

**EXTERNAL REVIEW OF
MASTER OF SCIENCE IN
CYBERSECURITY
AT
NYIT - VANCOUVER**

Review Committee (in alphabetical order):

Dr. Hasan Cavusoglu (chair)

Dr. Xing Liu

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1. **Overall Assessment**

Program Information:

Institution: New York Institute of Technology Vancouver Campus

Program: Master of Science in Cybersecurity

Assessment Summary Table:

Standard	Meets
<i>Degree Level Standard</i>	✓
<i>Credential Recognition and Nomenclature</i>	✓
<i>Curriculum/Program Content</i>	✓
<i>Learning Methodologies/ Program Delivery</i>	✓
<i>Admission and Transfer/Residency</i>	✓
<i>Faculty</i>	✓
<i>Program Resources</i>	✓
<i>Program Consultation</i>	✓
<i>Program Review and Assessment</i>	✓

Summary:

By referencing to the standards included in the Degree Program Review Criteria and Guidelines¹ published by the Ministry of Advanced Education, Skills and Training, we have assessed the Master of Science in Cybersecurity program at New York Institute of Technology (NYIT) - Vancouver Campus. We paid specific attention to the evaluation factors provided by NYIT in Appendix 1, which we believe match the aforementioned ministry standards.

We have concluded that the Master of Science in Cybersecurity program at NYIT - Vancouver Campus meet the standards set by the Ministry of Advanced Education, Skills and Training. Furthermore, our assessment of the program remains favorable after we have considered the additional factors.

¹ <https://www2.gov.bc.ca/assets/gov/education/post-secondary-education/institution-resources-administration/degree-authorization/degree-program-criteria.pdf>

External Review of Master of Science in Cybersecurity

Signed:

Chair of the Quality Assessment Panel:



(Signature)

Hasan Cavusoglu

(Printed Name)

July 15, 2021

(Date)

Quality Assessment Panel Members:



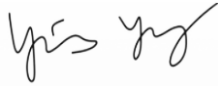
(Signature)

Xing Liu

(Printed Name)

July 15, 2021

(Date)



(Signature)

Yiping (Yvonne) Yang

(Printed Name)

July 15, 2021

(Date)

2. **Executive Summary**

New York Institute of Technology - Vancouver Campus has requested us to act as an external review panel to review its Master of Science in Cybersecurity program and provide guidance for improving its curriculum for the benefit of its students. Each of us holds a Ph.D. degree in an IT-related field. We have 54 years of experience combined in the post-secondary education sector. We all have experience in cybersecurity through research, program development, or course development.

The NYIT Master of Science in Cybersecurity program was consented by the Ministry of Advanced Education, Skills and Training in 2012. The primary “goal of the program is to prepare career-ready graduates who have comprehensive understanding of cybersecurity”.

NYIT Vancouver is applying for a renewal of the consented status. The external assessment we are tasked to provide is to be included in the renewal documents. Our assessment is based on: (i) the documents provided to us, (ii) the virtual campus tour, and (iii) the external program review meeting that took place between 12:30 pm and 4:30 pm through Zoom on 15 June 2021. The documents provided include Application for NYIT – Vancouver Cybersecurity Degree Consent Renewal, the application’s appendices, course syllabi, and faculty CVs. The virtual campus tour was in video format. The academic and administrative leadership of the institution provided overview presentations and answered our questions. We also had the opportunity to meet full-time faculty members as well as students in two separate meetings. After the meetings, we also received responses to our questions from the leadership team. Based on the information gathered, we are comfortable to provide our assessment of the program.

We concluded that the program meets the standards put forward by the Ministry. The evidence that we have seen confirms that the Institution is well-positioned to continue offering the program in Vancouver.

3. Degree Level Standard

Our focus was to assess if *the program meets or exceeds the degree level standard* (refer to Appendix 2).

Determination of Quality Assessment Panel

The program meets or exceeds this standard.

Rationale for Determination:

Magnitude and variety of courses offered; the quality of faculty members.

Criteria for Assessing Satisfaction of Degree Level Standards

1) Depth and Breadth of Knowledge

The program covers cybersecurity at a depth that meets the level of a master degree program. This was based on our read of course syllabi shared with us digitally and based on our conversations with the full-time faculty members during our virtual campus visit. The program covers a wide variety of aspects of cybersecurity, with proper progression from basics to advanced topics. We also understand that elective courses are offered to accommodate student interests.

2) Knowledge of Methodologies and Research

Based on our review of the syllabi, introduction of employment data by the leadership, and students' feedback, we understand that students who graduate from the program have necessary knowledge and skills on cybersecurity, ranging from threat detection techniques to mitigation strategies. The hands-on components in many courses prepare students for their subsequent career in the industry. The program has been structured in such a way that the students will be career-ready when they graduate.

Guest speakers from industry allowed students to interact with professionals with first-hand real-world experience.

3) Application of Knowledge

Based on our review of the syllabi and our conversations with the full-time faculty, assignments and projects are main assessment techniques used in most courses. This gives students the avenues to apply the theoretical knowledge they have learned to solve practical problems. Most full-time faculty members are also active researchers. Students are involved in research projects led by faculty. Students have generated research publications jointly with faculty.

4) Communication Skills

The program uses team work, project presentations, and report writing in most courses to enhance student communication skills. The program also offers communications courses. Dedicated staff position was created to help students improve their communication skills. During our virtual visit, we observed that the administrators are keen to improve students' communications skills.

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5) *Awareness of Limits of Knowledge*

We observed that faculty members advised students on advanced topics that might not have been covered by the required courses in the curriculum, especially in the project courses. Students confirmed that the faculty members were always available to help them. The project courses are means to expose students to new topics and inform them recent developments in the field.

6) *Professional Capacity/ Autonomy*

Students are expected to complete assignments and projects individually and collectively. The hands-on exercises provide students with solid problem-solving skills. Project courses and faculty sponsored research projects encourage independent discovery of knowledge and development of solutions for challenging problems. Incorporation of software development skills into the cybersecurity program not only empowers students the ability to create software solutions, but also broadens the scope of their career opportunities.

NYIT –Vancouver student teams participated in national cybersecurity competitions and achieved highly-ranked results.

4. Credential Recognition

Our focus was to assess if *the program's learning outcomes and standards are sufficiently clear and at a level that will facilitate recognition of the credential by other post-secondary institutions, professional and licensing bodies and employers.*

We believe the curricular learning outcomes of the program have sufficient depth and breadth. They are comparable to those in similar programs offered in other post-secondary institutions in North America.

Determination of Quality Assessment Panel

We believe the program meets ministry standards for master degree programs in British Columbia.

Rationale for Determination:

Our decision is based on the content of the curriculum, student employment report by the administration, reputation of the program, recognition by local industries.

Criteria for Assessing Satisfaction of Credential Recognition

We assessed this based on industrial recognition and student demand. Graduated students are getting hired locally and internationally. Enrollment numbers are on the rise too. More highly qualified students are applying for admission into the program.

5. Curriculum/Program Content

Our focus was to assess if *the program in both subject matter and learning outcome standards, offers an education of sufficient breadth and rigour to be comparable to similar programs at the proposed degree level offered by recognized provincial, national and international post-secondary institutions. The curriculum must be current and reflect the state of knowledge in the field, or fields in the case of interdisciplinary and multidisciplinary programs.*

Determination of Quality Assessment Panel

The Program meets the standards.

Rationale for Determination:

Industry advisory board, collaborative relations and knowledge transfer between campuses, quality of faculty members.

Criteria for Assessing Satisfaction of Curriculum/Program Content Standard

1. *Mechanism to stay current:* The Program has an industry advisory board that provides feedback on course contents so that the courses cover the state-of-the-art content. Faculty members are actively involved in research which enables them to stay current with the field.
2. *Capability to improve:* Dynamic and enthusiastic faculty members have strong academic background. They are motivated to prepare students for real-life jobs.
3. *Breadth and depth of knowledge:* The Program's main objective is to produce industry ready graduates. The courses cover topics that are relevant. The hands-on assessment components allow students to apply the theory to the practice.
4. *Program structure:* Courses are offered and sequenced in such a way to enable students to grow in their knowledge.
5. *Appropriateness of curriculum for the degree:* The number of credits and the GPA requirements are commensurate with the degree to be conferred.

6. Learning Methodologies/Program Delivery

Our focus was to assess if *learning methodologies achieve the desired learning outcomes at the degree level standard and at an acceptable level of quality.*

Determination of Quality Assessment Panel

The Program meets or exceeds this standard.

Rationale for Determination:

Number and diversity of courses offered (mandatory and elective), Qualified faculty members.

Criteria for Assessing Satisfaction of Learning Methodologies/Program Delivery Standard

- 1) *Appropriateness of the delivery methods:* We observed the appropriate pedagogical techniques are used based on the nature of the course.
- 2) *Expertise:* All full-time faculty members graduated from well-recognized universities. They have strong research background.
- 3) *Technology use:* NYIT's IT team provided us with detailed information about the computer infrastructure in both campuses. Software tools, programming, labs used are deemed as appropriate to ensure high quality learning.

7. **Admission**

We focused on assessing if the program intakes qualified students.

Determination of Quality Assessment Panel

The Program meets or exceeds this standard

Rationale for Determination:

Background of students, their work experiences, and incoming students' GPA.

Criteria for Assessing Satisfaction of Admission and Transfer/Residency Standard

1. *Appropriateness of the admission criteria:* The Program admits students with appropriate background. The admission process is designed to take into account various factors to ensure that right students are brought into the program.
2. *Maturity of students:* Because of the professional nature of the degree, students are motivated. They often have working experiences. Hence, they are generally mature.

8. **Faculty**

We focused on assessing if the Program has the human resources necessary for delivering a quality degree program.

Determination of Quality Assessment Panel

The Program exceeds this standard.

Rationale for Determination:

Academic background of the full-time faculty members and diverse part-time instructors.

Criteria for Assessing Satisfaction of Faculty Standard

1. *Sufficiency of the number of faculty:* Given the program structure, the number of faculty members (full-time and adjunct) is sufficient
2. *Appointment types of faculty members:* The Program has 6 full-time and 7 adjunct faculty members. For a 30-credit program, the 6 full-time faculty members are sufficient given that the Program has adjunct faculty members. We also note that if there is need, faculty members from the New York campus can teach in Vancouver.
3. *Appropriate policies:* The administration clearly indicated that faculty members had full academic freedom. We have not heard any negative comments from the faculty members. Faculty members are evaluated yearly as well as when their contract terms come up for renewal. The process is documented and known to the faculty. Faculty members are encouraged to participate in academic conferences to stay current. Given that main expectation from the faculty members is teaching, 21-credit teaching load is quite reasonable.
4. *Research:* Faculty is encouraged to do research although it is recognized that the primary role of the faculty is teaching. The Institution has internal funding for attending conferences. We observed that some of the students in the program have collaborated with the faculty members in research. This is generally through the project course.

9. Program Resources

We focused on assessing if *the Institution has the physical, learning, and information resources needed to ensure program quality. These include facilities, equipment, library resources, laboratories, computing facilities, shops, specialized equipment, etc.*

Determination of Quality Assessment Panel

The Program meets this standard.

Rationale for Determination:

Adequacy of physical space, library resources, and computer labs.

Criteria for Assessing Satisfaction of Program Resources Standard

1. *Adequacy of physical spaces and technology resources:* Classrooms are spacious and equipped with proper teaching resources (projector, board, etc.). Technology resources (learning management systems, email, office productivity applications, video conferencing (Zoom) are provided.
2. *Sufficiency of informational resources:* Library resources seem to be sufficient.
3. *Supplementary resources:* The program offers free or low-cost certification preparation to get students ready for industry-recognized certifications.
4. *External library resource:* We are informed of the library MOU between NYIT-Vancouver and BCIT.

10. Program Consultation

We focused on assessing if *the Institution has consulted appropriate individuals and organizations in the development of the application to extend the ministry's consent.*

Determination of Quality Assessment Panel

The Program meets this standard.

Rationale for Determination:

We are contracted to serve as an independent external reviewer of the program's past, current, and future.

Criteria for Assessing Satisfaction of Program Consultation Standard

1. *Evidence of due diligence:* The Institution has on-going relations with the tech industry in BC. The advisory board serves as a conduit between the Program and the industry. Its role is to validate the curriculum and to keep the Program current with the industry trends.
2. *Evidence of incorporation of feedback:* Contents of some courses are updated based on the consultation with the industries as well as their advisory board.

11. Program Review and Assessment

We focused on assessing if the Institution shows evidence that a program review and assessment procedure is in place.

Determination of Quality Assessment Panel

The Applicant meets this standard.

Rationale for Determination:

Existence of constituency-base assessment tools.

Criteria for Assessing Satisfaction of Program Review and Assessment Standard

1. *Evidence of a formal, institutionally approved policy and procedure for the periodic review of programs:* We observed that the Program has an Industry Advisor Board which meets regularly to assess the needs of the Program in order to maintain technological currency and meet industry needs. It conducts surveys to assess the employment opportunities for students and determine emerging skills needed by the industry. It also conducts student exit interviews to learn from students about their experiences and improve the Program and its delivery based on the students' feedback.
2. *Continuous Improvement:* We observed that the Institution has a Continuous Program Improvement process through which faculty and staff can suggest improvements about the Program.

12. **Summary of Comments and Additional Observations**

Major Strengths:

Recognition of the program: Given the specific focus of the program, student feedback, faculty response, we sense that employers appreciate the students trained by the Program.

Reputation of the program: The program is recognized as a highly reputable program in cybersecurity by the prospective students around the world.

Quality of faculty: We have observed that all full-time faculty members are well-trained with high qualifications, and are active researchers in areas relevant to the Program.

Quality of students: We observed the high quality of incoming students. This will create a positive cycle: better educational experience for students, more capable graduates, more satisfied employers, and better recognition of the Program.

Executive support: We observed that the Dean and other administrators from the main campus in New York were very proud of the Program and its faculty. We feel that this level of support is important for the continuing success of the Program.

Major Weaknesses:

Student body: The student body is mainly international. This may pose a financial risk in cases such as restricted international travel and border closures remain in effect for extended period of time.

Potential competitors: Given the high demand of cybersecurity professionals, similar programs may start to be offered by other institutions. This could affect the Program.

Absence of tenure: Full-time faculty members are employed based on term-based contracts. This might negatively impact their retention.

Development skills: The program needs more software development content to address industry's demand

Recommendations:

1. To ensure continuous commitment by full-time faculty, the Program may consider offering tenure-track or tenured appointments.
2. While the Program is connected with the industry, industrial relations may be further enhanced by establishing an alumni body and have regular events involving alumni.
3. Consider creating a co-op officer position to increase internship opportunities for students.
4. Enrich training tools in the lab and consider hiring a full-time lab technician.
5. Consider offering scholarships to attract more top students.
6. Consider offering release time for research active faculty members.
7. We recognize that the NYIT administration has been meeting with NSERC for the eligibility of their faculty members to apply to the grant competitions. We encourage them to continue to engage government research grant offices to gain the eligibility of their faculty members for federal grant competitions.
8. Consider adding courses on computer programming and software development
9. Consider offering courses such as mobile operating systems security, organizational culture and cybersecurity, and ransomware.
10. Incorporate cybersecurity related tools and techniques in the data mining course.
11. Consider adding a directed studies option for classes without minimum number of students, which would otherwise be canceled.

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12. Consider adopting newer editions of textbooks and course materials for subjects that have been updated frequently in new technologies.

Appendix 1: Evaluation Report Form

College of Engineering and Computing Sciences Evaluation Report Form

Program

1. Assess program purpose, structure, and requirements as well as formal mechanisms for program administration and monitoring.
2. Comment on the special focus of this PROGRAM and analyze its structure and the curricular content.
3. Comment on the plans and expectations for continuing program development and self-assessment.
4. Assess available support from related programs.

Faculty

5. Evaluate the faculty, individually and collectively, in regard to expertise, scholarship, experience, research and publication, professional service, and recognition in the field.
6. Assess the faculty in terms of size and qualifications.
7. Evaluate credentials and involvement of adjunct and support faculty.

Resources

8. Comment on the adequacy of physical resources and facilities, e.g., library, computer, and laboratory facilities; and support services for the PROGRAM, including use of resources outside the institution.
9. What is the institution's commitment to the PROGRAM as demonstrated by the proposed budget and the number of faculty lines relative to student projected numbers and workload.

Summary Comments and Additional Observations

Summarize the major strengths and weaknesses of the PROGRAM as with particular attention to feasibility of implementation and appropriateness of objectives for the degree offered. Include any further observations important to the evaluation of this PROGRAM and provide any recommendations for the PROGRAM

Appendix 2: Degree Level Standard for Master's Degree:

Excerpt from Degree Program Review Criteria and Guideline

<https://www2.gov.bc.ca/assets/gov/education/post-secondary-education/institution-resources-administration/degree-authorization/degree-program-criteria.pdf> (last access on July 2, 2021)

1. Depth and Breadth of Knowledge

A systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study, or area of professional practice.

2. Knowledge of Methodologies and Research

A conceptual understanding and methodological competence that enables the graduate to have a:

- (a) working comprehension of how established techniques of research and inquiry are used to create and interpret knowledge in the discipline;
- (b) capacity to evaluate critically current research and advanced research and scholarship in the discipline or area of professional competence; and,
- (c) capacity to address complex issues and judgments based on established principles and techniques.

On the basis of that competence, has shown at least one of the following:

- (a) the development and support of a sustained argument in written form; or
- (b) originality in the application of knowledge.

3. Application of Knowledge

Competency in the research process by applying an existing body of knowledge in the research and critical analysis of a new question or of a specific problem or issue in a new setting.

4. Communication Skills

The ability to communicate ideas, issues and conclusions clearly and effectively to specialist and non-specialist audiences.

5. Awareness of Limits of Knowledge

A cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.

6. Professional Capacity/ Autonomy

- (a) The qualities and transferable skills necessary for employment requiring:
 - (i) the exercise of initiative and of personal responsibility and accountability; and,
 - (ii) decision-making in complex situations, such as employment.
- (b) The intellectual independence required for continuing professional development; and,
- (c) The ability to appreciate the broader implications of applying knowledge to particular contexts.