Module Description

This module is based on the theory of cognitive apprenticeship. In this module, students are immersed in their company as a trainee technician. Students attend around 80 hr of formal training session where they further develop their skills in programming and troubleshooting PLCs and robotic arms. They learn to integrate vision systems and other sensors to their automated systems. In order to become engineers in the field of automation students also need to learn about manufacturing processes and quality control. Throughout the module they reflect on their work, learn about manufacturing processes and develop artefacts which include robotics, PLC, as well as vision systems.

Learning Outcomes

On completion of this module the learner will/should be able to:

1. Select the appropriate tools, methodologies and techniques to solve manufacturing problems, and design and implement solutions.
2. Program and troubleshoot a robotic arm integrating vision and other inputs.
3. Communicate findings to teams and management, and work effectively as a team member.
4. Describe and communicate how the regulatory constraints affect the operations of the company, and how ethical considerations affect their conduct as a technician.
5. Program and troubleshoot a PLC, integrating inputs and outputs.
6. Reflect on their experiential learning, and their ability to solve problems using a structured technical approach, and identify gaps.

Indicative Syllabus

The employer will train the student on:

- Relevant problem solving methodologies
- Team management and dynamics
- Common technical problems relevant to the workplace

The company will organise approved formal training in PLC, Robotic and IR vision. Indicative content:

**PLC**

1. Parametrizing of PLC Hardware components.
2. Writing simple LAD program for specific automation tasks
3. Debugging LAD Programs for specific automation tasks
4. PLC to HMI communication
5. Visualization of different automation tasks on the HMI (human machine interface)
6. HMI debugging.

**Robotic**

1. Robotics-Repeating motion instructions, parameters and options
2. Remote TCP
3. Motion commands, possibilities. (PTH, DO switch, Call, Time before, Distance before, Point logic)
4. System setup for external program selection and start (SELECT, RSR, PNS)
5. Program management from PLC or HMI.
6. Program select, start, stop, error handling.
7. Program parameterisation from PLC or HMI (speed setup).
8. Background logic, running programs in the background, RUN command.
9. Background edit.
10. Special I/O functions, analog signal handling, interconnect, universal marker bits (flag).
11. Common used workspaces (space function).

IR Vision Operation
1. Safety rules by working with robot
2. Introduction of FANUC iRVision system
3. Making layout – FOV, lens, shutter, lighting
4. Camera settings, calibration
5. Vision process types: 2D single view, 2D multi view
6. Shape recognise tools: GPM, CSM, histogram
7. Robot program: Vision commands, Vision registers

The company will allow students 4 hr/ week, as well as some technical support, to work on their technical project.

Teaching and Learning Strategy
The industry module’s learning strategy is centred around the cognitive apprenticeship theory framework, with the Industry supervisor providing modelling, coaching and scaffolding for the student. The student will learn programming of robotic arms and PLC as well as the integration of IR vision by attending formal approved training. They will develop their skill through project work.

The GMIT supervisor will organise a 4hr workshop every September where both students and industry supervisors will be introduced to the programme and the responsibility of both students and industry supervisor. The industry module will be discussed and the type of projects expected for the industry module will be explored.

At the beginning of semester 2, the GMIT supervisor will conduct a 4hr workshop to train the industry supervisor in mentoring students.

GMIT Engineering students transferring into year 2 will start attending their workplace for a minimum of one day per week in semester 2. This will allow the student to familiarise themselves with their company and explore the potential projects that could be completed and their feasibility.

Students, Industry supervisor and GMIT supervisor will then meet and agree a learning plan for the industry module. This will include the Company Certified Automation training to be attended, the type of work done for the employer, the project to be conducted and indicative weekly schedule of work to allow time to complete the project work. The industry supervisor will be expected to support the student in its project work and provide technical support.

Assessment Strategy
Attendance at around 80 hr training in company certified automation is mandatory in this module. The module will be failed unless the student can provide evidence of attendance at the training programme as agreed with their Academic supervisor. The learning outcomes of the training will be assessed through the technical projects of the module.

The module will be marked on the following assessment submissions:

- **Reflective logbook** assessed by the academic supervisor.
- **Process study** on how the regulatory constraints affect the operations of the company, verified by the industry mentor and assessed by the academic supervisor.
- **Two projects** demonstrating their ability to programme PLCs and Robotic arms, as well as the integration of a vision system respectively.

**Reflective Logbook**
In order to facilitate this process, students will be expected to complete a weekly online reflective logbook as part of each Industry module assessment. One of their GMIT supervisor’s responsibilities will be to review their first two entries in the Logbook and give them feedback on where and how to incorporate reflection. The students will be expected to make a minimum of 13 entries in their logbook. The academic supervisor will mark 5 of the entries. The basis for the reflection being:

- How they meet the learning outcomes of the module
- What challenges they have encountered

The academic supervisor will assess the level of reflection achieved in the Logbook using a rubric.

**Process Study**
This will take the form of a short report, which will describe a relevant aspect of the company.
The student, supervisor and mentor will be provided with a Process Study Description Document outlining the nature of the report. It will include formatting guidelines, marking scheme, and the required chapters.

Technical Project

The projects will be specified by the student and the Industry Mentor before the end of the GMIT Block, and a Project Charter drawn up. This will then be reviewed by the GMIT Project Supervisor, and once approved, the student is expected to be ready to start the project as early as possible into the Industry module. The output of the first project will be an artefact demonstrating the student level of expertise in PLC programming. The second project will demonstrate the level of expertise in robotic arm programming with the integration of a vision system.

Repeat Assessment Strategies

The repeat opportunity will be reviewed by the programme board on an individual basis. The process study, reflective logbook and project work could be resubmitted, but the programme board will decide if all or only some of the assessments should be resubmitted. If the module is failed due to a lack of attendance at the training, then the student should take the training at the next opportunity and resubmit the project work.

Indicative Coursework and Continuous Assessment:

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<th>Percent</th>
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<td>Process Study</td>
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Blended Delivery Mode Average Weekly Workload:

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Recommended Reading Book List


Literary Resources

Industry-specific reading.

The Book List from each module will apply to this Industry Module.

Online Resources

Industry-specific website.

GMIT Moodle support learning system.

Programme Membership

GA_EAURG_B07 202000 Bachelor of Engineering in Automation & Robotics
GA_EAURG_C06 202000 Higher Certificate in Engineering in Automation & Robotics