Bio Technology Forensics Program Review Self Study Template
Last updated: Feb13, 2012

Indicator **1.0 Industry Trends**	**Summary of Key Findings**
1.1 Sectoral Standards and Industry Trends **Review / discuss:** • New or emergent industry / sector themes or issues that may have a potential impact on program positioning • Industry / sector issues identified by the Program Advisory Committee • Recent labour market data or sector reports • Recent or anticipated changes in occupational standards, level of entry and credential and / or standards of accreditation • Program alignment to labour market and sectoral trends	The program advisory committee has noted some trends including Bioinformatics, the start up of more companies and the Toronto Biosource Directory- company directory for potential employees in various sectors. The committee recommended Forensic chemistry as a new course and that the students need more tissue culture skills. Biotalent and partnerships with other colleges may be feasible. Canada is considered a world leader in Biotechnology. Small and medium-sized companies with fewer than 50 employees make up 75% of total biotechnology companies in Canada. Many of these smaller firms are involved in less traditional areas of biotechnology. Large, more traditional biotechnology companies with 150 or more employees represent 10% of the industry. Many companies are looking for workers who have technological, business and project-management skills; however, employers with fewer than fifty employees are looking for workers who can use many different skills, especially scientific and business expertise as well as strong communication and writing skills along with technical skills. Ontario has the most bio technology-related companies in Canada

	Computer-based competencies such as bioinformatics and molecular modeling are becoming more important as companies and researchers deal with the integration of traditional and information sciences.. Companies seek graduates that are at the forefront of emerging fields, such as molecular medicine, gene therapy, signal transduction, combinatorial library and genomics. People who work in these occupations require ongoing retraining and professional development to keep abreast of new information and changing technology. Increasingly, individuals in this field will require certification. Labour Market Data from Service Canada (NOC 2221 Biological Technologists and Technicians): According to the Labour Force Survey (2009), the median hourly wage for Biological Technologists and Technicians was $20.00. That is to say that half of all workers in this occupation earned less than this amount and half earned more. The median hourly wage for all occupations was $21.00. According to the same survey, the average wage for Biological Technologists and Technicians was $21.30. Employment opportunities in the Greater Toronto Region area are expected to be fair. This is largely due to a low turnover rate and a limited number of older workers in this occupation.
1.2 Program Advisory Committee Feedback **Review / discuss:** • Key regional issues identified by the Program Advisory Committee	• Belong to Innovation Cluster but there is little involvement- should the program become more involved? Ask member at PAC. • There are no other regional issues in the program

that may not have emerged in labour market data • The Advisory Committee's assessment of the response, or capacity to respond, to the above issues or trends	• Placement delivery – 15 week placement to be done either in the summer or fall – emphasis was placed on fall but to keep the summer placement as well – placement delivery is now happening in every semester based on student needs. • Looking globally for internship placements though challenging to compete in different countries – placements have been done in the US and Holland. • Worry if semester changes that a shorter internship period will not be ideal for employers and could cost placement down the road
1.3 Industry Liaison **Review / discuss:** • Program initiatives to maintain involvement with the industry / sector such as field placement supervisions, clinical, faculty renewal, professional learning, other professional affiliations, or community-based projects	- Field Trips to MARS for 4 years for students to see information on labs programs – helps for placements and connections to industry – leading biotech hub in Ontario - Ashvin – membership to CSFS for the last 6 years attended 3 conferences in the last 6 years - Shannon – membership to CIS – attended OCE conference (Ontario Centre of Excellence) for innovation to applied research 2010 – with Peter Spasov - Field Placement Visitation is a key aspect of our program meeting with advisors and supervisor keeps faculty engaged with ongoing trends and we have a direct link to any gaps there may be with our program to the workforce.

2.0 Curriculum Development and Framework	Summary of Key Findings
2.1 Curriculum Framework **Review / discuss:** • The program faculty's approach to, and philosophy of, teaching and learning	This program is lab-based and applied; students get hands-on experience in their classes. There is a concentration on developing skills for the field. Highly trained contract faculty that have cutting edge skills from the field. The laboratory environment is one that is based on research, exploration, problem solving and discovery to complete, create and analyze any test, procedure, analysis that is done. The faculty's philosophy of teaching is straightforward: teach/train your

	students as they would be working in a lab - with problem based learning, working together for a solution and letting the students be guided through their actions towards a final goal. By using problem based learning methods students learn, process, understand and apply the key skills (and critical thinking) necessary to be an effective lab technologist.
2.2 Outcomes from Curriculum Renewal **Review / discuss:** • Key outcomes from the Curriculum Renewal processes of the past few years • Progress to date in implementing the recommendations arising from Curriculum Renewal • Success of the changes implemented and the means by which they are being evaluated	Action Plan: • Capital access for centrifuge. Actions completed/ not completed: - Did not get monies for equipment needs. - Follow up about CPS for co-ops/ internships - Changed delivery pattern of biochemistry from a three hour lecture to a one hour lecture/ 2 hr seminar - Chemistry I and II changed to meet program needs better via General Arts and Science. - Articulation agreements with universities: Trent, University of Western Sydney, Charles Sturt University, Australia (Burlington On campus), pending is UOIT. - Forensic chemistry course has been developed - Solution for high attrition rate from first to second semester has been managed by adding a January intake.
2.3 Curriculum Map • Review the Program Curriculum Map and discuss the extent to which there is alignment of vocational and course outcomes • Review / discuss the distribution and progression of Vocational Learning Outcomes, Essential Employability Skills, and General Education themes across the curriculum. **Submit an updated curriculum map as an attachment.**	Course outlines are being reviewed and learning outcomes revised for some of the specific program courses. A package of “themes” has been created to package, similar outcomes, and content into a subject sequence that makes sense to students. **The proposed changes include:** Semester one introduces a Laboratory Math course specific to BTF (NEW) that would be a prerequisite for Semester two Laboratory Physics which would be a prereq for Semester three Laboratory Automation 1 which would be a prerequisite to Semester four Laboratory Automation 2. These courses will switch semesters as indicated in the recommendations section of this report. This allows the students for a

	strong physics background before approaching an automation course that uses that background to apply in a more lab oriented direction. Allowing the following changes to happen will allow the Technical communications course to move from semester 2 to semester 1 providing the students with fundamental report writing and presentation skills throughout the rest of the program.

2.4 Curriculum Sequencing **Review / discuss:** • The extent to which course content, levels of learning, and assessment methodology are successfully sequenced and aligned between courses and across semesters	Assessment in the BTF program is best shown through the DNA core courses found in every semester. DNA 1 has assessments a “bell ringer” situation where answers must be given in a short period of time. As students progress through the courses the assessment become harder and more intricate while keeping the same time factor. This type of assessment is important as it tests the general knowledge or common sense questions and the ability to keep a well documented lab notebook (tests are open book – simulates real lab experience). Presentations are also a key component to the program. These presentations escalate in time and complexity through semester 1 to semester 4, with corresponding critique and evaluation In the final semester students are put through competency tests to see how they adapt to different laboratory situations, problems, or procedures. They are asses on their ability to make decisions and carry out the tests to ensure proper tests/results are completed. Similar type assessments are also found in other courses in the program to varying degrees. For the most part courses are properly sequenced, with the exception of the Laboratory Automation I course in semester 1 and Laboratory Physics course in semester 2. Major changes to curriculum within these courses are needed to provide a better flow of information for students.
2.5 Delivery Mode **Review / discuss:**	For all the courses within our control we use a combination of lecture and labs, with some seminars if labs are not available. Lectures deliver key concepts and core information, and labs/seminars focus on applied

• The *primary* modes used to deliver curriculum such as lecture, seminar, lab, applied project, field camp and web based or hybrid courses • The rationale for, and appropriateness of, these delivery modes in relation to program learning outcomes	learning, building of lab skills and confidence the frequency/length of labs is the industry requires the application of these skills at entry-level employment.
2.6 Evaluation Methods **Review / discuss:** • The program approach to learning assessment • The balance and frequency of assessment types across the curriculum and their appropriateness to course / vocational outcomes	The program includes a large amount of competency testing and standard written tests. Timed lab tests to ensure that students are learning the required skills and can quickly access the information. Tests (bell-ringers) are open-book underscoring the need in the profession of keeping good notes and logs. Group and individual presentations are used to eliminate "textbook speak" and to demonstrate knowledge. Semester 1 to semester 4 presentations start with partnered presentations in the first semester culminating in poster presentations to the college community. The same assignment is assessed in two different courses in Semester 2. One course includes the development of a resume and mock interviews for preparation for placement.
2.7 Curriculum and Diversity **Review / discuss:** • Program strategies that support student diversity and promote understanding of diversity, including program culture / climate, curriculum content and approaches to teaching and learning	Issues in diversity are embedded in the curriculum in such areas a mock interviews and preparing for field placement. Faculty also recommend general education electives that cover this topic area. Approaches to teaching and learning that accommodate various learning styles Inclusive learning environment that fosters respect for others Team work is embedded in various assignments

2.8 Credentials Framework **Review / discuss:** • The Ontario College Credentials Framework and the extent to which the program aligns with the provincial standards	This program is an Ontario Advanced College Diploma with vocational outcomes at this level. The vocational standards for the Biotechnology Technologist Programs are used to inform this program for curriculum design and decisions. It should be noted that these standards are from 1999 and there have been some changes in the field that are being reflected in new curriculum in the last several years (refer to trends

• The program's current admission requirements and their suitability in relation to program rigor and student preparedness	section). **Minimum Admission Requirements:** OSSD with the majority of credits at the College (C) and Open (O) level, including: • 2 College (C) English courses (Grade 11 or Grade 12) • 2 College (C) Math courses (Grade 11 or Grade 12) • 2 College (C) Science courses (Grade 11 or Grade 12) These admission requirements align with other colleges and, with the added science and mathematics requirements, reflect the skill necessary for admission into a technologist-level diploma.
2.9 Learning Pathways **Review / discuss:** • Recent or anticipated initiatives that promote student pathways including high school articulations, dual credit, program laddering, dual diplomas, and university transfer, articulations, and partnerships	There is a program laddering system in place with the School of General Arts and Sciences (GAS) where students that are in their General Arts and Science – College Transfer program can enter into semester one of BTF. Graduates from BTF can then be laddered in the Police Foundations Semester 3 as potential future education. There are Articulations agreements set up with the University of Western Sydney and Charles Sturt University (both out of Australia) where students can complete a BSc in as little as 10 months. There is an articulation agreement with Trent University Upon successful completion of the Biotechnology Technologist - Forensics Advanced Diploma program at Fleming College, graduates with a minimum 75% cumulative program average will be eligible to apply to the Bachelor of Arts or Sciences (Honours), Joint-Major program at Trent University. Applicants must declare their choice of program at the time of initial application to Trent. A potential high school articulation could be considered as there are

	two high schools in the local board that have forensic programs – one of which Ashvin has been working on with teachers from the local school board.

3.0 Student and Graduate Satisfaction	Summary of Key Findings
3.1 Formal Measures of Student and / or Graduate Satisfaction **Review / discuss:** • Key Performance Indicator results for the program with a focus on #s 4, 8, 9, and 11 • Program status and positioning in relation to the KPIs of other programs of a similar type (where applicable) • Feedback and summary report from Learning Support Services (LSS) summary • Themes or issues emerging from a review of course evaluation summaries	Graduate satisfaction with generic and vocational learning outcomes (KPI4) was 87% higher than the comparator colleges at 81% and lower than the college average of 88%. Students also reported satisfaction with their learning experiences (KPI8) in the program with an average of 83%, higher than their counterparts at other colleges with an average of 80% and lower than the college average of 83%. Satisfaction with teachers (KPI9) was 75% slightly higher than comparator colleges at 74% and slightly lower than the college average of 76%. The one statistic of concern is the graduate satisfaction with the program which was 68% as compared to other similar programs with an average of 73% and the college average of 83%.
3.2 Other Measures of Student and Graduate Satisfaction **Review / discuss outcomes from:** • Student or graduate focus groups • Student Advisor observations / reports • Formal or informal discussions with students and graduates such as class councils, class representatives, individuals or delegations • Debriefing sessions following a field placement, clinical placement, or practicum	Graduates find that the best part of the program is the internship getting out into the workforce for a long period of time has provided them with the skills and confidence to succeed. For the workplace our placement is ideal when compared to competitors for a number of reasons – length of placement, the fact that students do not have to return to school afterwards, and the quality of student coming out of the program. The hardest part of the placement is that it is unpaid, but we have found that it opens the most doors and gets students into placement otherwise not available to others. Students enjoy the laboratory/practical portion of the program. From reading reports and talking to students the best part of the program is getting the opportunity to try out what they have been reading about.

	The hardest part of the program is the data/math courses and the biggest regret that students have when the hit the workforce/placement is that they should have paid more attention to those classes as its linked to all the work they are doing. We have had students sit on PAC meetings and provide prospective of the program to our members. Comments from students: I find the program very well structured; impressed with my ability to take his knowledge brought from university and apply it in the lab setting; looking forward to the internship in the fourth semester. Another student presented the options available to her after she graduated to go to university – its seems each University is different in regards to how much credit it will give to our students – a bit concerning for students if they have certain schools they would like to go to afterwards – but working on more articulations. Students have also found the computers course too basic and would hope for a more updated course that would be pertinent to the field Students would like a dedicated lab for the program – currently shared with a lot of programs – but typically BTF students end up getting late labs starting at 7pm and going till 10pm. Having another lab would alleviate the lateness of having to be at school.

4.0 Employment Trends	Summary of Key Findings
4.1 Employment **Review / discuss:** • Graduate employment statistics over the last few years, including those of students employed in the field, in a related field, outside the field, or unemployed, and any emerging patterns in this data • Student preparedness for entry-level positions • Emergent employment trends such as new types of positions,	The overall employment rate (KPI2) was 85% slightly higher than comparator programs with an average of 79%. The number of graduates in related employment was low at 24%, lower than the comparator colleges at 29% and 57% for all programs at Fleming. At this time these numbers do look low, but this is only based on two rounds of KPIs – from the first two years of the program. Student/Alumni contact with Faculty has shown that these numbers have trended upwards every year since the program has been

changing job market, regional distinctions, changing employer profile, or emerging skill shortages	established.
4.2 Other Graduate Destinations **Review / discuss:** • Alternative graduate destinations such as further education, international opportunities, volunteer service, or other experiences	Graduate programs in Science and Biology Undergraduate programs in Chemistry

5.0 Strategic Positioning	Summary of Key Findings
5.1 College Alignment **Review / discuss:** • Program alignment with college priorities such as vision, mission, values, strategic plan, academic framework, and the educational mandate, and / or academic priorities of the School • Opportunities for new program initiatives based on Program, School, or community strengths and alliances	This program aligns with the college's strategic priority of applied learning. This program mirrors the workplace in lab work, lab techniques and other areas of work requirements in the field. A full semester internship allows student to hone their skills as valued members of a team in the workplace. One area that could be strengthened is the partnership with the Innovation Cluster. More active involvement in the partnership would increase the presence of the program in the scientific community and may provide more opportunities for applied projects for students.
5.2 Competitor Programs **Review / discuss:** • Key parallels and differences between this program and those of its closest competitors, where applicable • 'Value-added' program distinctions and their attractiveness to prospective students	Canadore has both a two year technician and a three year technologist. The fourth and fifth semesters of the program offer 6-9 months of placement. Centennial has several programs that are at both the technician and technologist level – biotechnology technician/ technologist-microbiology (including co-op and fast track options). The Biotechnology Technologist - Industrial Microbiology program has met the national technology accreditation requirements established by the Canadian Council of Technicians and Technologists (CCTT) and, as such, has received national accreditation status by the Canadian Technology Accreditation Board (CTAB). Durham has a three year biotechnology technologist program. Seneca has a three year biotechnology technologist (Research) program that includes an optional co-op experience. The program prepares learners to work as a research technologists in life sciences through familiarization with scientific methods, experimental techniques, and research equipment. The co-op is only for students with a higher than 75% average and based on professor recommendation. The three year program at St. Lawrence in biotechnology technologist has a fifteen week placement in the sixth semester. Fleming's compressed five semester program has a full block placement in the fifth semester of fifteen weeks (600 hours). This longer placement than other colleges allows for more practical hands-on experience and training.

6.0 Enrolment Trends	Summary of Key Findings
6.1 Demand for the Program **Review / discuss:** • Patterns in the number of program applicants, qualified applicants, and actual registrants over the past 6 years • Changes, if any, in the student demographic profile, including level of maturity, diversity, prior knowledge, technological literacy, work experience, and expectations • Impact, if any, of this changing student profile on program curriculum	The students range from direct entry to non-direct entry. In Fall 2008/ Winter 2009, 28 students were direct-entry while 50 were non-direct entry. Of the direct entry, 89% were under 21. Of the indirect entry, 52% were under 21, 36 % were between the ages of 21-24, 8% were 25-29, and 2% were 30-39. International applications for Winter 2012 are 125.

6.2 Student Progression **Review / discuss:** • Patterns of student success and retention on a semester by semester basis over the last six years • The effectiveness of any strategies adopted to improve student success and retention	**2005** Retention from Sem. 1 to 2 was 83%, Sem. 2 to 3 was 85%, Sem. 3 to 4 was 96% and 100% from Sem. 5 to Sem. 6. **2006** Retention from Sem. 1 to 2 was 92%, Sem. 2 to 3 was 75% which was a noticeable dip from the previous year, Sem. 3 to 4 was 93% and lower than the previous year with 79% from Sem. 5 to Sem. 6. **2007** Retention from Sem. 1 to 2 was 75%, Sem. 2 to 3 was 75%, Sem. 3 to 4 was 98% and only 77% from Sem. 5 to Sem. 6. **2008** Retention from Sem. 1 to 2 was 81%, Sem. 2 to 3 was 78%, Sem. 3 to 4 was 90%. **2009** This year showed a poor retention rating from Sem. 1 to Sem. 2 with a retention rate of 77%, almost as low as 2006. Two areas of concern are the retention rates from Sem. 1 to Sem. 2 and from Sem. 2 to Sem. 3.

7.0 External Relations	Summary of Key Findings
7.1 Alumni **Review / discuss:** • The type and range of alumnae involvement in the program • Current and future strategies to engage alumnae in the program	Alumni have been involved with the program through Open Houses where a few will come back and talk to prospective students. Alumni have also provided great links into the industry and have been liaisons into getting more students into companies/agencies that previously had not taken students for internship. Faculty have kept in contact with Alumni and have looked at where they are working – ideally providing them an opportunity to come back and share their experiences and jobs with current students as guest lecturers. The Advisory committee is well managed, provides invaluable information, and meets on a regular basis.
7.2 Community Relations **Review / discuss:** • Significant partnerships, relationships, connections, or offers of support from the community that help to enrich the program and the student experience • Faculty, staff, and student involvement in volunteer projects and events • Contributions to the not for profit sector such as committee or board service by program-associated faculty and staff • Community recognition in the form of student bursaries, awards and scholarships	The BTF Program is involved with the Greater Peterborough Innovation Cluster and has been able to provide contacts to help in the growth of the biotech industry in Peterborough. The Cluster has been able to share their expertise with the program and support students in finding internships. The BTF program has worked in the past with local business (industry) the MNR, SGS Lakefield and PepsiCo to help the students develop interview, research skills and guest lectures. Ashvin has been working with a local high school to develop a 4U forensics course and has previously gone and spoken at a number of high schools with the local school boards. At this time there are no monies from the community for bursaries etc, but it is something that can be investigated further.
7.3 Program Advisory Committee **Review / discuss:**	Dr. Joanna Freeland, Forensic Science Program Trent University Dr. Bruce Lodge, Standards Council of Canada, Ottawa

• The distribution of Committee membership by constituency, sector, and / or region • The vitality of the Committee such as the frequency of meetings, and members' level of participation, engagement, and turnover • The extent to which Committee operations are aligned with the Fleming College Advisory Committee Orientation Manual and Advisory Committee policy.	Mr. Richard Cooke, Turnkey Automation Inc, Ajax Mr. Brad Barnum, Lakefield Research Dr. Evgeny Zakharov, University of Guelph, Genomics Facility, Guelph Dr. Shari Forbes, Associate Professor Forensic Science and Chemistry, Director of Forensic Science UOIT, Oshawa Mr. Garth Jones, Centre of Forensic Sciences, Toronto

8.0 Program Resources	Summary of Key Findings
8.1 Human Resources **Review / discuss:** • The number and distribution of all faculty, technicians, and technologists associated with the program including full-time, part-time, sessional, and cross-appointments • Profile of the Dean, faculty, and staff associated with the program including cumulative credentials, scholarship, work-related and teaching experience, and expertise in education • Significant faculty or staff accomplishments such as professional recognition and awards, achievement of credentials, and appointments • Contributions to the professional community or industry by program-associated faculty and staff including board / committee service, research, and presentations / publications • Current staffing levels for the program in relation to program numbers, curriculum, delivery modes and areas of specialization / generalization • Hiring priorities over the next few years based on the above • Current professional development and renewal plans in relation to program or student needs	There is currently three full time faculty dedicated to this program. There are four fully loaded partial load faculty associated with this program. All Faculty members have at least a Masters Degree in a related science field. Trent University Degree: Bachelor of Education (Intermediate/Senior: Biology/Chemistry) Laurentian University, Degree: M.Sc. – Biology University of Western Ontario Degree: BSc. – Honors Biology *Achievements:* Merit Award – Trent University (2007) Marita I. Mallory Cancer Research Bursary Graduate student Teaching Assistantship Aiming for the Top Scholarship *Western Scholarship of Excellence* National Biology Competition (University of Toronto)

	- 8th in Canada of 5118 participants *Publications:* Turcotte, L., and Lannér, C. (2006) Characterization of B1: A protein associated with the cancer status of ovarian epithelial cells. Northern Health Research Conference, June 2-3, 2006, Sault Ste. Marie, Ontario. Lannér, C., and Turcotte, L., Liu, J., Hickey, R. and Malkas, L. (2006) Detection of a biomarker for the cancer status of ovarian epithelial cells. Experimental Biology 2006, San Francisco, CA, April 1-5, 2006. M.Sc., Environmental and Life Sciences Graduate Program 2007-2010 Trent University, Peterborough, ON Thesis: "The development of a DNA bank and database for the North Atlantic right whale: a genetic resource for endangered Species." B.Sc. in Forensic Science (Honours) 2003-2007 Trent University, Peterborough, ON Honours Thesis: "Species identification of whale bones from an Antarctic whaling station."
8.2 Physical Resources **Review / discuss:** • Program costing information • Scope of current program resources such as laboratory equipment, software, library holdings, or tools essential to or which enhance program delivery or student learning • The adequacy of above resources in the context of program	Lab space has become an issue with growing numbers in the program. Lack of capital to purchase lab equipment. Consumables' spending has been reduced in the program with students providing more such as gloves. This program contributed 52.3% to overhead in the most recent Program costing information Fees in this program are differentiated

outcomes, program currency, and student numbers • Program specific external revenue such as sponsorships, grants, donations or gifts-in-kind • Other externally generated revenues, if applicable	

File report in:
S:\shared data\CLT\:< ***School name*****>: <*****Program Name*****>**
Attach copies of existing and revised bench marks
Attach an updated Program Curriculum Map

Based on an analysis of your key findings, identify areas that require attention.

Develop recommendations and an action plan that reflects the program's priorities and its capacity to achieve them.

Program Review Action Plan	Responsibility	Timeframe
<u>Recommendations</u>:		
- Continue to pursue Canadian Medical Lab Technologists of Ontario certification either directly through the CMLTO or through an articulation with UOIT (ideal).	**Coordinator**	**Ongoing**
- Learning outcomes need to be revised to behavioural outcomes in some of the program-specific courses. CLT will assist with this process. - Teaching team to discuss diversity/ culture issues during mock interview such as a question or issue.	**CLT, Chair, Coordinator**	**Spring 2012**
- Forensic chemistry course has been developed and is ready for semester four of 2012/ 2013 which will be determined after this review. This will take the place of the Gen Ed that was offered in semester 4.	**Faculty**	**Complete**
- Have a curriculum flow from math to physics to laboratory automation I and then II. See below. - Implement a new course through LJCS called Laboratory Mathematics – this would replace the Math for Health Sciences offered by GAS. - Move Laboratory Physics to Semester 2 – investigate the potential for it to be changed to a one hour lecture and two hour lab. - Move Laboratory Automation I to Semester 3. - The above course changes would result in Technical Communications being moved from semester 2 to semester 1 (GAS course)	**Chair**	**Winter 2012**