**Program and Curriculum Review Template**

*Instructions: Review all information that is stored on your program and curriculum review web page.*

[***https://department.flemingcollege.ca/pcr***](https://department.flemingcollege.ca/pcr)

*On this template, enter Key Findings only, in brief point form. This is intended to be a reflective, continuous exercise and it is not expected that there will be a written response to every single question. You will work with this document and update it annually. The primary focus on an annual basis will be on the curriculum areas and at the 5 year interval, the document will be a more comprehensive representation of further depth of analysis within each of the sections. Add links to additional information only if you will find it to be helpful in the future use of this document.*

**READER NOTE:** Multiple programs are discussed in this one template. These three programs are very similar, and documenting them together is much more useful in efficiently reviewing and planning. While most comments are common for all three programs, comments will identify differences where they exist. The three programs included are GIA (Application Specialist), which also includes GAO (the Online delivery method of Applications Specialist), and GC the Cartographic Specialist program. (Shawn Morgan, June 2017)

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| Program Coordinator:  | Shawn Morgan | Chair: | Rick Gray |
| Program Review Facilitator: | Val Bishop | Date Completed: | June 2017 |
| Program Name: | Geographic Information Systems - Applications Specialist and Cartographic Specialist | Program Codes: GC, GIA (GAO) | GIS - AS/CS |
| 1.0 Industry Trends and Employment | Summary of Key Findings |
| 1.1 Industry and Sector Trends Review and discuss the following:Industry / sector changes or issues identified by the Program Advisory Committee Recent labour market data or sector reports as provided by the Fleming Library Researchers. Recent or anticipated changes in occupational standards, level of entry and credential and / or standards of accreditation Based on the above, do these changes or issues necessitate changes to your program, either immediately, or in the next few years?  | The GIS industry changes rapidly, so changes to curriculum are required constantly. Major changes are frequent in courses using cutting-edge technology, like Web GIS (each semester), and less frequent in theory-based courses, like Geodesy (every few years).GISP certification strives to be an industry-wide, internationally-recognized, software-agnostic Certification available to geospatial professionals. It requires annual fees and entry exams to become and maintain membership. Rarely is it a requirement for employment in Canada, but has become a filter for positions in the USA. Professor Marikka Williams is a member, and annually presents on the GISP certification during Field Camp. Students having graduated from Fleming’s GIS program perhaps acts as a credential itself within Canada, given the number of graduates through the years and the Canadian name recognition more so than GISP. Membership in Geospatial Information & Technology Association (GITA) or the Urban and Regional Information Systems Association (URISA) are well established in Canada, but are employer-focused more than for individuals. GoGeomatics events also has a good following, creating a community that has less barriers for graduates to participate in. Ontario’s MNRF indicated they only advertise on GoGeomatics, with positions not mentioning a required GISP certification.PAC has indicated the transition to ArcGIS Pro (from Desktop) is occurring slowly and the program should continue to phase this into the curriculum. Further, Cloud-based software is becoming more important to the enterprise and asked to have this more integrated into the curriculum. (PAC/Collaborative Project)The PAC also confirmed the move towards smartphone-based data collection, moving away from dedicated “data collection” devices and the software running on these, ArcPad.The following are notes taken from the May 9, 2017 PAC meeting and address industry and sector changes/trends as noted by PAC members.* iPad and smartphone data collection is growing quickly
* real time satellite data noted trend
* accessibility of products to meet AODA
* drone activity and related policy development
* data governance is an issue in industry (storage, licensing, privacy, ownership, policy, security)
* Technologies moving towards the Cloud
* always hoping for more IT background in employees and struggling to find this

As well PAC members made the following suggestions for the program to consider in response.* good stereo 3D stereo stations would be beneficial for the program
* Spectroradiometer might be a good purchase
* Is photo interpretation taught? Do this in remote sensing -m ost is algorithm based not just visual extraction
* consider hosting a Young Professional Conference at the College - suggest 3 days in the summer.
* Online courses are hard to find on the Fleming website
* missing a Surveyor Specialist Program from the College

Again, the GIS industry changes rapidly, so changes to curriculum are required constantly. There are detailed notes that reference this in Section 3.2 of this report. As well, the following items were noted in the May 9, 2017 PAC minutes as upcoming curriculum changes:* Python becoming more common, trend that C# is being less used for scripted vs application development
* Web GIS - need to integrate into more courses further, big move towards this in industry
* There is also a trend towards Cloud (particularly Software as a Service) based services
* moving FME (data translation software) earlier in the program to allow opportunities for students to work with the software for longer.
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| 1.2 Labour Market and Employment TrendsReview and discuss the following: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. Emergent employment trends such as new types of positions, changing job market, regional distinctions, changing employer profile, or emerging skill shortages | KPI 2 Overall Employment Rate: GIS-CS 2014 88.5% 2015 77.3% 2016 87% 2017 79.2%KPI 3 Related Employment Rate: GIS-CS 2014 84.6% 2015 50% 2016 60.9% 2017 70.8%https://department.flemingcollege.ca/fdr/attachment/1298/downloadToday, we are seeing the trend of specialization becoming increasingly important. Skills shortage upcoming on Surveying/Surveyors. Currently program is only an introduction to Surveying. As the technology evolves, the division between what a GIS person is too changes. Students who develop software/program, are gifted with cartographic skills, and those who are excellent at database and analysis are becoming more focused and specialized. In particular information technology skills combined with GIS has been identified as a need by PAC members and by GIS job descriptions. The GIS program was originally designed as a catch-all/generalist approach. New courses are perhaps necessary to foster this specialization, where students can dive deeper into specific technologies of their choice. This will also evolve the program and create larger differentiators to the increasingly competitive GIS education space. Many upcoming retirements are opening new positions in Government, usually causing cascade to open junior positions.  |
| 2.0 Key Performance Indicators Review and analyze the formal Key Performance Indicator (KPI) results for your program. | Summary of Key Findings |
| 2.1 Student SatisfactionIn addition to the formal Student Satisfaction KPI results, comment upon any other formal or informal discussions with students and graduates such as *student focus groups*, class councils, class representatives, individuals or delegations, or debriefing sessions following a field placement, clinical placement, or practical work integrated learning experience.  | Cartographic Specialist:KPI 9 Student Satisfaction with Teachers GIS - CS 2014 60.9; 2015 84.7%; 2016 70.2%; 2017 66.3% KPI 8 Student Satisfaction with Learning Experience: GIS - CS 2014 70.3% 2015 90.3%, 2016 78.3%, 2017 69.1%https://department.flemingcollege.ca/fdr/attachment/1298/downloadApplication Specialist:KPI 9 Student Satisfaction with Teachers GIS - AS 2014 61%, 2015 88%, 2016 63%, 2017 68%KPI 8 Student Satisfaction with Learning Experience GIS - AS 2014 22%, 2015 95%, 2016 69%, 2017 73%(2017 KPI data Pivot tables)Note that in 2016 two faculty that teach only in the AS program were on medical leave, and existing faculty/contact faculty were teaching courses new to them on short notice/without development time. Student Focus groups were conducted on May 17, 2017 for both in class and online students.Students commented that the program strengths are its diversity and depth of the learning, content is relevant and up-to-date, and the 10-month format is great for career changes/getting into the industry. The Collaborative project is excellent opportunity to work with professionals/gain real world experience, and they like the group work. Hands-on experience, especially with field camp, was very nice. First semester being common (between Cartographic and Applications programs) was also identified as a strength. The Online program also offered flexibility that enabled them to take the program. Finally that the staff are attentive, knowledgeable, and great at explaining things. With so much technology to learn, students identified opportunities to improve on the teaching methods. Although the online students like that they are taking the same lectures as those taking the in-person mode, they do feel it was a good choice to have labs separated. Some students in-person did not like lectures being held in lecture rooms, and want them in computer labs, while others said the opposite. Labs they said felt more like lectures, and should be time that they can catch up, rather than learn new material. There was also too many assignments and items to complete first semester, and that the tutoring sessions were poorly scheduled/when they felt they could not attend. Labs also move quickly, and if you miss one step they felt lost. A recommendation was having an additional resource to help in the classroom, particularly for geospatial and programming. Students commenting on the Evaluation, assessment and feedback in the program was mixed. Comments included that some feedback was lacking, or late, or too general. They feel faculty should be providing more time for each individual for feedback. For programming, students felt they learned better with smaller weekly assignments, vs large assignments. Other feedback suggestions the student groups had included many ideas. Faculty office hours should be scheduled to match their schedules/provide drop-in time. Project and time management was a skill students feel they could get more help in. Room scheduling causes issues, especially when working on a limited number of higher-powered machines/or machines with specialized software. Week 15 had too many items due/tests to take, causing many overlaps. Week 8 should be a catch up week, and not one with new assignments. Further, how can other work be completed while attending field camp (Week 9)? Faculty have excellent industry knowledge, but teaching skills are an area where improvement is desired. Online students identified that working in mixed-mode groups was challenging, as those in-person students didn’t have the familiarity of the technologies, and their schedules were different (as labs are scheduled differently). Students identified concerns over efficiency of communication technology used, in particular Contact North/Skype for Business.For proctoring exams, an earlier expectation of the schedule is necessary to schedule better, and better communication of where proctoring services can be obtained.  |
| 2.2 Retention RatePlease review the retention rates for Fleming College students within each program for Fall intakes 2008 to 2012. The report illustrates the retention of students within Fleming College (i.e. those students who transfer out of their current program, but who remain in the college and progress to the next semester level). The information in this report is based on students enrolled at the 10th day of classes for each semester.Review patterns of retention on a semester by semester basis as well as graduation rates over the last five years.Comment on the effectiveness of any strategies adopted to improve student retention.Please review the IPP (Integrated Program Planning) data that focuses on Retention data. | Cartographic Specialist retention rates are noted as 2014 - 84%, 2015 - 92% and 2016 - 82%. (2016, IPP data analytics)Applications Specialist retention rates are noted as 2014 - 90%, 2015-76% and 2016 -79%. (2016, IPP data analytics)\*note no 2017 data availableRecently students that leave the program indicate they do so because of external factors and/or choosing to no longer pursue GIS as a career. Many with external factors influencing their departure said that they will return to complete the program when they can. Many students are overwhelmed with the workload, and have been accommodated to take the program part-time, despite not being marketed as a part-time program. Reviewing the program demands/workload, opportunities for part time studies, and improving student support is important to alleviate these pressures. It is important to note that faculty have designed the immersive study format as a full-time, and is optimal to do so. There are many part-time study programs elsewhere, which have had limited success and we feel the Fleming GIS programs should be focused on maintaining itself as a full-time, quick-study program as it is currently oriented. It is frequently identified as the reason students choose fleming, and while it may cause some students to leave, generally the retention and graduate rate are high.  |
| 2.3 Graduate RateReview patterns of graduation rates on a semester by semester basis over the last five years. | KPI 1 Graduation Rate: GIS - CS 2014 86.7% 2015 86% 2016 94.1% 2017 95.1%https://department.flemingcollege.ca/fdr/attachment/1298/downloadCartographic Specialist has averaged an 90% graduation rate over 2014-2017 academic years.Application Specialist has averaged a 91% graduation rate over 2014-2017 academic years.In past, students picking up a single course that they missed cannot enroll and start until the second week of classes, which puts them behind. We are seeing this trend increase and it would improve student graduation rate if the part time registration process permitted students to apply and start week 1, closing the lag time for enrollment. Further compounding this is the online delivery method, which has a steep learning curve in the delivery technology that requires time to navigate. -- Morgan 2017 |
| 2.4 Graduate SatisfactionUse the FDR report for Program Review – 5 year historical trends to provide your analysis. | Cartographic Specialist: graduate satisfaction with the program noted as 2014 - 77%, 2015 - 50% and 2016 - 84% (2016, IPP data analytics)and KPI 11 Graduate Satisfaction with Program GIS - CS: 2014 80.8% 2015 70.9% 2016 78.6% 2017 85.8% https://department.flemingcollege.ca/fdr/attachment/1298/downloadIt is unknown why these statistics are different between these two data sources.Applications Specialist: graduate satisfaction with the program noted as 2014 - 82%, 2015 - 86% and 2016 - 77% (2016, IPP data analytics) and KPI 11 Graduate Satisfaction with the Program GIS - AS: 2014 82%, 2015 86%, 2016 77% 2017 98% (2017, KPI data)\*note that there is no 2017 graduate satisfaction data available in the IPP data analytics) |
| 2.5 Enrolment Trends and DemandYour team will review and analyze the patterns in the number of program applicants, confirmations and actual registrants over the past 5 years. You will also examine changes, if any, in the student demographic profile and the impact, if any, of this changing student profile on program curriculum.Assess whether the program curriculum needs to change based on the above analysis.Use the KPI excel spreadsheet that provides Day 10 enrolment numbers for Fleming for the last 10 years, to assist you with your analysis.Please review the IPP (Integrated Program Planning) data that focuses on trends related to student demand, and the related ‘Situational Analysis’ information included for your program – select the  Demand Trending Tab and Situational Analysis Tab. | Note: Since 2015-16 year, the Applications Specialist program is offered both Online and In-person. Cartographic Specialist program is currently offered only in-person, and has been investigated multiple times for online delivery. Challenges with respect to section size and program numbers, possibly further negatively affecting the GC program’s contribution to overhead.Students currently enrolled in the program come mostly after graduating a 3 or 4 year University degree, often in a related discipline like Environmental, Geography, or Social-sciences fields. Others say they are attracted to the quick-nature of the program (only 10 months, and then you’re done). One area of concern has been the social resiliency of students, in particular for those attracted to the online program. Those enrolled are more sensitive to stress, less able to work in groups together, and generally need more emotional/personal support. Time management is a key to success, which an increasing number of students struggle with. Cartographic Specialist:Applications: 2014 - 102, 2015 - 95, 2016 - 73 Registrations: 2014 - 27, 2015 - 19, 2016 - 9Overall decline in applications and registrations is apparent. The conversion rate has also been declining from 26% in 2014 to 12% in 2016.Enrollment numbers have fluctuated slightly over the three years from 69 in 2014 to 72 in 2015 to 56 in 2016.(2016, IPP data analytics, Situational Analysis)Demand trends are following the broader system trends.Applications Specialist:Applications: 2014 - 144, 2015 - 138, 2016 - 222Registrations: 2014 - 38, 2015 - 47, 2016 - 55Relatively steady increase in both applications and registrations and a current conversion rate of 25%. Enrollment numbers have subsequently also been steadily increasing from 102 in 2014 to 123 in 2016. (2016, IPP data analytics, Situational Analysis) |
| 3.0 Program Curriculum | Summary of Key Findings |
| 3.1 Program Learning Outcomes and/or Sector StandardsReview program level learning outcomes in preparation for curriculum mapping (vocational, essential employability skills, general education)Where applicable review sector standards to ensure program is keeping up with new trends, developments and requirements. | The program outcomes have been reviewed and a few will be addressed as an action item. In particular, the language of the 4 cartographic-specific outcomes needs to be revised to use less technical words.The program focuses on a general technical overview, spanning multiple sectors and as such does not have specific sectoral standards.  |
| 3.2 Program of Study, Course Outlines, Delivery and Program Map Review the feedback and suggestions received from Course-level survey completed by faculty at the end of each semester.Review the balance and frequency of assessment types across the curriculum and their appropriateness to learning outcomes for the course and program level outcomes.Collect a cross section of samples of student work as evidence of achievement of learning outcomes.Reflect and comment upon the variety of methods used to demonstrate program outcomes.Reflect and comment upon the degree of technology-enhanced delivery of the program outcomes.Discuss the degree and depth to which the program is providing work integrated learning experiences.Record the course in the curriculum that covers the college-wide sustainability learning outcome: “Students will be able to explain the interconnections between the broad principles of sustainability - which include human health and well-being, ecological health, social issues, and secure livelihoods- in order to support a better world for all generations”Review (or create) Program Curriculum Map(s) to ensure that there is alignment of current courses to the overall program outcomes, including the Vocational Learning Outcomes, the Essential Employability Skills, and adherence to the General Education Policy.Make recommendations to address any gaps identified or improvements required.Review the program’s current admission requirements and their suitability in relation to program rigour and student preparedness.Include an updated program curriculum map on your program and curriculum review web page. | Tests, projects, and group work all combine to demonstrate program outcomes. **Technology** is a focus in the program, especially with the Online delivery method being added in 2015/16. Contact North is our virtualized classroom for delivery, we use a Virtual Desktop Infrastructure (VDI) so students can use the same managed computer “lab” remotely, and (new for 2016-2017) we use Skype For Business as an instant messaging platform to communicate between students, faculty and staff. This combination works very well. The VDI will require replacement within the next 5 years, as its hardware ages. It has been suggested the programs move towards a bring your own device (BYOD) program to avoid the expensive replacement of the VDI, which is critical in supporting the online delivery method.  **Gaps**: More web-publishing throughout program, better foundation teaching for alignment throughout courses (example was Geodatabases is out of order). Surveying track is a possibility for specialization. One of the most successful parts of the GIS post-grad programs is the collaborative project. This allows students to apply their skills to a project for an external organization, delivering a solution to their problem. Students work in groups of typically 3, taking leadership on delivering the solution. First, the back-half of Winter students plan their project. The front half of Spring semester students develop and deliver the project to their client. As well, students present their solution in a conference-format to the college, public and clients at a GIS open house day, usually held the last day of the semester. These collaborative projects deliver real-world solutions to problems, helping them achieve the **college-wide sustainability learning outcome**. **Admission requirements**One assumption on requirements is that students are proficient in English. With the increased trend of international students, command of the English language in reading, writing, and speaking is critical for student success. Our focus is applying technology, given this is a post-graduate program. Establishing a clear English proficiency requirement is a priority. Admission requirements currently are applicants must hold a university degree or college diploma, or equivalent education or work experience.An **improvement to the curriculum** could include a new course in GIS Corporate and Legal Management, focusing on data agreements, managing and documenting resources; the “business” end of GIS. Learning Outcomes* Lots of minor revisions
* Some more major revisions include GEOM 73 (including more Web into the Customization course), and GEOM 111 (modernizing and focusing the courses Databases
* Minor revisions could be made as faculty are working on their courses
* Designing course learning outcomes so they can be clearly assessed - takeaway from teaching and learning day
* Development time - an issue as the program runs 10 months--through May and June- faculty are given development time throughout the year on paper, but in reality this doesn’t translate yet constant revisions are necessary to meet outcomes

Assessment/Evaluation* mainly minor revisions across programs
* same two courses with the major revisions
* GEOM 67 - comments around assessments are challenging to mark, marking is complex across the program (maps etc.)
* perhaps LDST could be brought in to assist the program team with this challenge, track it visually perhaps. In past suggestions provided were challenging to implement and/or some contributed to plagiarism issues.
* we can reduce the number of assessments if we (as faculty) coordinate across the team - this has been expressed by students (too many assessments)
* efficiency is the overarching goal - we need to look at this, but in past has proved challenging due to a lack of development time
* does it make sense to do more lighter assessments or less larger assessments?
* will need a solution re: action items around when large revisions and how large course revisions will take place
* faculty skill sets can go stale very quickly - industry is always shifting and we need to always stay up to date with our skills - this takes time and is a challenge for the program
* Collaborative projects - link with industry but by the end of the project, the students are teaching us
* would like to retire AutoCAD from municipal mapping - would like to look closer at software being used - link between technology and assessments - transitioning to a more successful tool in this course
* need to start mapping content and assessments

Sequencing* timing and arrangement of skills and courses
* access course shouldn’t be access, it should be more focused on GIS
* sit down as a team with course outlines and work through it

Student Course Material* industry changes frequently
* manual suggested for the survey camp
* suggestions of building video libraries to aid in student learning and lesson faculty needing to live-demo, but challenged to do this with frequent changes by industry, requiring frequent updates
* circles back to an issue of time
* project manual for project planning course - something to consider, workbook almost - fill in the blank idea
* For online students. a total station video was created - students love this video
* Online equivalent survey camp needs more work this year
* APST 142 and 87 - are to be the same course, but had to split due to camp fees, and in reality they are very different courses due to lack of equipment access with remote students.

Technology* 5 courses need more IT support -- currently students only have the teaching faculty and tech for help, which are in high demand by 60+ students while taking these courses
* time to learn new software and mediums not given to faculty, which changes frequently
* e-portfolios - rolling out Fleming wide - blog format on a Fleming domain - something to consider - establishing a professional identity online
* project management tools brought into the course - social side of getting things done, students are in a support role in the workforce, students often lack these skills

Faculty feedback surveys noted the following courses as requiring major revisions:GEOM73 - this course needs to get current to industryGEOM101 - needs IT revision, uses htdocs and this is very old way of managing website sharesGEOM99 - needs IT upgrade, no external GIS web server available from Fleming which causes significant limitations on what can be done. GEOM65 - needs student material updated and IT upgrade, with externally facing server inside FlemingGEOM67 - needs assessment reviewed, student material updated and videosAPST62 - needs IT upgrade and a manual created.GEOM111, GEOM70 and GEOM65 - sequencing needs adjusted and new technology introduced in first semester/reinforced through 2nd and 3rd semester courses.It is noted that Faculty feedback is missing for GEOM 66 and GEOM 75.See Technical Pedagogy attachment for sequencing. |
| 4.0 Strategic Positioning and New Opportunities | Summary of Key Findings |
| 4.1 College and School AlignmentReview program alignment with college priorities such as vision, mission, values, strategic plan, academic plan and the educational mandate, and / or academic priorities of the School. | Program Alignment with College Vision and Values: The GIS programs are aligned with the current College **Vision: “***More than Skills. Fleming will be known for our continuous pursuit of excellence in teaching and every endeavor”;* and College **Values:** *“Learning, Collaboration, Creativity, Continuous Improvement, Sustainability, and Inclusiveness” (Fleming College Strategic Plan, 2015-2018, p. 2).*Because how GIS is used changes so frequently, faculty must evolve the program very rapidly. It becomes part of the discipline. Further, technology works best when the fine details are addressed, otherwise what is created looks very poor. Striving to achieve an excellent program with these demands is challenging and faculty are extremely motivated to do this. The industry is also very diverse, which each faculty take on specific areas to be the best they can. The education students receive can then be very well rounded, yet still technically deep in the subjects by focusing on what matters.  Program Alignment with Academic Priorities: Specifically the GIS programs reflect the following Academic priorities: *“Learning Design: Reimagine and design learning opportunities to fully engage our students using accessible outcomes-based approaches, applied learning and authentic assessment.*  Connection to the Strategic Plan: Priority #1 Deliver outstanding student learning and experiences, and Priority #2 Collaborate and prosper with our communities” (Fleming College Academic Plan, 2015 – 2018, pp. 10 – 11). The GIS programs offer the collaborative project, which is both applied learning and directly benefits the community. This collaborative project is conducted in the May-June period, with planning for the project in March and April. Students earn experience building and delivering the solutions necessary to meet the clients requirements. The For-credit project has guidance from experienced faculty, helping students get the most value from the applied-learning time, while also meeting the communities demands. Faculty also learn from this experience and bring that real-world knowledge back into the first two semesters for the following years’ class, evolving the curriculum to bring outstanding student learning.   *“Teaching Excellence: Promote and recognize innovation and excellence in teaching by supporting and engaging faculty in industry practices, discipline research, and educational technology.* Connection to the Strategic Plan: Priority #1 Deliver outstanding student learning and experiences, Priority #2 Collaborate and prosper with our communities, and Priority #3 Excel as an organization” (Fleming College Academic Plan, 2015 – 2018, p. 12). Fleming faculty members are committed, energetic, and creative people who want to contribute to the future of education. Discuss how the college has supported faculty in your program, in their growth as dual professionals, i.e. teachers and subject-matter experts, to achieve teaching excellence. GIS is a field which constantly changes. As a field focused on software and data, there are always new ways to learn and grow. Faculty have significant work experience prior to becoming full time or contract faculty, and understand this field requires lifelong learning. The GIS programs teach students not only how to use the current generation software and technology, we give opportunities for personal growth and specialization. Maintaining the baseline program requirements is challenging, which faculty ensure all students meet through testing and practical exercises. Each student is encouraged to specialize further, and dive deep into their own interest areas. This passion spreads through the program community fostered by faculty, and maintained upon graduation. Many graduates supply collaborative projects to the program, which continues the cycle of growth by faculty, students, and the program.   |
| 4.2 Competitor ProgramsAnalyze key parallels and differences between this program and those of its closest competitors, where applicable.Comment on the ’Value-added’ program distinctions and their attractiveness to prospective students. | See attached competitor programs chart. Fleming’s program has a historical, geographic and technology benefit over most other programs in Canada. Fleming was first to start a GIS post-graduate program, which gives us a huge alumni to associate with, and many of those early graduates are the ones making hiring decisions today. Second, our proximity to the GTA gives us a huge draw of talent (for guest speakers, contract faculty and other resources) that other colleges with similar program generally lack. Finally, our technology taught to students is done by newly-hired faculty that have 15+ years of industry experience each. This allows us to be the best at what we are doing. Finally. students in our program have a Collaborative Project, which gives students working experience while also keeping Faculty updated on industry trends, while making connections with contacts and technical skills. The 10-month model is praised by graduates as well, since students can quickly learn what they need to jump into this industry. Please see program ideas (Section 4.4) for reference to 3rd semester course options which would make our programs more competitive. |
| 4.3 Learning PathwaysComment on recent or anticipated initiatives that promote student pathways including secondary school partnerships, dual credits, program laddering, dual diplomas, and university transfer, articulations, and partnerships.Identify any new pathways that could be developed.  | Vancouver Island University has a pathway to a Masters’ program, direct entry into second year. Students must apply to be accepted and must meet all VIU pre-existing admission requirements (undergrad etc).  The Trent-Fleming articulation agreement has had limited numbers, maybe 1-3 per year and some with none. Better marketing/advertising and, perhaps, Fleming faculty working with Trent would aid in this being taken more advantage of by Trent students Attempted to strike an agreement with Laurier, but their faculty there were not receptive of a college-university partnership unfortunately.  |
| 4.4 New Program or Redesign IdeasAre there opportunities for new program initiatives based on Program, School, or community strengths and alliances? | Big Data and Data Analytics are a growing field, which has many similarities to GIS data. Perhaps starting a new program coordinating with other departments, outside of Frost.Students are asking for the Cartographic program to go online. Currently we get about 20-30 students per year in the Applications Specialist program. Looking at historical numbers (pre-online) it was about a 3 or 2:1 ratio for Applications to Cartographic. For fiscal sustainability, taking Cartographic also online may prove challenging. More research in how best to accomplish this is important. Feedback from graduates and employers is that they want our education to update their teams. With the online version of our program, this is more possible than ever. However, scheduling and enrollment are challenging. For scheduling, there is no pre-schedule for the course, only one that is released about a week before the class starts. That is not enough lead time for professionals to enroll. Further, part-time students are told that they cannot enrol until week 2, which we find puts students immediately behind in the demanding program. What would be ideal is set about 3 months in advance and is business-friendly (either completely within the hours of 8:30-4:30, or completely after-hours). This only needs to be set for the online version of the program, which includes the lecture and a single lab section. For enrollment, we could work with the registrar to identify the number of “online part time” spaces that can be made available for each course, and for the program overall. Perhaps working professionals could audit the course, rather than ‘take’ it. Review the current model of Applications and Cartographic specialist, possibly merging the two programs into a single entity where students are given options, rather than a direct learning track. The program advisory committee has been in support of this idea, but administrative challenges are acting as a barrier to implementation. Reviewing this concept, a single program with options, is important to address new courses.The PAC, faculty and students have identified the current single-track as limiting. There is the potential for new courses, specifically in the 3rd semester to help students further specialize. Application specialist students could take new courses in Remote Sensing (UAV/LIDAR), Information Technology, Big Data, Programming, or Web GIS in their third semester. These would be additional courses, and students could choose one to take in the third semester. Competitor programs are offering more courses, allowing students to specialize. Our current single-track method needs to be modernized, offering further specialities. The opportunity for more specialized courses in the Spring semester would help address this. For example, students in Applications Specialist take a database course currently, but could choose from a Remote Sensing, Programming or Database course in this 3rd semester to dive deeper into a chosen specialty. The PAC and alumni have identified this idea as attractive for their own professional development.  |
| 5.0 External Relations | Summary of Key Findings |
| 5.1 Community PartnershipsDoes your program have significant partnerships, relationships, connections, or offers of support from the community that help to enrich the program and the student experience?Are faculty, staff, and student involved in volunteer projects and events? | The collaborative project is one which works with hundreds of organizations external delivering real-world experience to students. Esri Canada provides a scholarship to a student, and also recruits into their associate (paid 1-year contract job) position at one of Vancouver, Montreal or Toronto office. Latitude Geographics (Victoria BC) provides their software and support in training students with this software solution for no licensing costs. Safe Software (Burnaby BC) has engaged us to provide support and training our faculty and students.  |
| 5.2 Program Advisory CommitteeComment on the distribution of Committee membership by constituency, sector, and / or region.Comment on the vitality of the Committee (frequency of meetings, members’ level of participation, engagement, and turnover.)  | Gord McElvray - Retired (absent 2017)Al Buckle - Director, TeraNetNicole Schleifer - Manager, City of Peterborough (New 2016)Bob Ryerson - Semi-Retired/Academic/ConsultantMurray Lister - Manager, Grand River Conservation Authority (New 2016)James Britton - Section Manager, MNRFDan Bulger - Manager, ESRI Canada Technical ServicesRobert White - CEO, White Star (USA) (New 2016)Steve Grise - Technical Independent Consultant (New 2016, Absent 2017)Tammy Sikma - Manager, County of PeterboroughRaul Ponce - Professor, Trent University (Absent 2017)Chris North - Esri Manager (Absent 2015-2017)Rick Clace- Dean, Confederation College (absent 2016-2017)Frank Kenney - MNRF Science Division and Contract FacultyMike MacLean - (soon to be) Retired, City of Peterborough (absent 2016-2017)Chris Wilkinson - Conservation OntarioRobert Sevigny - Retired, City of Toronto2016 committee revitalized, but needs to be vetted again. The Committee currently convenes once per year in the Spring. Many members recently retired and will be asked to step down to make room for new entrants. James Britton has agreed to take the chair role, as Chris North has been absent for multiple years. There has been concern with contract faculty representing industry on the PAC, thus having a conflict of interest. |
| 5.3 Alumni RelationsDescribe the type and range of alumnae involvement in the program.Current and future strategies to engage alumnae in the program. | Many of our alumni submit projects to be completed as a collaborative project. These are completed by student groups of 3 in their last four months of the program. In March and April the groups plan their project implementation. Then in May and June the groups focus their time and follow through to deliver the project for course credit to the client by end of June. A faculty advisor is assigned to each group to assist and guide the groups in this professionally-focused (versus Academic) process. Students must defend their completed project to a panel of professors to meet quality and professional standards. An open house is held the last day of the semester, which faculty, students, alumni, the public and the project sponsor are welcomed in a conference-style event. See attached list for client names and projects completed in 2016-17. |
| 6.0 Program Resources  | Summary of Key Findings |
| 6.1 Program Revenue and ExpensesPlease review Integrated Planning and Performance (IPP) information for your program.Are program resources adequate, in the context of program currency and student numbers? (e.g. laboratory equipment, software, library holdings, or tools essential to program delivery and student learning.Are there opportunities for further program specific external revenue such as sponsorship, grants, donations or gifts-in-kind?Review the existing revenue and expenses associated with your program using the IPP tool and provide comments below. | Application Specialist: CTO has been steadily increasing and currently sits at 14% for 2016 fiscal year.Cartographic Specialist; CTO has been steadily decreasing and currently sits at 15% for fiscal year 2016. Down from a high of 35% in 2014 fiscal year.The program has many inefficiencies that can be solved through scheduling, software monitoring technology, and more partnerships. Currently the programs mostly share 3 computer labs with all other programs. The computing requirements of the GIS program is one of the most demanding on campus. With the evolution of the technology used, there is movement away from desktop platforms and into the web. This “cloud” based technology allows us to use any computer as a terminal and perform some of our work. However, other work requires server-like infrastructure, which data processing and visualization occurs and can only be completed on the most powerful of computing systems. Students have recommended that GIS labs be scheduled, giving GIS post-grad students a priority over the most powerful computing rooms, both for classes and for working outside of class. With the online program there is an identified risk of cheating during tests and assignments that doesn’t exist with in-person students. To reduce costs for the online students, we have limited invigilated exams to one per course per semester. But typically, there are many tests that students take, rather than relying on only one. So these others’, students could “cheat” without much oversight. Software does exist to help invigilate these students, which we have requested (Respondus Monitor). There are also software tools that allow an instructor to monitor a classroom labs’ desktops on a single screen. This would help during practical tests, where students are performing tasks, and further maintain academic integrity. Finally, as data acquisition tools become more costly, we have been looking at external partnerships and demonstrations, versus purchasing. More opportunity to bring in (and possibly offer compensation for) external organizations to work with students, demonstrating key technology they will encounter is important. We have had successful demonstrations from Ontario-based municipalities on their UAV/Drone, and server infrastructure environments, and wish to host more of these opportunities in the coming years. This will help reduce program costs while increasing learning opportunities for students.  |
| 6.2 Faculty and Staff ResourcesPlease comment on: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 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.Hiring priorities over the next few years based on the above. | Our faculty are the most important asset. Their knowledge directly translates in how and what they teach. GIS is a rapidly changing industry, as new, less-expensive workflows enable industry to do more with less. If we do not keep up with yearly refreshes, we won’t continue to be leaders in this industry. It is estimated that courses must be 25-50% revamped each year, or they will be outdated/not appropriate. Faculty typically scramble to do this development in their own time while having a busy teaching load. In particular, at the post-graduate level, we are even more pressured by the program advisory committee, employers and the students to do this well, or it reflects very negatively on our KPI. Currently most faculty and technicians work multiple programs, including the post-graduate GIS program, in support of courses with GIS and GPS technology at the Frost campus. In the last few years, due to budget concerns development time has been limited to a few college-wide initiatives, and faculty have been struggling in particular with their assigned duties in the GIS Post-graduate program. Those faculty who have been at the college longest have expressed their skills are lacking in the more technically-demanding courses in the post-graduate program, and thus the pool of who can teach what is diminishing. Further, due to unplanned medical leaves, full-time faculty have been shuffled between courses with no notice, and without any development time. The student feedback has shown this to hurt the program. Many full-time faculty members are also teaching into other programs more and more, with their time teaching at the post-graduate level decreasing--possibly because these other diploma-level courses are easier to teach/have less required ongoing development compared to those in the post-graduate GIS programs. More faculty technical assistance is necessary in the program. Currently the online program requires significant technician time investment to help organize, prepare and ready students for day 1 of the course. Further, as the requirements become more technical, faculty time to prepare each lecture, lab and test also increases. More technician time assisting in each course would go to reduce the time pressures of faculty. However, this time must come from those with the correct skillset, which is increasingly becoming more demanding in the information-technology realm. The last few years Flemings’ IT team has helped significantly, especially with respect to the Online program. This demand will increase, and thus should be adequately planned going forward of which staff at Fleming can support each course, both in their availability and technical skillset.  |

Program Improvement Plan

Based on the analysis of your key findings, identify areas that require attention and action in the next 1-3 year timeframe. Ensure that you only recommend actions that reflect the program’s priorities and its capacity to achieve them, and record the success of any changes implemented and the means by which they are being evaluated.

**Write recommendations to:**

1. **bridge identified gaps**
2. **build on strengths**

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| Priority | Recommended Improvements: | Timeframe | Person(s) Responsible | Action:ImmediateMidtermLong Term |
| 1 | Investigate how part-time students can be present week 1 in class to avoid them falling behind, in particular with the Online program.  | 2017 academic year | Coordinator with Chair and Admissions | Midterm |
| 1 | Address the concerns related to faculty workload and development time. Modify the teaching loads to accommodate development time to stay current | ASAP | All faculty and Chair | Immediate |
| 1 | Plan to replace the VDI with new infrastructure as IT has identified this requirement in ~2 years. Review and possibly implement a BYOD for its replacement.  | Plan 2018-2019 | Techs, Coordinator With IT | Long Term |
| 1 | Implement improved invigilation methods for online students, which can be used throughout the semester. Streamline the process scheduling for the exam invigilation as well.  | 2017-2018 | Coordinator, Testing Centre, LDST facilitation | Immediate |
| 2 | Revise the 3 database courses, Geom65 (Fall), Geom70 (Winter) and Geom111 (Spring) to better support other courses offered.  | In progress, completed September 2017 | Shawn Morgan, Rahul Chandra, Karen Whillans | Immediate/In Progress |
| 2 | Look at assessments across all courses for integrated student learning. Can we reduce the number and distribution of assessments as it has been expressed by students there are too many. | Start of each semester, started September 2017 | All faculty, LDST to facilitate the process | Continuous |
| 2 | Review the technologies introduced in each course, look for efficiencies and rationalize what courses should be focusing on. This also helps with the course sequencing (another recommended item) | Spring 2017 | All faculty (from 2016-17) | Immediate, Completed |
| 2 | Vet the PAC board membership. | Before Dec 2017 | Coordinator with Chair | Midterm |
| 2 | Investigate better ways to deliver the third-semester courses (May and June), perhaps in a compressed format or night time only so that graduates and industry professionals may also take them. | 2019-2020 | Faculty with scheduling/management/finance | Long Term |
| 2 | Review room and timetable scheduling to address student concerns of moving between computer labs and large breaks between classes, as well possibly making classes more appealing to industry to take as a one-off.  | 2017-2018 | Chair with Scheduling | Immediate |
| 2 | Continue integration of ArcGIS Pro, ArcGIS Online, and mobile data management into curriculum, replacing ArcGIS Desktop.  | Started, completion 2021 (aligned with Esri deprecating ArcGIS Desktop in 5 years) | All faculty | Immediate/In progress |
| 3 | Investigate the business case for taking the Cartographic program Online. In particular, addressing concerns about section sizes and related costs, and the opportunity presented to deliver the Cartographic courses to recent graduates.  | 2017 academic year | Coordinator with Chair and Dean, related to program overhead costs | Midterm |
| 3 | Investigate the business case for merging Cartographic and Applications programs together. | Academic year 2018-2019 | Chair with Coordinator, and faculty | Long Term |
| 3 | Design and offer new courses in the third semester to further specialize students. (Programming/Web, Surveying, LIDAR/UAV RS, Big Data, and Information Technology) | 2019-2020 | Coordinator with Faculty | Long Term |
| 3 | Investigate how to reuse materials from the certificate programs to offer industry-desirable courses, possibly through continuing education.  | 2018-2019 | Coordinator with Continuing Education | Midterm |
| 3 | Reevaluate best methods for in-person and remote student communication for improved engagement | Winter 2018 | LDST, IT, Techs and Faculty | Immediate |
| 4 | Review how best to incorporate data governance, the GIS legal and data management topics identified as a gap in student learning by the PAC.  | Academic year 2018-2019  | Coordinator with Faculty | Long Term |
| 4 | Review each course and how web-GIS can be used throughout the program, not just in web-GIS courses. Better program technology and support is needed to make this happen (making a fleming-managed web server externally accessible, for example). This will build on the successes which IT has been instrumental in providing over the last 3 years, including federated login for ArcGIS Online, the virtual desktop for remote students, and improved networking in the GIS labs.  | Each year | Techs, Coordinator, Faculty | Immediate/In progress |
| 5 | Course descriptions require updating by instructors, given the many updates in the past few years. | Before September 2017 | All faculty, Chair | Midterm, In Progress |
| 5 | The 4 Cartographic Program Outcome statements language is to be reviewed, and revised to be clearer and measurable.  | June - 2017 through June 2018 | Learning design support, coordinator, PAC, and Chair | Midterm |