorting, buffering, and simple assembly/kitting tasks with mixed objects. It combines two industrial robots—**ABB IRB120** and a **Denso robot**—supervised by a **UniLogic PLC**, with **two conveyor belts** feeding parts into the cell and **two storage locations** for placement/output. A key feature of the cell is its **dual-robot layout**: each robot has its own primary working area, plus a **controlled overlapping zone** where both robots can reach. This overlap enables flexible operation modes such as workload balancing, shared buffering, and rework handling. The conveyors provide continuous flow of parts, while sensor feedback ensures that picking happens only when objects are correctly positioned and identified. The PLC coordinates the motion of conveyors, manages part-flow logic, enforces safe access to the shared zone, and synchronizes robot cycles so the cell can adapt to different object types, storage rules, and production priorities with minimal mechanical changes.

Platforms / hardware	Software & tools
- ABB IRB 120 industrial robot - Denso VS6577 industrial robot - Unitronics UniStream PLC (+ HMI)	- ABB RobotStudio (offline programming & simulation) - Wincaps III (Denso programming/testing) - Unitronics UniStream/UniVision (PLC + HMI, I/O mapping)
Project options (projects can be modified based on student interests**)**	
- HMI process selector: palletizing vs. handover vs. coop pick-and-place - Collision-Safe Cooperative Pick & Place With Zone Interlocks - Two-Line Palletizing / Depalletizing	
Expected outcomes	**Recommended background**
- Literature review - Project code and documentation/video - Final report in IEEE research paper form	- Basics of industrial robot programming - PLC fundamentals (I/O, sequencing/state machines) - Structured testing & documentation
Literature	
- ABB RobotStudio tutorials - Denso Wincaps tutorials - UniLogic PLC+HMI tutorials	