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UNIVERSITY of HAWAI'I
LEEWARD
COMMUNITY COLLEGE

Office of the Chancellor

UNIVERSITY OF HAWAII
BOARD OF REGENTS
'23 APR 26 P2:03

March 30, 2023

MEMORANDUM

TO: Randolph G. Moore
Chair, Board of Regents

VIA: Ernest Wilson
Chair, BOR Committee on Academic and Student Affairs

VIA: David Lassner
President

VIA: Debora Halbert
Vice President for Academic Strategy

VIA: Della Teraoka
Interim Associate Vice President for Academic Affairs, Community Colleges

FROM: Carlos Peñaloza
Chancellor

SUBJECT: REQUEST TO CHANGE THE ASSOCIATE IN SCIENCE IN INTEGRATED INDUSTRIAL TECHNOLOGY DEGREE FROM PROVISIONAL TO ESTABLISHED

SPECIFIC ACTION REQUESTED:

It is requested that the Board of Regents approve from provisional status to established status to the Associate in Science degree in Integrated Industrial Technology (IIT).

RECOMMENDED EFFECTIVE DATE:

Upon Board of Regents Approval

ADDITIONAL COST:

None

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PURPOSE:

The purpose of the Associate in Science degree in IIT is to address the current and future workforce needs in manufacturing and transit systems in Hawai'i by providing the education and skills required for a variety of automation and control related occupations.

BACKGROUND:

Board of Regents Policy, RP 5.201, Section III.B.2, states "...request to the board for "established" program status shall be submitted in the academic year following the end of the program's first full cycle." Board of Regents approval of provisional status for the Associate in Science (AS) degree in Integrated Industrial Technology was granted on January 26, 2017, with a recommended effective date of Fall 2017. A request for an extension of a two-year term was requested and granted in February 2021 due to the pandemic and associated academic disruptions. The extension provided Leeward Community College (Leeward CC) time to conduct a review of current degree and certificate programs and align them to Hawai'i's workforce needs. This proposal is requesting the program be granted established status in Spring 2023.

The increasing use of industrial automation across multiple workforce sectors in Hawai'i has placed a strain on the availability of trained and qualified electro-mechanical technicians and systems integrators in the state.

The IIT Program graduates highly skilled technicians with a technology driven, purpose-built, multidisciplinary degree that supports a shift to industrial automation across multiple industries. Demand for program graduates is high, automation technology is evolving rapidly and penetrating more and more industries such as manufacturing, food and beverage production, transportation, and building automation. This degree is structured to evolve with technology, and ensure that students are proficient in both new and legacy systems.

The IIT curriculum was developed collaboratively with local subject matter experts in manufacturing, automation, and transit systems and aligns with the workforce needs of the states emerging reliance on industrial automation across multiple industries and aligns with the Leeward CC Mission, the UHCC Strategic Plan, and the new UH System Policy on Sustainability.

The IIT Program integrates well with several degree programs at Leeward CC where faculty from IIT, Sustainable Agriculture, Information and Computer Science, and the Associate in Science in Natural Science programs work together to develop student projects designed to have students from different disciplines collaborate.

The most recent example is IIT and the Sustainable Agriculture Program where students from both programs work together on a project in agricultural automation

technology. With collaboration, the IIT and the Sustainable Agriculture Programs will prepare future farmers with the knowledge, skills, and abilities to incorporate automation into farming techniques. Additionally, the UH West O'ahu's Bachelor of Applied Science in Facilities Management is a logical next step for IIT graduates that want to pursue a bachelor's degree.

ACTION RECOMMENDED:

Recommend approval to change from provisional to established status, Associate in Science degree in Integrated Industrial Technology.

Attachment:
1. Provisional to Established Status Associate in Science (AS) in Integrated Industrial Technology

c: Interim Executive Administrator and Secretary of the Board of Regents Jamie Go

UNIVERSITY of HAWAI'I®

LEEWARD
COMMUNITY COLLEGE

Presented to the
University of Hawai‘i Board of Regents

Provisional to Established Status

Associate in Science (AS) in Integrated Industrial Technology

Submitted: Spring 2023

Table of Contents

1. Executive Summary

Background

Leeward Community College (Leeward CC) proposed a two-year Associate in Science (AS) degree in Integrated Industrial Technology (IIT) in December 2016 and received University of Hawai'i (UH) Board of Regents approval to offer the degree program beginning in fall 2017 with IIT courses first offered in spring 2018.

The AS in IIT degree was developed in consultation with representatives from UH Community College (UHCC) campuses that offer analogous curriculum such as the Electrical Installation & Maintenance Technology (EIMT), Electronic & Computer Engineering Technology (ECET), and Electronics Technology (ET) Programs, and with input from campus advisory committees, and representatives from industry.

The IIT Program was developed to provide students on O‘ahu with a foundation in electronic, electrical, mechanical, and automated control systems to meet the workforce needs of an emerging industrial technology industry. The IIT Program provides students with a theoretical and practical understanding of mechatronic systems as well as develops practical skills in troubleshooting, preventative and corrective maintenance, and systems integration. Students apply basic engineering principles and technical skills to install, calibrate, modify, and maintain automated systems.

The IIT Program includes coursework in mechanical systems, fluid power systems, control systems, Computer-Aided Design (CAD), analog and digital electronics, and motion control that prepares students for high-skill and high-wage occupations that involve the integration of electronic, electrical, mechanical, and communications systems. Typical occupations include automated programmable electromechanical systems technician, robotics and manufacturing systems technician, and process control systems integration technician.

UH BOR Provisional Status Approval

The BOR approved the provisional AS degree in IIT on January 26, 2017, with a recommended effective date of Fall 2017.

Reason for a Delay in Seeking Established Status

Leeward CC requested and was subsequently granted a two-year extension of the IIT program's provisional status in February 2021 due to the pandemic and associated academic disruptions. The extension provided Leeward CC time to conduct a review of current degree and certificate programs and align them to Hawai'i's workforce needs. This proposal is requesting the program be granted established status in spring 2023.

2. Alignment of Program with Mission and Strategic Planning of the Campus and University System

Leeward CC Mission Statement: 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 foster students to become responsible global citizens locally, nationally, and internationally. We advance the educational goals of all students with a special commitment to Native Hawaiians.

Program Mission: The mission of the IIT Program is to educate and train highly skilled technicians with a technology driven purpose-built, multidisciplinary degree program that supports Hawai'i industries shift to industrial automation.

The AS in IIT aligns with:

a. The Leeward CC mission by providing a STEM based Career and Technical Education Program that leads to high-skill, high-wage careers in Hawai'i.

b. The *2015 – 2021 UH Strategic Directions* regarding the Hawai'i Graduation Initiative Action Strategy 3 - anticipate and align curricula with community and workforce needs. The IIT curriculum was developed with input from local subject matter experts in manufacturing, automation, and transit systems.

c. The *2015 – 2021 UHCC Strategic Directions* regarding the Hawai'i Innovation Initiative by developing and offering mid-level technician training in STEM related Jobs and delivering programs and training needed for a qualified workforce in existing and emerging careers. The following are objectives that the IIT Program addresses.

1. Increase access to STEM programs and provide distance and hybrid opportunities in STEM education.
2. Create specific pathways into baccalaureate programs in data science and cybersecurity, biotechnology, engineering, physical sciences, and

other in-demand fields using meta majors.
3. Increase credit and non-credit programs to prepare students for high-skill, high-wage, and in-demand jobs.
4. Identify new programs and opportunities that align with the community needs and workforce demands.

3. Alignment to the Needs of Local Industry

A key aspect of educating a technical workforce in emerging technologies is for community colleges and employers to work together to identify the requisite knowledge, skills, and competencies necessary for success in the industry, identify skill gaps in existing technical education programs, and develop curriculum that properly prepare graduates for careers in the industry.

In 2013, Leeward CC formed a working group with Honolulu Area Rapid Transit Authority (HART), and the rail system operations and maintenance contractor, Ansaldo Honolulu/Hitachi Rail Honolulu. The working group conducted an extensive analysis of the knowledge, skills, and aptitudes described in the Honolulu Rail Transit Project Operations and Maintenance position descriptions *(DOC CODE HNL09009 Rev 2.0),* compared the results with the local workforce and determined that Hawaii lacks the workforce skills required. The rail contractor has a requirement to hire locally to the greatest extent possible and were concerned that they would not be able to fulfill their mandate. They requested Leeward CC to develop an educational program to train technicians with the skills sets they required.

Hitachi Rail Honolulu intends to employ a substantial workforce of over 150 employees, including over 100 electronic and electro-mechanical technicians and systems integrators. This is evident in the Honolulu Rail Transit Project Operations and Maintenance management plan below in Table I (DOC CODE HNL-09005).

Table I: Hitachi Operations and Maintenance Plan

Position	Manning Level
First Line Response Team	13
Leading Vehicle Technicians	07
Passenger Vehicle Technician	35
Maintenance and Storage Facility Equipment Technician	03
Infrastructure leading Technician	07
Train Controls Technician	08
Platform Screen Gate Technician	08
Communication Technician	03
Maintenance and Storage Facility Technician	03

Fare and Vending Technician	07
Guideway and Contact Rail Technicians	12
Power and Electric Plant Leading Technicians	03
Electro-Mechanical Technician MSF	04
Traction Electronics Technicians	06
SCADA Technicians	02
Total	**121**

The use of industrial automation in the state of Hawai'i has risen considerably in the past several years. Local manufacturing plants as well as public utilities such as wastewater treatment, Board of Water Supply, and power plants are upgrading and modernizing systems and processes. Food and beverage production plants such as water bottling, corrugated cardboard, and commercial bakeries are replacing outdated analog equipment with more efficient and "smart" systems that are part of an integrated automated control network. The use of industrial automation reaches beyond manufacturing and production and is being installed in building management systems, emergency power systems, and warehouse distribution centers such as Fed-Ex, UPS, and Amazon.

Agriculture is a sector where processes are being automated with technologies that have been adapted to farming. The agricultural industry is using specialized machinery and control systems that use automation and artificial intelligence to improve the farming process resulting in an optimization of the harvesting process, greater efficiency in pest control, increased yields, increased production efficiency, and reduced environmental impact of fertilizers and pesticides.

The increasing use of industrial automation across multiple workforce sectors in Hawai'i has placed a strain on the availability of trained and qualified electro-mechanical technicians and systems integrators in the state. Leeward CC determined that there was sufficient demand to propose a new academic program, Integrated Industrial Technology (IIT), to help meet the needs of multiple industries.

Using the results of the working group and input from the local manufacturing industries, Leeward CC developed coursework designed to provide the necessary education to meet the minimum qualifications for employment in transportation and local manufacturing industries. Companies can now confidently incorporate automation into their processes because there are trained technicians to program and maintain the equipment.

The IIT Program addresses the current workforce needs in manufacturing and transit systems. The degree program provides the education and skills required for a variety of automation and control related occupations, allows graduates to enter the workforce with higher-level skills and training, and provides a more direct path from technical positions to front line supervisory and management positions.

The IIT Program is designed with an open architecture so that it can be expanded to include areas of specialization in Computer Numerical Control (CNC) manufacturing, robotics, process technology, and controls technology. The coursework for each of those areas of specialization is currently offered as non-credit workforce development programs.

4. Classification and Demand

Program Classification

The IIT Program is listed under the Classification of Instructional Programs (CIP) Code of 15.0406 "Automation Engineer Technology/Technician", a program that prepares individuals to apply basic engineering principles and technical skills in support of engineers and other professionals engaged in developing, installing, calibrating, modifying, and maintaining automated systems. Coursework includes instruction in computer systems; electronics and instrumentation; programmable logic controllers (PLCs); electric, hydraulic, and pneumatic control systems; actuator and sensor systems; process control; robotics; applications to specific industrial tasks; and report preparation. CIP code 15.0406 cross references to several SOC codes including the following:

- 17-3023 - Electrical/Electronic Engineering Technologists and Technicians
- 17-3024 - Electro-Mechanical Technologists and Technicians
- 17-3026 - Industrial Engineering Technologists and Technicians
- 17-3027 - Mechanical Engineering Technologists and Technicians
- 17-3029 - Manufacturing Production Technologists and Technicians

Industry Demand for Program Graduates (Hawai'i)

Students that successfully complete the IIT Program will obtain the entry level skills for the above occupations. The following table reflects the New & Replacement Positions for the State and County Prorated. The position numbers in the archived instructional Annual Report of Program Data (ARPD) reports from 2017-18 and 2018-19 were based on Emsi Burning Glass (now known as Lightcast) old methodology. Since the data from

2017 – 2019 is not consistent with data from 2019 – 2022, data from these first two years are not included in this table.

Table II: Demand Indicators

Demand Indicators	2017-18	2018-19	2019-20	2020-21	2021-22
New & Replacement Positions (State)	No accurate data available	No accurate data available	113	86	54
New & Replacement Positions (Prorated County)	No accurate data available	No accurate data available	78	63	47

5. Program Enrollment and Graduation of Students

Leeward CC promotes the IIT Program using traditional avenues of communication including the Leeward CC website with an IIT landing page, social media, and print media available in the counseling offices. The program coordinator actively promotes the program to high schools, military transition offices, the Leeward CC Kīpuka - Native Hawaiian Center at Puʻuloa, and industry partners. In 2019 the UHCC system office provided resources to produce an informational video that is available on the Leeward CC IIT landing page and was broadcast several times by local media outlets. Promotional efforts were curtailed in 2020 due to restrictions on face-to-face activities imposed by the state's emergency order for social distancing. The following tables show the Demand, Efficiency, and Effectiveness Indicators of the IIT program.

Table III: Program Enrollment

Demand Indicators	Year 1 2017-18	Year 2 2018-19	Year 3 2019-20	Year 4 2020-21	Year 5 2021-22
Projected Number of Majors	20	20	20	20	20
Actual Number of Majors	7	27	36	38	38
Number of Majors Native Hawaiian	2	6	6	7	7
Fall Full-Time	67%	78%	76%	68%	54%
Fall Part-Time	33%	22%	24%	32%	46%
Spring Full-Time	64%	65%	39%	57%	32%
Spring Part-Time	36%	35%	61%	43%	68%
SSH Program Majors in Program Classes	0	345	558	635	545
SSH Non-Majors in Program Classes	0	116	81	18	40
SSH in All Program Classes	0	461	639	653	585
FTE Enrollment in Program Classes	0	15	21	22	20
Total Number of Classes Taught	0	11	15	12	12

In Table III, note the variance between the projected and actual number of majors in 2017 - 18. Though students were enrolling in the courses during the 2017 - 2018 period, it wasn't until the second year of the program that declared majors started to appear. Over the last four years, declared majors have held steady at an average of 36 - 38 students.

There has also been a steady increase in the total number of students taking IIT courses. Table III outlines students with declared majors in the IIT Program, non-IIT majors and a total in the program courses. The figures indicate an increase in the number of student semester hours in IIT courses. Given the steady increase in SSH this is a leading indicator of program growth.

Table III also shows the ratio of full-time to part-time students. The program has an average of 60% full-time student population. However, in spring 2020 the percentage of part time students increased dramatically and can be attributed to the pandemic, as many students opted to shift to part time. As the impact the pandemic had on student enrollment and participation diminishes, we anticipate a marked increase in enrollment.

Table IV: Efficiency Indicators

Efficiency Indicators	Year 1 2017-18	Year 2 2018-19	Year 3 2019-20	Year 4 2020-21	Year 5 2021-22
Average Class Size	7	13	12	16	14
Fill Rate	28%	52.4%	49.6%	63.7%	57.7%
FTE Appointed Faculty	1*	1*	1*	1*	1*
Majors to FTE Appointed Faculty	0	0	0	0	0
Majors to Analytic FTE Faculty	0	27	18	19	19
Analytic FTE Faculty	0	1	2	2	2
Number of Low-Enrolled (<10) Classes	0	6	3	0	1

*One full-time 11-month faculty/coordinator divides his time to teach and coordinate the IIT Program through the Math and Science Division and his responsibilities in the Office of Continuing Education & Workforce Development (OCEWD). Two to four lecturers also teach the IIT courses.

Table V: Program Completion

Effectiveness Indicators	Year 1 2017-18	Year 2 2018-19	Year 3 2019-20	Year 4 2020-21	Year 5 2021-22
Successful Completion (Equivalent C or Higher)	0%	84%	88%	93%	98%
Persistence Fall to Spring	0	78%	87%	80%	86%
Persistence Fall to Fall	0	63%	56%	65%	54%
Unduplicated Degrees/Certificates Awarded	0	12	23	22	20
Degrees Awarded	0	0	9	11	11
Certificates of Achievement Awarded	0	5	14	9	4
Certificates of Competence Awarded	0	12	14	9	11
Transfers to UH 4-yr	0	0	1	1	2

Table V indicates that there has been a consistent number of certificates awarded to students completing the program. Successful stacking of the credentials has helped students to earn the certificates during their time at Leeward CC.

6. Instructional Resources

Faculty & Staff Resources

Leeward CC has one full-time 11-month faculty/coordinator who developed and presently coordinates the IIT Program through the Math and Science Division. This faculty divides his duties between coordinating the IIT Program and coordinating the Industrial Technology workforce development programs through OCEWD. The degree program has one counselor assigned to advise students on the program.

Table VI: Faculty & Staff Resources

Personnel	Year 1 2017-18	Year 2 2018-19	Year 3 2019-20	Year 4 2020-21	Year 5 2021-22
Projected Tenured Faculty	0	0	0	1	1
Actual Tenured Faculty	0	0	0	1	1
Projected Lecturers	2	2	4	4	4
Actual Lecturers	3	3	5	3	2

Table VII: Instructional Resources

Instructional Resources	Year 1 2017-18	Year 2 2018-19	Year 3 2019-20	Year 4 2020-21	Year 5 2021-22
Tuition/Course Fees	$8,488	$61,368	$84,895	$87,485	$78,793
Other Allocation (Grants)	$0	$160,000*	$0	$0	$0

*Rapid Response and Perkins Grants

Table VIII: Operating Costs

Operating Costs	Year 1 2017-18	Year 2 2018-19	Year 3 2019-20	Year 4 2020-21	Year 5 2021-22
Projected Operating Costs (from Provisional proposal)	$96,738	$144,316	$151,975	$155,000	$160,000
Actual Operating Costs	$13,725	$218,399*	$85,164	$71,408	$74,967
General Funded Budget Allocation	$13,725	$58,399	$85,164	$71,408	$74,967

*Grant funds of $160,000 were used for capacity building.

Physical Resources

Leeward CC has a dedicated classroom/laboratory facility that houses all IIT related training equipment, materials and supplies. The lab facility is shared between the IIT program and industrial technology workforce development/apprenticeship courses. During the initial development of the curriculum, Leeward CC acquired over $600,000 in equipment, materials, and supplies through two grant funded projects: 1) The *Department of Energy Grant DE-OE0000430* to develop a Smart Grid Technology Training/Degree program. 2) The *Trade Adjustment Assistance Community College and Career Training Grant (C3T) from 2011 – 2014.* Additionally, the program received a $136,000 Rapid Response grant from UHCC system and $24,000 from Perkins grant in 2018 to build capacity for both IIT and workforce development/apprenticeship courses.

Table IX: Physical Resources

Quantity	Description	Courses that utilize the equipment
1	Motor Control Systems Trainer	IIT 251
1	Modular Chemical Reactor	IIT 221, IIT 271
1	Rigging Systems Trainer	IIT 131
10	Rockwell Studio 5000 Programming Software	IIT 221, IIT 271, IIT 281
10	Rockwell 5380 Programmable Logic Controller	IIT 221, IIT 271, IIT 281
12	Siemens TIA Portal Programming Software	IIT 221, IIT 271, IIT 281
12	Siemens S7-1200 Programmable Logic Controller	IIT 221, IIT 271, IIT 281
15	NIDA Electronics Training System	IIT 201, IIT 205, IIT 251
1	Mechanical Drive Systems Trainer	IIT 131
1	Fluid Power Systems Trainer(hydraulic/Pneumatic	IIT 121
27	Automation Studio Systems Integration Software	IIT 121, IIT 221, IIT 271, IIT 281
6	3D printers	IIT 151
1	CNC 2D mill	IIT 151
1	CNC Laser cutter/engraver	IIT 151
115	Electronic Test Equipment	IIT 201, IIT 205, IIT 221, IIT 271, IIT 281
1	SMC IPC 200 Water Bottling System	IIT 271, IIT 281
8	Motor Control Cabinet Trainer	IIT 251
10	PLC SCADA Cabinet Trainer	IIT 221, IIT 271, IIT 281
2	Power Distribution and Load Trainer	IIT 271, IIT 281
10	Desktop PC	IIT 201, IIT 205, IIT 231
24	Laptop PC	IIT 201, IIT 205, IIT 231

The physical resources that support the IIT Program are sufficient to accommodate course sections of up to twenty-five students. As the program grows, additional resources will be required to support additional students. Expenses to support the

equipment, and purchase consumables are shared between the IIT Program, and workforce training programs.

Library Resources

The IIT Program takes full advantage of open educational resources. Since courses are offered using a hybrid online and face to face modality, the program utilizes 2 learning management systems NIDA, and Amatrol to deliver content that students can access anywhere. The program coordinator maintains a robust technical library available to students upon request. The Leeward CC library has additional technical and research resources available to students including research assistance, loaner computers, copy services, a Learning Resource Center and a Writing Center.

The IIT and workforce development programs are a collaborative effort between the Math and Science Division and OCEWD. The programs share resources including the faculty program coordinator, teaching faculty, equipment, supplies, and laboratory facilities. The collaborative effort and shared assets give the program flexibility to provide students in workforce training credit for the course work they completed, and degree seeking students are eligible to sit for national certification exams from:

- The Association of Packaging and Processing Equipment (PMMI)
- The National Institute for Metalworking Skills (NIMS)
- Smart Automation Certification Alliance (SACA)

Program Efficiency

The IIT Program has made significant gains in efficiency over the past five years. Class size and fill rates increased and will continue to increase as the program restarts outreach and recruitment efforts. Program expenditures remained stable and are attributed to the cost of lecturers. IIT was initially developed as workforce development. The faculty that developed, and presently coordinates the degree program is internally assigned as the coordinator for both the AS degree and the workforce courses. When the IIT program is designated as an established program, the faculty will be reassigned to the Math & Science Division, thus decreasing the program expenditures and increasing efficiency.

Program Effectiveness

The course completion rate for IIT is consistently in the 90-percentile range. Persistence from fall to spring and fall to fall have remained consistently above 60%. Additionally, withdrawals are low six withdrawals over four academic years, the low withdrawal rate is attributed to the clear path to completion and excellent counseling. The number of degrees and certificates awarded is consistent from year to year. Successful stacking of the credentials has helped students to earn both certificates and an AS degree during their time at Leeward CC.

Program Performance

Conferring of certificates and degrees is the primary indicator of program performance. IIT has had much success in getting students to complete both certificates and the AS degree. Most program graduates are entering the workforce with high-skill, high-wage positions, while a few have opted to continue their education in a UH 4-year program. More and more employers are learning of the program and encouraging students to move directly to employment.

Program Learning Outcomes (PLOs):

Upon successful completion of the IIT Program, graduates will be able to:

- Apply the principles of mathematics, electronics, mechanical, and controls systems to program, maintain, calibrate, and repair advanced integrated systems in manufacturing and transportation.
- Incorporate appropriate safety, health, and personal protection procedures applicable to an industrial working environment.
- Demonstrate an understanding of the structure and function of mechatronic systems and follow a logical sequence for isolating problems within an industrial process.
- Analyze process control system operation and select the appropriate sensing equipment for that operation.
- Analyze the operating difficulties of an automated system and perform the corrective actions needed.
- Utilize proper procedures for inspection, preventive and corrective maintenance of integrated industrial systems.

The IIT Program includes twelve IIT specific courses (42 Credit Hours), and six general education courses (19 Credit Hours). The recommended course sequence for the 15 credit Certificate of Competence (CO), the 31 credit Certificate of Achievement (CA), and the 61 credit Associate in Science degree is shown in Table IX. IIT courses in the first and second semester do not have prerequisites for enrollment. This provides students with the flexibility to start the program in either the fall or spring semester.

The campus is exploring the possibility of shifting to a year-round program schedule that would allow students to complete the degree program in 18 months. Adjusting the IIT Program to a year-round schedule will make more efficient use of the program resources and be in sync with the year-round workforce development training offered through OCEWD.

7. Program Organization

Table X: Projected versus Actual enrollments

Academic yr.	2017-2018	2018-2019		2019-2020		2020-2021		2021-2022		2022-2023
Semester	Spring 2018	Fall 2018	Spring 2019	Fall 2019	Spring 2020	Fall 2020	Spring 2021	Fall 2021	Spring 2022	Fall 2022
Projected Courses	3	5	6	10	5	7	5	7	5	7
Actual Courses	3	5	6	10	5	7	5	7	5	7
Projected Sections	3	5	6	10	5	7	5	7	5	7
Actual Sections	3	5	6	10	5	7	5	7	5	7
Seats	75	125	150	250	125	175	125	175	125	175
Actual	21	80	65	103	80	55	70	106	67	73
% Fill	.28	.64	.43	.412	.64	.31	.56	.60	.53	.41

Information about the IIT program can be found here, https://www.leeward.hawaii.edu/iit while information on Areas of Study at Leeward CC can be accessed at https://www.leeward.hawaii.edu/programs.

The IIT curriculum is presented in Table XI with six existing general education courses and twelve IIT specific technical courses.

Table XII lists the recommended course sequence of stackable credentials of a Certificate of Competence (CO) of 15 credits, Certificate of Achievement (CA) of 31 credits, and an Associate in Science degree of 61 credits.

The IIT Program provides a clear structured pathway for both full and part time students and offers underserved populations additional opportunities to participate in STEM degree programs. Additionally, the program provides opportunities for adult learners such as incumbent workers to attain a degree. The program takes advantage of the Leeward CC Prior Learning Assessment (PLA) program, which provides adult learners, and current and former military to get credit for non-traditional education and experience so they could complete the degree program in a shorter time than traditional students.

For students who wish to continue their studies and earn a bachelor's degree, the program provides a solid foundation in technical and general education. Degree programs that are a logical extension of the IIT degree program are the engineering degrees at UH Mānoa, the Bachelor of Applied Science with a Concentration in Facilities Management at UH West Oahu, and the Bachelor of Applied Science in Engineering Technology at UH Maui College.

Table XI: Integrated Industrial Technology Program (61 Credits)

Course Number	Course Name	Credits
IIT 101	Industrial Safety Health & Environment	3
IIT 121	Electro Hydraulics and Pneumatics	3
IIT 131	Mechanical Drive Systems	3
IIT 151	Rapid Prototyping	3
IIT 171	Principles of Process Quality	3
IIT 201	AC/DC Circuits	4
IIT 205	Digital and Analog Circuits	4
IIT 221	Programmable Logic Control (PLC)	4
IIT 231	Process Control and Instrumentation	4
IIT 251	Motor and Motion Control	4
IIT 271	Distributed Control Systems	3
IIT 281	Supervisory Control & Data Acquisition Systems (SCADA)	4
ENG 100	Composition I	3
MATH 103	College Algebra or higher	3
PHYS 100/L	Survey of Physics & Lab	4
ICS 141	Discrete Math for Computer Science I	3
Arts & Humanities	Elective - 100 Level & Above	3
Social Sciences	Elective - 100 level & above	3

Table XII
Recommended Course Schedule

Semester One

Course Alpha	Course Title	Credits
IIT 101	Industrial Safety Health & Environment	3
IIT 121	Electro Hydraulics and Pneumatics	3
IIT 131	Mechanical Drive Systems	3
ENG 100	Composition I	3
MATH 103 or higher	College Algebra	3
		15

After successful completion of the above Semester One courses, the student will achieve a Certificate of Competence in IIT.

Semester TWO

Course Alpha	Course Title	Credits
IIT 151	Rapid Prototyping	3
IIT 171	Principles of Process Quality	3
ICS 141	Discrete Math for Computer Science I	3
PHYS 100/L	Survey of Physics & Laboratory	4
Social Sciences	(100 Level & Above)	3
		16

After successful completion of the above Semesters One and Two courses, the student will achieve a Certificate of Achievement in IIT.

Semester Three

Course Alpha	Course Title	Credits
IIT 201	AC/DC Circuits	4
IIT 221	Programmable Logic Control	4
IIT 231	Process Control and Instrumentation	4
IIT 251	Motor and Motion Control	4
		16

Semester Four

Course Alpha	Course Title	Credits
IIT 205	Digital and Analog Circuits	4
IIT 271	Distributed Control Systems	3
IIT 281	Supervisory Control & Data Acquisition Sys	4
Arts & Humanities	(100 Level & Above)	3
		14

After successful completion of the above Semesters One - Four, the student will achieve an AS degree in IIT.

Program Faculty and Staff

Program Coordinator, William Labby, Assistant Professor CC, Office of Continuing Education & Workforce Development

Bryson Padasdao, Assistant Professor CC, Engineering, Mathematics and Science

Justin Carland, Instructor, Engineering, Mathematics and Science

Emerson Lee, Lecturer, Mathematics and Science

Kainani Santos, Lecturer, Mathematics and Science

Brian Siperly, Lecturer, Mathematics and Science

Amy Amper, Assistant Professor CC, Counselor; Program Counselor for Information & Computer Science, Integrated Industrial Technology, Sustainable Agriculture, and Office of Continuing Education & Workforce Development.

Academic Specialist (Perkins funded). This position is currently vacant. The previous Academic Specialists were Melodee Himuro, Sabrina Sullivan, Daniel Cordial, and Tami Williams. They were involved in coordinating the Peer Mentors and supporting students in several CTE Programs, including the IIT Program.

Peer Mentor (Perkins funded). **Jaclyn Lau,** A Peer Mentor is a successful student in a CTE Program who supports other students in the same program. Often, students relate better to students than instructors or counselors.

Program Collaboration

Industry Partners

The IIT Program has a long-standing relationship with several employers on Oahu, including HART, Hitachi Rail Honolulu, Diamond Bakery, Toell-USA (Pure Hawaiian Water), Hawai‘i Pacific X-Ray Corporation, and Hawai‘i Energy Systems. Hitachi Rail Honolulu presently has fourteen program graduates employed; they anticipate continuing to hire graduates every year. Additionally, two program graduates are employed by contractors commissioning the trains for Hitachi Rail Honolulu. The demand for IIT program graduates to fill high-skill, high-wage career positions in Hawai‘i is high. As information on the program permeates the industry, more and more companies are recruiting program graduates.

Advisory Group

In 2019-2020 the IIT Program participated in a National Science Foundation funded mentorship program to develop pathways to credentials. An element of the mentorship helped the program develop and utilize a model for business engagement that differs from the typical advisory group. The Business and Industry Leadership Team (BILT) model facilitates building relationships with industry leaders, ensures classroom content is current and relevant and develops pathways to employment for students. The BILT is a unique forum for industry professionals to share trends and ideas with educators and other business leaders in a neutral, non-proprietary environment, and generates goodwill by demonstrating a commitment to the region's workforce needs. The IIT BILT has been instrumental in ensuring the curriculum addresses the latest technology advances, as well as providing input on competencies that are in-demand locally.

Table XIII: IIT Business and Industry Leadership Team

Company	Representative
Hitachi Rail Honolulu	Rod Baybayan
Toell USA	Randal Ijima
Vivint Inc	Jason Lindquist
Jade Food Products	Deanne Ho
Hawai'i Energy Systems	Huy Nguyen
Hawai'i Pacific X-Ray Corporation	Christopher Johnson
Aloha Edibles	Carri Loui
Kalihi Business Association	Gary Yoshioka

Leeward CC Sustainable Agriculture Program

The IIT Program and Leeward CC Sustainable Agriculture Program are collaborating on a project to install a FarmBot on campus. The FarmBot is a practical, engaging, and hands-on tool for learning robotics, nutrition, soil science, biology, coding, and other STEM learning objectives. FarmBot technology is rapidly advancing, thereby bringing down equipment costs and making automated farming technology more accessible to small farms. By working together, the IIT and the Sustainable Agriculture Programs will prepare future farmers with the knowledge and skills to incorporate automation into farming endeavors.

State of Hawai‘i Department of Education (DOE)

The DOE is developing a new career pathway in Advanced Manufacturing, Automation, Robotics, and Electro-Mechanical Technology. The IIT Program coordinator is on the advisory board for the development of this career pathway academy, which will provide students with the educational foundations to succeed in the IIT degree program.

Wahiawa Value-Added Product Development Center

Leeward CC manages the Wahiawa Value-Added Product Development Center which is currently under renovation with an anticipated opening in late fall 2023, will house a wide array of food and beverage processing and packaging equipment that will be available for use by industry and the community. The Center and the IIT Program are collaborating to develop and offer courses on the installation, use, maintenance and calibration of food and beverage processing and packaging equipment.

8. Evidence of Student Learning and Student & Program Success

The IIT Program attracts a diverse population of students that include recent high school graduates, working adults, veterans, and students that have transferred from other campus programs such as the Associate in Science in Natural Sciences (ASNS) Program. Additionally, we have two transfers from the UH Mānoa College of Engineering, a student with a BS in Electrical Engineering from UH Mānoa, and a student with a BS in Computer Engineering from UH Mānoa.

Graduation and Employment

The program has graduated thirty-one (31) students with their AS degree, additionally students have earned thirty-six (36) Certificates of Completion, and thirty-two (32) Certificates of Achievement. In fall 2022, there are thirty (30) students enrolled in the degree program.

Program graduates are presently employed at the following local companies:

- Hitachi Rail Honolulu
- Hawai‘i Pacific X-Ray Corporation
- Pepsi of Honolulu
- Brown and Caldwell Engineering

- Hawai‘i Energy Systems
- Toell USA
- Tripler Army Medical Center Environmental Services Division
- Headquarters Pacific Air-Forces
- Leidos Technologies

Starting compensation for program graduates ranges from $55,000 to $80,000 annually. Several of the graduates hired by Hitachi Rail Honolulu have moved to leadership positions with significant increases in compensation in excess of $100,000.

Demand for graduates has been on the rise for the past 3 years as more and more companies learn of the program. Several employers have requested to provide informational sessions to third and fourth semester students to encourage them to apply for positions with their company. The City and County of Honolulu Department of Human Resources recently approved the IIT Program to meet the requirements for technical positions at Honolulu Fire Department, Honolulu Police Department, and the Department of Environmental Services (Board of Water Supply and Wastewater).

Performance Statistics

As with any new degree program, the IIT Program experienced challenges with recruitment. Promoting the program to both the industry and to potential students is a critical element of success. Outreach and recruitment were curtailed in 2020 -2021 because of restrictions imposed by the pandemic. Despite the challenges imposed by the pandemic, the IIT Program has steadily increased the number of declared majors every year since 2018. Beginning in mid-2022 the program resumed outreach visits to high schools, military transition offices, Kīpuka - Native Hawaiian Center at Pu‘uloa, and community centers in Central and West Oahu. The program provides informational workshops, seminars, and summer camps to stimulate interest in the degree program with the goal of increasing enrollment, with emphasis on encouraging underserved populations to consider IIT as a career pathway.

Gender

In a historically male dominated career field, 12% of IIT Program students/graduates are female, with an aim to increase the percentage of female students and graduates. The IIT Program has had a strong female presence from the beginning, employing two female lab assistants and two female peer mentors. The peer mentors assist in

outreach and recruiting with an objective to encourage more women to consider a career path in industrial automation.

Ethnicity

11.17% are Native Hawaiian, 34% are Filipino, and 15.75% are Asian. This is consistent with the overall ethnic composition of the college and reflects the demographics of the communities of Central and West Oahu that Leeward CC serves.

Time to Completion

The IIT Program provides students with a clear pathway to graduation. The program pipeline is designed in such a way that a student can easily complete the degree program in two years, while also providing for flexibility by offering students the option to begin the program in the fall or spring semesters.

9. Conclusion: Closing Comments for Established Status

The AS degree in IIT was developed to educate and train highly skilled technicians with a technology driven, purpose-built, multidisciplinary degree program that supports Hawai‘i’s industry shift to industrial automation across multiple industries.

The IIT Program is aligned with the Leeward CC Mission, and UH Strategic directions. Specifically, the program increases access to STEM degree programs, prepares students for high-skill, high-wage, in-demand career positions and is aligned with workforce demands and community needs. Additionally, The IIT Program supports the UHCC Strategic Plan (updated for 2015-2021) and the new UH System Policy on Sustainability (Executive Policy 4.202). Additionally, the IIT Program is aligned with the Leeward CC Integrated Academic, Facilities, and Enrollment Plan 2015 – 2021. The program supports the Hawai‘i Graduation Initiative to increase enrollment and completion rates while reducing time to completion. Outreach and recruitment efforts for the IIT Program are directed toward Central and West Oahu with the goal of increasing the enrollment of target populations. To date the program has had much success recruiting, retaining and graduating students from target populations. The program also supports the Hawai‘i Innovation Initiative: Developing and delivering programs and training needed for a qualified workforce in existing and emerging careers.

The IIT Program provides students with a robust and relevant educational experience that prepares them for career positions in the field of Industrial Automation.

The coursework is presented in a dynamic, interactive, and learner centered environment, students are personally and actively engaged in the material and immersed in the content through high challenge, low threat interactive learning activities. The knowledge and skills obtained in early coursework are refined and reinforced in later courses where they draw on multiple disciplines to solve problems. This coordinated, multidisciplinary approach to learning prepares students to resolve complex, real-world problems that require proficiency in systemic diagnostics.

Industry demand for program graduates is high and is expected to grow. Automation technology is evolving rapidly and penetrating more and more industries such as manufacturing, food and beverage production, transportation and building automation. This degree program is structured to evolve with the technology, and ensure students are proficient in both new and legacy systems.

Leeward CC is the only UH community college that offers an AS in IIT. Presently, Leeward CC offers fifteen associate degree programs, four transfer programs, eleven Career and Technical Education (CTE) programs, and two certificate programs.

The IIT Program offers a STEM/CTE degree in the emerging field of industrial automation and provides graduates with an opportunity for a high-skill, high-wage career in Hawai‘i .

10. Appendices

2022 IIT ARPD: https://go.hawaii.edu/kMc

Letters of Support: https://go.hawaii.edu/dMk