NEW YORK INSTITUTE OF TECHNOLOGY

Continuous Program Improvement (CPI)

Student Learning Outcomes (SLO)/Program Learning Outcomes (PLO)

Plan Implementation Report - AY 2023-24

Program name	MS Electrical & Computer Engineering
Expected date of submission	6/30/2024
Department chair/program director	Steven Billis
Dean's signature	

New York Tech's CPI process is implemented to meet Middle States Commission on Higher Education (MSCHE) Standard V: *Educational Effectiveness Assessment*, which states: "Assessment of student learning and achievement demonstrates that the institution's students have accomplished educational goals consistent with their program of study, degree level, the institution's mission, and appropriate expectations for institutions of higher education."

Each department was asked to create a three-year assessment/evaluation plan to improve student learning for ***each of their degree programs*** covering the following academic years: **2022-2023, 2023-2024, and 2024-2025.**

All degree programs' three-year Program Learning Outcomes (PLO) plans are available here: http://www.nyit.edu/planning/academic_assessment_plans_reports

This is a report on the PLO CPI plan **implementation** for the **2023-24** academic year.

First, please respond to the feedback provided by the CPI Committee in response to your program's prior year (AY 2022-23) CPI plan implementation report. How did you incorporate the Committee's recommendations into your CPI efforts?

Second, please address the following points in this year's (AY 2023-24) report:

1. Program learning outcomes assessed
   List the program learning outcomes that were assessed in AY 2023-24 based on your three-year plan (2022-25).
   (Please refer to the guidelines for articulating expected program learning outcomes.)

2. Methods
   Describe the method of assessment that you used (student artifacts, sampling methods, sample size, who and how they were assessed, etc.) and attach measurement instruments (e.g., rubrics, exam items, scoring guide for a particular task, supervisor evaluation form, survey instrument, and other measurement tools). Remember: direct assessment is required, and both direct and indirect assessment are strongly recommended.
   (Please refer to the guidelines for assessment methods.)

3. Analyze and interpret assessment data
   It is strongly recommended to provide criteria-based analyses of assessment results and based on the analysis to determine if students are meeting the expected learning outcomes.
   (Please refer to the guidelines for compiling, analyzing and interpreting assessment data).

4. Close the Loop
   If the expected program learning outcomes were successfully met, describe how the program will keep or expand the good practices. If they were not successful, explain how you have or will refine the plan and begin the next cycle of Plan-Do-Study-Act (PDSA).
   (Please refer to the guidelines for closing the loop and taking action to improve program learning outcomes.)

5. Describe how faculty were involved in the implementation of the PLO CPI plan and how the results will be communicated to all stakeholders.

Relationship Between the SLOs and the Programs Courses

The SOs of the MS in ECE are:

1. A comprehensive knowledge of computer architecture and system design.

2. A comprehensive knowledge of advanced topics in mathematics and stochastic processes.

3. A comprehensive knowledge of linear systems and digital communications.

4. A comprehensive knowledge of advances in areas such as parallel computing, networks, and VLSI designs.

5. Proficiency in specific areas of specialization such as computer security, quantum computing, nanotechnology, signal processing and information theory

Course	SO1	SO2	SO3	SO4	SO5
EENG 633 Parallel Computing Systems	x			x	
EENG 635 Probability & Stochastic Proc.		x			
EENG 641 Computer Architecture I	x				
EENG 665 Linear Systems			x		x

EENG 670 Electromagnetic Theory					x
EENG 675 Information Theory		x			x
EENG 720 Modern Ctrl. Theory					x
EENG 725 Queuing Theory		x			x
EENG 726 Markov Processes		x			
EENG 730 Nanotechnology		x			x
EENG 741 Cptr. Arch. II	x			x	
EENG 751 Signal Processing I		x			x
EENG 755 Computer Network	x			x	x
EENG 760 Antenna Theory					x
EENG 770 Digital Com			x		
EENG 810 Array Sign. Proc.		x			x

EENG 830 RF Electronics		x			x
EENG 851 Signal Processing II					x
EENG 870 Design Project I	x	x	x	x	x
EENG 880 Design Project II	x	x	x	x	x
EENG 890 Master's Thesis I	x	x	x	x	x
EENG 891 Mstr II	x	x	x	x	x

To set the context for the program's assessment activities it is useful to understand the role of this work within the larger institution. New York Tech implemented Continuous Program Improvement (CPI) in 2020 across all academic departments and students support units to improve educational effectiveness. It replaced the Academic Assessment Committee of the Senate. CPI emphasizes a data-informed, decision-making process to guide departments for overall quality improvement that leads to the improvement of students' learning, college experiences, and achievement.

The CPI Committee of the Academic Senate is the institutional unit that brings together all assessment and improvement activities at the university—for programs with or without professional accreditation, and for academic departments and student support units. The committee members come from all academic schools and numerous support departments. Its meetings are open and minutes are posted on the web site of the Academic Senate.

The Committee's mission is to:

- Raise the visibility of CPI for educational effectiveness assessment within the university

- Maintain a common, unified, mission-driven process
- Improve educational effectiveness by increasing faculty participation in and knowledge of science of improvement
- Prepare a formal annual report on the status of assessment at the university, including recommendations for improvement
- Ensure that the Continuous Program Improvement (CPI) process is used to advance New York Tech's mission and goals and connected with financial planning and support
- Periodically evaluate (CPI) process and make recommendations for improvements

NYIT's model for the assessment of student learning in its academic programs is designed according to the following principles:

- Program faculty are responsible for assessing the student learning outcomes of their program.
- Assessment activities should be useful, annual, and integrated as much as possible into what faculty are already doing.
- Faculty define the most important learning outcomes, set standards of performance, and measure achievement.
- Results are used to make program improvements.
- The CPI Committee of the Academic Senate provides institutional oversight.
- The offices of the Provost and the Vice President for Research, Assessment and Decision Support provide institutional support.

At NYIT’s College of Engineering and Computing Sciences, each program has a multidimensional assessment process in place to ensure that the Student Outcomes have been attained. It is a process that provides data to support continuous program improvement.

To ensure that students achieve student outcomes 1 to 5, the faculty has built the curriculum such that key concepts are introduced, developed, and reinforced throughout students’ time in the program.

In both fall and spring semesters, ECE faculty members prepare a Faculty Course Assessment Report (FCAR) for each course they teach. The FCAR requires:

- The FT faculty members of the department have met previously, as a group, to determine the relationship between the SOs and the ECE program's required and elective courses.

- The FT or adjunct faculty teaching a specific course is required to establish appropriate performance tasks (APTs) to assess to what extent each SO is being met. These APTs may be quizzes, exam questions, reports, projects, presentations, etc.

- Each student's APT is then scored with the method shown below to create an EGMU vector for each SO and a corresponding assessment metric. It should be noted that the faculty member is required to show which part of each APT is being used to form a metric for the student outcome with appropriate documentation.

EGMU		Score
E - Excellent	**Fully demonstrates/accomplishes the attributes and behavior in the rubric**	**3**
G – Good	**Mostly demonstrates/accomplishes the attributes and behavior in the rubric**	**2**
M – Minimal	**Minimally demonstrates/accomplishes the attributes and behavior in the rubric**	**1**
U - Unsatisfactory	**Does not demonstrate/accomplish the attributes and behavior in the rubric**	**0**

These course-embedded assessments serve as the primary tools to determine student outcome achievement and afford a direct link between learning outcomes and student outcomes as one aspect of curriculum change.

The data from FCARs are then evaluated at the spring Faculty Assessment meetings. At these meetings all full-time faculty members and those regular part-time faculty members wishing to participate identify and propose strategies to improve Student Outcomes.

While many courses may satisfy a particular outcome, the assessment committee has picked a subset of these courses that it finds most appropriate to determine the minimum metric for each outcome.

The recommendations of the assessment committee meetings are generally of two types: One set of recommendations can be implemented solely through the faculty member making internal changes to the courses (i.e., textbook changes, pedagogical changes). The other set of recommendations would need to be forwarded to the curriculum committees of the College of Engineering and Computing Sciences and then to the Academic Senate for adoption (i.e., new course, prerequisite/co-requisite changes, catalog description).

We have found that each of our assessment tools must be used in conjunction with one another if we are to undertake changes that are meaningful.

Timeline of the PLO Assessment

Program Learning Outcomes	AY 22-23	AY 23-24	AY 24-25
1. A comprehensive knowledge of computer architecture and system design	●		
2. A comprehensive knowledge of advanced topics in mathematics and stochastic processes	●		
3. A comprehensive knowledge of linear systems and digital communications		●	
4. A comprehensive knowledge of advances in areas such as		●	

parallel computing, networks and VLSI designs			
5. Proficiency in specific areas or specialization such as computing security, quantum computing, nanotechnology, signal processing and information theory			●

AY 22-23

PLO1: To assess this PLO the department chose:

EENG 641 Computer Architecture:

- Students were introduced to performance evaluation techniques and learned how to use the results of such techniques in the design of computing systems **EGMU 2.25**

PLO2: To assess this PLO the department chose:

EENG 635 Probability & Stochastic Processes

- Students explored correlation, spectral density, ergodicity and their applications in linear systems. **EGMU 2.35**

PLO1 & PLO2: To assess these 2 PLOs the department chose:

EENG 870 Design Project 1

Motion Sensor Controlled Robotic Arm
PLO1: **EGMU 2.25**
PLO2: **EGMU 2.5**

AY 23-24

PLO3: To assess this PLO the department chose:

EENG 665 Linear Systems

- Students explored linear vector spaces **EGMU 2.55**

EENG 770 Digital Design

- Noise representation **EGMU 2.2**

PLO4: To assess this PLO the department chose:

EENG 633 Parallel Computing Systems

- Students explored sequential vs. parallel computing systems **EGMU 2.55**

EENG 755 Computer Networks

- Students explored applications of queuing theory **EGMU 2.0**

AY 24-25

PLO5: To assess this outcome the department chose:

EENG 670 Electromagnetic Theory

- Students explored electromagnetic wave phenomena such as propagation of plane wares, in isotropic and anisotropic media. **EGMU 2.3**

Closing the Loop

The faculty found that they could improve these EGMUs by spending more time on:

EENG 641: superscalar processors with in-order and out of order execution

EENG 635: ergodicity

EENG 870: IEEE Standards of Communication

All ECE full-time and adjunct faculty were involved in this exercise and the resulting report will be made available to our stakeholders (industrial board members(at IAB meetings), students and administration).