Integrated Industrial Technology

2020
ANNUAL REVIEW OF PROGRAM DATA

LEEWARD
COMMUNITY COLLEGE
1. Program or Unit Description

The Integrated Industrial Technology offers an Associate in Science Degree (AS-IIT) as well as a Certificate of achievement and Certificate of Completion. The AS-IIT degree is a 61-credit degree program intended to provide students with a foundation in electronic, electrical, mechanical, and automated control systems to meet the workforce needs of an emerging industrial technology industry.

This program provides students with a theoretical and practical understanding of mechatronic systems and develops practical skills and systems integration. Graduates will be able to program, operate, maintain, calibrate, and repair the equipment that makes up these systems.

The degree prepares students for occupations that involve the integration of electronic, electrical, mechanical, and communications systems. Typical occupations may include automated programmable electromechanical systems technicians, robotics and manufacturing systems technicians, and process control systems integration technicians.

The IIT degree and certificate programs are open to anyone, however recruitment for program participants is primarily focused in three areas: High school graduates, military veterans, and industry professionals. Additionally, the program provides an alternative graduation pathway for students that are not able to complete the more rigorous Associate in Science - Natural Science (ASNS) program.

The program coordinator and program counselor use a recruiting strategy that helps to identify potential students that have both an aptitude and desire to pursue a career field in mechatronic technology. In partnership with Kamehameha schools, the program is sponsoring summer camps and outreach counseling at public high schools in West Oahu to identify potential students as early as sophomore year of High School.

The program provides a clear structured pathway for both full and part time students, program courses are typically scheduled afternoons and evenings to and is designed to provide an opportunity for adult learners (industry professionals) to return to attain a degree in their profession. The program take advantage of the existing Prior Learning Assessment (PLA) program and provides an avenue for adult learners to earn a degree faster than traditional students.

2. Analysis of the Program/Unit

The Integrated Industrial Technology Program is a relatively new offering for Leeward CC. The program received probationary approval from the UH Board of Regents in Spring 2017. The first cohort of students started in Spring 2018, followed by three additional cohorts beginning in fall 2018, fall 2019, and fall 2020. The unduplicated head count for the program stands at 69 students.

The program is cautionary, primarily due to the BOR probationary status, however the prospects for the program’s health are positive in terms of graduates and incoming freshmen.
To remain viable, relevant, and productive, Leeward CC must provide programs and services that are responsive to student choice and the economic demands of industry and businesses. The Integrated Industrial Technology Associate in Science Degree program was developed in response to a rapid increase in demand for electromechanical and mechanical engineering technicians by Hitachi Rail Honolulu. The company projects hiring approximately 150 electromechanical technicians in the next 4 years. To date Hitachi has recruited and hired 83% of the IIT program graduates. Combined with an increased need for technicians in the food and beverage manufacturing, and public utility industries, the demand for IIT program graduates to fill high skill high wage career positions in Hawaii is high.

The program does not have a full-time teaching faculty assigned; thus, the courses are taught by lecturers. When the program is awarded permanent status by the UH board of Regents, the campus will have more latitude to hire a full-time teaching faculty assigned to the IIT program.

The IIT program student demographics indicate a diverse student population in terms of age group, veteran status, ethnicity, and full vs part time student. There is a considerable gender gap with females being significantly underrepresented (12%).

3. Program Student Learning Outcomes or Unit/Service Outcomes

The Associate in Science in Integrated Industrial Technology is a technology driven, purpose-built multidisciplinary degree program designed to meet the needs of Hawaii companies. The program learning outcomes reflect the broad spectrum of technical specialties incorporated into the coursework.

- **Apply the principles of mathematics, electronics, mechanical systems, and controls systems to program, maintain, calibrate, and repair advanced integrated systems in manufacturing and transportation.** IIT-271 Distributed Control Systems, and IIT 281 SCADA systems incorporate the knowledge and skills gained in all previous coursework. Students design, program, and calibrate an industrial mechatronic system, troubleshoot, and repair mechanical and software faults.

- **Use appropriate safety, health, and personal protection procedures applicable to an industrial working environment.** IIT 171- Safety, Health and Environment is a 1st semester course that establishes the academic foundation of safety, health, and personal protection. Reinforced by instructor led practical applications in concurrent 1st semester courses IIT 121 Electro hydraulics and Pneumatics and IIT 131 Mechanical Drive Systems. 3rd semester lecture/lab courses IIT 231- Instrumentation and IIT 251 motor and motion control provide practical application of concepts in electrical and arc flash safety as well as safety requirements for lock out tagout and safeguards for rotating machinery.
• Demonstrate an understanding of the structure and function of mechatronic systems and follow a logical sequence for isolating problems within an industrial process. IIT-271 Distributed Control Systems, and IIT 281 SCADA systems incorporate the knowledge and skills gained in all previous coursework to troubleshoot and repair mechanical and software faults in several mechatronic systems including the SMC IPC-200 which emulates a liquid production and bottling plant and includes the technologies used in the continuous process industry, such as pneumatics, electric motors, sensors, continuous processes, programmable controllers, and industrial communications.

• Analyze process control system operations and select the appropriate sensing equipment for that operation. IIT 231 Process Instrumentation provides students with both knowledge and practical application of sensors and sensing equipment using Simtronics process simulation software and Arduino Input/Output sensor programming.

• Analyze the operating difficulties of an automated system and perform the corrective actions needed. Students are introduced to troubleshooting in 1st semester courses IIT 121 and IIT 131. IIT 171 Principles of Process Quality provides a theoretical foundation in analysis of variance. IIT 231 expands on ANOVA by introducing variability in both product and the instruments used to measure variance. Students utilize Xbar R charts to analyze process variability and stability.

• Utilize proper procedures for inspection, preventive maintenance, and corrective maintenance of integrated industrial systems. 3rd semester courses IIT 251- Motors and Motion Control and IIT 201 DC and AC Circuits provide foundations in preventative and corrective maintenance and inspection of integrated industrial systems. IIT 281 SCADA systems provides students with practical experience in corrective maintenance of control and data acquisition hardware and software.

• Demonstrate an understanding of the theory, construction, installation and operation of hydraulic and pneumatic systems in an automated controls environment. 1st semester course IIT 121 is a comprehensive study of fluid power systems that includes practical exercises and instructor led projects using a fluid power demonstration trainer. Concepts are reinforced in IIT 231, process instrumentation by incorporating electrohydraulic control using input and output sensors.

• Demonstrate an understanding of mechanical drive systems, their function, and the operation in an automated controls environment. IIT 131 Mechanical Drive Systems provides students with both theoretical and practical application of a variety of mechanical Drive Systems.

• Apply principles of process quality assurance to an automated control environment. IIT 151 principles of Quality provides a comprehensive study of root cause analysis, the primary troubleshooting methodology employed to determine defective equipment and systems.
- **Use CAD/CAM to create drawings of parts and assemblies to create prototypes using additive manufacturing.** IIT 151 Rapid Prototyping provides students with the knowledge and skills to design 3 dimensional objects using CAD software. Students design parts and assemblies of common industrial equipment and translate that data to a computer aided manufacturing equipment for production. Students are introduced to both additive and subtractive manufacturing processes to manufacture parts and assemblies.

The Integrated Industrial Technology AS Degree program was awarded probationary status by the UH Board of Regents in April 2017. The program coordinator and Math and Science Division Chair are continuously evaluating the coursework through a variety of methods, including a Business and Industry Leadership Team (BILT). The data collected since the start of course offerings will be evaluated and used to apply for permanent program status in summer 2021.

### 4. Action Plan

At Leeward Community College, we work together to nurture and inspire all students. We help them attain their goals through high-quality liberal arts and career and technical education. We advance the educational goals of all students with a special commitment to Native Hawaiians.

The Integrated Industrial Technology AS degree and certificate programs at Leeward CC provide students on O‘ahu with a foundation in electronic, electrical, mechanical, and automated control systems to prepare them for high skill-high wage career jobs that meet the workforce needs of an emerging industrial technology industry in Hawaii. In keeping with the college mission, we foster students to become responsible global citizens locally, nationally, and internationally.

The IIT program must stay current with rapidly changing technology and stay connected with local industry to ensure we are meeting the requirements of local employers.

To accomplish this the program is participating in a National Science Foundation initiative, *Pathways to Credentials*. The intent is to align the IIT curriculum with national credentials that are stackable, portable, and aligned with industry needs. We are piloting an industry advisory group project called a *Business and Industry Leadership Team* (BILT). The BILT aims to shift the emphasis of industry input from the traditional evaluate and critique methodology to a collaborative instructional design model. The intent of this pilot project is to determine if IIT can sustain multiple specializations to fully support multiple industry sectors.

The program was awarded a grant from Kamehameha Schools to develop a long-term outreach and recruiting program to engage high school students in career exploration, technical camps, and early college experiences for underserved populations. Additionally, I want to develop strategies to encourage young women to consider a career in mechatronics.
5. Resource Implications

The IIT program falls under the administrative control of the Math and Science Division. The IIT program was initially developed for workforce development and courses are concurrently offered as credit bearing courses and non-credit bearing workforce development courses. The faculty that designed and taught the IIT workforce development courses is the discipline coordinator for the IIT degree. The IIT discipline coordinator is an 11-month faculty that is responsible for both the credit bearing and workforce development programs, there is no overload cost to the college for coverage of the IIT discipline coordinator duties. All classroom and laboratory equipment as well as consumables are presently being furnished by the Office of Workforce development.

Beginning in fall 2021 the math and Math and Science Division should budget for the purchase of consumables, annual subscription to online content, software update fees, and equipment maintenance. Long term budgeting for the replacement of laboratory assets will be determined following the transition of the IIT program from probationary to permanent status.

I am NOT requesting additional resources for my program/unit.