



RED RIVER COLLEGE
OF APPLIED ARTS, SCIENCE AND TECHNOLOGY

Computer Analyst/Programmer (CA/P) Information Systems Technology (IST)

Curriculum Validation – Program Renewal

Final Report

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Submitted to:
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CA/P IST Programs Curriculum Validation-Program Renewal Final Report

Introduction

RRC offers two programs to prepare graduates for the Information Technology (IT) industry. The older of the two, Computer Analyst/Programmer (CA/P), is a two-year program with a September entry date. It prepares students to be proficient in application development for business systems by providing training in three distinct areas: technical training in information processing, related business courses for understanding business systems, and practical applied training through an optional paid co-operative education work term.

The newer program, Information Systems Technology (IST), provides students with a highly developed skill set in Information Technology. After successfully completing the first year, covering the basics of programming, networking, analysis, design, and hardware, students choose one of the following majors: Application Development, Database Management, Network Management, or Web Development. Similar to the CA/P program, it also includes practical applied training through an optional paid co-operative education work term.

Due to rapid and constant change in the information technology field, Program Renewal needs to be more frequent for these programs. One of the developments, since the IST Program Renewal was completed in June 2005, is that both programs now share a common first-year, which enables students to seamlessly transition to the other program for the second year or pursue a second diploma with one additional year of study. For this year's Program Renewal, the new department Chair requested to include both programs toward the end of determining other synergies and potential for efficiencies.

Curriculum Validation Deliverables:

The CA/P IST Programs Curriculum Validation process involved 8 interrelated deliverables:

1. Environmental Scan and Analysis of the key findings of similar programs across Canada.
2. Industry Occupational Analysis (DACUM)
3. Graduate Skills and Abilities Chart
4. Graduate Focus Group
5. Graduate Profile
6. Program Renewal Plan
7. A 5-year Program Renewal Plan in Gantt Chart format
8. Final Report

Outcomes from the Deliverables:

1. Environmental Scan and Key Findings (Appendix A)

The Environmental Scan provides the faculty and chair with information about similar programs offered in Colleges and Universities locally and nationally. The Curriculum Validation facilitator gathered information on similar programs and trends influencing their development and direction. The Curriculum Validation Facilitator gathered the information through web sites, email, and telephone contact. The scan gathered information under the following categories:

- Name of institution, location, contact person
- Size of program
- Credential offered
- Program features
- Curriculum Model
- Curriculum Content
- Student Assessment
- Current and Coming Challenges
- Curriculum Renewal
- Partnerships
- Additional Information (Other and comments)

Fifty-one programs were scanned for the CA/P IST Programs Curriculum Validation – Program Renewal. The programs scanned by province were:

British Columbia

- British Columbia Institute of Technology
 - Computer Systems Technology (Diploma)
 - Computing Systems Technology Information Systems (Degree)
- Douglas College
 - Computing Science and Information Systems (Certificate)
 - Computer Science and Information Systems General (Diploma)
 - Computer Science and Information Systems (Diploma with Double Specialty)
- Kwantlen Polytechnic University
 - Computer Information Systems (Certificate)
 - Computer Information Systems (Diploma)
 - Bachelor of Technology in Information Technology

Alberta

- Mount Royal College
 - Computer Science (Certificate)
 - Computer Information Systems (Diploma)
 - Bachelor of Applied Computer Information Systems and Business

- North Alberta Institute of Technology
 - Computer Network Administrator (Certificate)
 - Computer Systems Technology (Diploma)
 - Bachelor of Applied Information Systems Technology
- Southern Albert Institute of Technology
 - Database Administrator (Certificate)
 - Network Technician (Certificate)
 - Object Oriented Software Developer (Certificate)
 - Information Technology (Diploma)
 - Bachelor of Applied Technology information Systems

Saskatchewan

- Saskatchewan Institute of Applied Science and Technology
 - Computer Technician (Certificate)
 - Business Information Systems (Diploma)
 - Computer Systems Technology (Diploma)

Ontario

- Durham College
 - Computer Programmer (Diploma)
 - Computer Systems Technician (Diploma)
 - Computer Systems Technology (Advanced Diploma)
 - Computer Programmer/Analyst (Advanced Diploma)
- Niagara College
 - Computer Programmer (Diploma)
 - Computer Programmer Analyst (Diploma)
- Seneca College
 - Computer Networking and Technical Support (CNS) (Diploma)
 - Computer Programmer (CPD) (Diploma)
 - Computer Programmer and Analysis (CPA) (Advanced Diploma)
 - Computer Systems Technology (CTY) (Advanced Diploma)
 - Business Administration – Information Systems (BAI) (Advanced Diploma)
 - Software Development (Degree)
 - Informatics and Security Degree (IFS) (Applied Degree)

East Coast

- New Brunswick College
 - Network Support (Certificate)
 - Computer Systems Technician: Web Support (Certificate)
 - Computer Systems Technician: Desktop Support (Certificate)
 - Computer Network Technology: Network Support Specialist (Diploma)
 - Computer Network Technology: Network/Web Support (Diploma)
- Nova Scotia College
 - Information Technology (Diploma)
 - Network Technology (Advanced Diploma)

Manitoba

- Assiniboine Community College
 - Computer Systems Technology (Diploma)
- University College of the North
 - Computer Analyst/Programmer (Diploma)
 - E-Business Developer (Certificate)
- University of Winnipeg
 - Information Security Management Diploma
 - Internet Systems Specialist Diploma
 - Business Systems Analyst Diploma
 - Applied Computer Science
- University of Manitoba
 - Bachelor of Computer Science
- Brandon University
 - Computer Science (Degree)

Key findings from the Environmental Scan

Two CA/P and IST instructors conducted research on post-secondary IT programs across Canada to compare and contrast similarities, differences, current trends, and challenges. Their findings are listed below.

1. Unique Features of Programs Scanned

Large institutions with high program enrollment offered unique streams/majors. These institutions were generally in larger cities where there are more opportunities for graduates from specialized majors.

Unique streams/majors offered:

- Gaming
- Human Computer Interface
- Forensics
- Distributed systems
- Wireless and Mobile Programming

Eight programs offered Gaming programming in their curriculum - five programs offered a course in Gaming and three offered a Gaming major. Gaming was popular in larger colleges and universities in British Columbia and Ontario.

Red River College's CAP and IST programs are unique in offering PowerBuilder courses. Red River College offers two different PowerBuilder courses in CAP and the IST Application Development stream.

2. Commonly Awarded Credentials

Twelve programs offered Certificates, twenty-two offered Diplomas, seven Applied Degrees, and seven offered Advanced Diplomas as shown in the table below.

Type of Credential	# of Programs Offering it
Certificate	12
Diploma	22
Advanced Diploma	7
Applied Degrees	7
Degrees	3

The certificate programs seemed to be in response to competition from private schools who offer 1-year certificates, and to other 1-year programs that cater to unemployed, sponsored students (number of programs with sponsored students not available). Certificate programs also targeted mature students wanting to learn a new skill in less than two years time. One issue that many institutions have with certificate programs was the graduate's level of knowledge being less than needed for successful industry employment, however, one-year certificate programs allow mature students re-entering the workforce the option of continuing into the second year of a diploma program.

Many programs allowed students to move seamlessly into IT diploma programs and Applied Degrees to solve this problem. Forty of the fifty-one programs scanned allowed students to move to the next level with full credit for the courses taken. This includes certificate to diploma, diploma to advanced diploma and diploma to applied degree.

As some institutions found that even two years was not sufficient time to teach the skills needed, they offered Advanced Diplomas or Applied Degrees to fill the void, giving graduates another level of knowledge that made them more marketable.

One of the concerns of programs that offered advanced diplomas and applied degrees was industry's perceived value. Industry perception was that the next valued step was a degree. Unless articulation agreements were in place, these programs found that universities did not recognize applied degrees and did not grant reasonable credit towards a four-year or a Masters level degree.

Articulation agreements with high schools and universities were common (see table below).

Area	# of Programs
Articulation agreements with High Schools	11
Articulation Agreements with Universities	36

3. Partnerships

Forty-three of programs scanned have partnerships with Microsoft or other vendors allowing them to purchase software products at a reduced rate. Some programs have established partnerships with IBM, Oracle, and SUN. This provided access to hardware, software, and learning resources at a reduced rate.

Fourteen of the programs require students to use a laptop. Programs have collaborated with companies like DELL, IBM, and HP to provide students with laptops during their educational tenure.

4. Pre-requisite Skills Requirements

All programs had prerequisites (see table below), the common prerequisite skills/requirements for programs scanned were:

- Grade 12 graduate
- Grade 12 Math (applied and pre-calculus)
- Grade 12 English

Type	# of programs out of 51
Pre-requisites	51
PLAR	50
Entrance Exam, tests or assignments	5
Competitive Selection	5
Remedial courses or upgrading	31

Fifty of the fifty-one programs had Prior Learning Assessment for entrance requirements or granting of credits to a program.

Five programs had an entrance exam, completion of assignments, or tests requiring a certain percentage to gain entry in the program.

Five programs, based on a number of factors including GPA, used competitive selection.

Thirty-one programs offered remedial courses or upgrading.

5. Experiential Learning

Twenty-six programs offered Co-operative Education (Co-op) work terms for students regardless of the credential issued. The length of the Co-op work term varied from 3 weeks to two terms of 6 months each. The most common length of a work term was 4 months and was optional in the majority of the programs. The table below lists detailed information about the Co-op programs offered.

Number of Programs offering Co-op	26
Average length of Co-op	4.6 months
Number of programs with a required Co-op	14
Average Cost of a 4 month Co-op	\$487.55
Co-op listed on diploma	14

A practical project with industry was also popular (see table below).

Number of programs with at least one project course	31
Number of programs with more than one project course	13

In some programs, the practical project was for nonprofit companies and in others, any companies that applied. The projects varied from one term to a complete year. Most institutions found more value in real world industry projects with had firm deliverables over textbook projects.

6. Delivery features

Delivery Method	# of Programs Offering
Full time	49
Part time	16
Fast Track	11
Offered distance courses towards credential	7

The most common delivery of programs is full time (see table above for stats). Some programs offered courses during a normal 9-5 or 8-4 working day to accommodate students that may be single parents, have family commitments, work part time etc. This allows students who are parents to put the children in daycare during the day and free up their evenings for their families or other commitments. This allows students that need income to work part time during the evenings.

Many institutions offered their programs part-time with evening and via Distance Education options as well, allowing working students to keep their jobs while continuing their education. There is a trend towards offering more part time programs to meet

these requirements. Most programs have a maximum number of years for successful completion.

Several colleges and universities offered eight to twelve month intensive programs (fast track). This provided a quick retraining for adults.

Some of the courses were offered via Continuing Education or contract training (some were government sponsored unemployment retraining programs). The cost of these programs ran upwards to \$15,000 for one year. Issues did arise from these programs including lack of students and the cost barrier.

Many two-year program graduates that work towards a degree do so part time (evenings and weekends). Most graduates preferred to work and complete the Degree (applied or regular) part time continuing with their careers.

Red River College's CAP and IST programs are two of only a few that offer the complete first year via Distance Education. Full-time CAP and IST instructors developed most of these courses. A few of the Distance Education courses have not kept up to date with the day program courses.

7. Majors Common to Most Programs

A number of the IT Programs offered majors:

Major	#of programs	Offered at least one course in the topic
Programming	26	47
Networking	15	51
Web Development	7	45
Database	5	40
Security	5	25
Business Analyst	5	N/A
Data Communications	2	29
Gaming programming	3	8

The most popular streams/majors were **Programming, Networking, and Web Development**. The programs were usually two years or more with a standard/common first year including core courses, with courses focused on each major in the following years. Often, a minimum number of students were required for a major to be offered. Most of the programs that did not have majors listed above had at least one introductory course in the area.

8. Accreditation

Ten of the eighteen colleges and universities scanned are CIPS (Canadian Information Processing Society) accredited. Red River College's CAP and IST programs are as well.

Most of the programs that have a Networking component have a connection to CISCO. In some cases students write the certification exams (CCNA I and CCNA II, for example) as part of their course work and in others students have the opportunity to go and write the exams.

Microsoft and Novell (on a smaller scale) certifications appear in many one and two year programs, particularly the Microsoft MCSE certification. Some programs teach the Microsoft and Novell curriculum and have students write the exams as part of the course work.

The CAP and IST programs teach most of the content students need to write the Novell CNA exam (Certified Novell Administrator), and most of the content for the MCSE and CCNA I. A few one and two year programs include Sun Certification in Java programming (differing levels) as part of their curriculum.

9. Current and Forecasted Challenges Facing Programs

The most significant current challenge facing IT programs in Canada is declining enrollment. The growth leading up to the "Y2K" period is long gone. However, for the first time in over five years, there is a waiting list for the CAP and IST programs at Red River College. The September 2008 intakes are full. At this time, it is not possible to see if this is a trend.

Demand for graduates in Manitoba is increasing. Often the CAP and IST programs do not have enough Co-op students to match up with Co-op jobs. EDS, a large IT developer in Canada, just announced they will be expanding in Winnipeg adding several hundred new IT jobs.

Attracting females to the programs continues to be a long-standing issue. Programs like Women in IT (WIT) continue to market to the schools to trying attract more females to the IT programs in Canada.

Keeping instructors current with industry has also been an ongoing problem in a field where the only constant is change. Colleges and universities are encouraging staff to take courses (paid for by the college or university) to keep current. Offering faculty the option to return to industry for a year is another option that has become popular. Red River College currently has four instructors that are on return to industry leave. This allows them to see what is current in industry, catch up, and bring the new skills back to the college.

Hiring and retention of qualified faculty due to competitive job market is an ongoing problem with most programs. Most colleges and universities cannot pay the industry going rate which is much higher. Many faculty have left to return to industry due the much higher pay rates.

To retain faculty at RRC, CA/P and IST instructors benefit from flexible timetables and generous educational support. They have also been encouraged to do contract work in their field of expertise.

2. Industry Occupational Analysis (DACUM) Chart (Appendix B)

The Industry Occupational Analysis using the DACUM process is a familiar component of the curriculum development process at Red River College and provides the program with a description of regional occupational needs. Included in the process is the identification of emerging and retiring industry trends.

Due to the various areas of specialization in the IT industry, this Program Renewal included four DACUM workshops. With the guidance of the facilitators, participants identified major competencies and related tasks required by entry-level workers in the CA/P and IST fields. The Application Development workshop was the traditional two-day session. The three IST stream DACUM workshops built upon the generic skills identified by the Application Development participants and were one day in length. The 25 individuals who took part in this exercise represented a cross-section of all the streams offered in the CA/P and IST programs.

DACUM workshops were held on the following dates:

CA/P Application Development	March 10 and 17, 2008
IST Web Development	March 26, 2008
IST Database	April 1, 2008
IST Networking	April 2, 2008

The resulting CA/P and IST DACUM identified the following emerging and retiring trends:

CA/P Emerging Industry Trends:

- Super-users
- Specialists
- Q/A Quality Assurance
- Service-oriented architecture
- Security
- ISP (Information Systems Professional) certification CIPS (Canadian Information Processing Society)
- Corporate Governance
- Industry Governance

CAP Retiring industry Trends:

- Legacy skills (e.g. RPG)
- Moving away from specialists
- Moving away from mainframes
- Top down programming
- Old languages
- Outsourcing (more project management in-house)
- Linear development

Web Development Emerging Industry Trends:

- Lack of commitment to employee and employer
- Feeling of entitlement
- User-centric applications aka Facebook
- Entrepreneurship aspect
- Rich user experience interface systems (AJAX)
- More wireless devices (phones, PDA, Blackberries)
- XML – XSLT
- SOA (Service oriented architecture)
- Enterprise-service-bus (ESB)

Web Development Retiring industry Trends:

- Waterfall
- Flash
- Portals
- Desktop software
- Proprietary standards
- Straight HTML sites
- VAX based enterprise systems

Networking Emerging Industry Trends:

- High security (specialists, firewalls)
- People resource more important (skills needed)
- Security important in all areas of industry
- Wireless VOIP (high speed, broadband)
- Increased availability needed (disaster recovery)
- Less downtime tolerated
- I.T.I.L. (Information Technology Infrastructure Library) best practices
- Specialization
- Need collaborative skills
- Soft skills
- Technical skills

Networking Retiring industry Trends:

- Connectivity less of an issue due to sufficient bandwidth and technology
- Basic networking (layers)
- Security as a specialty (all IT must address security not just security specialists)
- Basic client server applications
- Less downtime
- Vendor/customer relationship/service (inability to meet customer expectations)
- Focus on technical skill only (must address process and business Issues/needs)
- Security not just a perimeter issue any more

Database Emerging Industry Trends:

- Iterative development
- Data architecture - architecture integration
- Midrange development
- Package solutions - i.e. SharePoint Databases - database modeling
- Mainframe development
- Business intelligence - executive information systems
- Service oriented architecture (SOA)
- I.T.I.L. (Information Technology Infrastructure Library) best practices Methodology
- Business case driving information technology (short-term) less strategic – more profit driven
- Outsourcing work
- Virtual services
- Clustering databases
- Centrally managed
- Importance of compliance Bill 198 - FIPPA – Accountability
- Chance marketing process (C.O.B.I.T.) = Control Objectives For Information and Technology
- “Googlizing” of database

Database Retiring industry Trends:

- Waterfall-based development
- Moving away from mainframe (also emerging)
- IT input into direction of business development and application development
- Technical case for development less of a driver for IT development (business case is greater driver)
- Stand alone databases
- Isolated projects
- Data modeling (related to Waterfall development)

3. Graduate Skills and Abilities Chart (Appendix C)

The outcome of this workshop was a single, composite chart that outlines the graduate skills and abilities. The chart is the cross-referencing of:

- a) the competencies identified in the four Industry Occupational Analysis (DACUM) Charts and the College Wide Learning Outcomes (CWLOs), and
- b) the teaching faculty's assessment of what would constitute realistic learning expectations considering the length of the programs.

This chart serves as the focus for curriculum renewal and the basis for the development of program learning outcomes. Please see the full chart in **Appendix C**.

4. Graduate Focus Group

At the request of the faculty and Chair, the facilitators added another deliverable to be considered in the renewal of the program. On Tuesday, May 6, 2008, Craig Edwards and Pat Routledge facilitated a focus group of graduates to obtain feedback on the strengths and weaknesses of the program. The following is a summary of key points raised during the session.

Question: Which parts of the program have been the most helpful in preparing you for the field?

- Business communications courses especially for those who have no retail experience or are just out of high school
- Accounting courses really helpful used almost daily on the job
- Database knowledge really important as it goes hand in hand with programming
- Familiarity with a variety and the types of topics, number of languages covered assists you in learning new ones on the job
- CA/P's coverage of a wide variety was really beneficial
- Three week project module was excellent and should be longer in length
- Group work where groups are pre-selected helped to adapt to what it will be like on the job where you don't get to choose who you work with
- Teaching style of Henry Penner, abstract assignments helped you learn by yourself, which is what you need to do on the job.
- Interaction with instructors. They are available unlike large classes at university. EAs very helpful as well
- Teachers let you fail with is a great way to learn from critical programming mistakes
- Availability of building during off hours; Princess Street Campus better for working in groups
- Structure of Power Builder assignments, how they built upon one another
- Co-ops got to apply what you learned; you had to compete for the positions; good preparation for the workplace
- Oracle systems administration

- Laptops allowed a great deal of flexibility as to where you did your homework and facilitated group work
- Hand on emphasis of program, much better than theory taught at university
- Cisco content sets you apart from graduates from programs who don't include that

Question: Which parts of the program have been the least helpful in preparing you for the field?

- Statistics course (some found it useful, but other definitely did not)
- The initial learning curve is overwhelming to many
- Some courses are mostly theory rather than hands on practice, you don't retain material unless you practice it
- Too much emphasis on building your own system rather than purchasing
- Too many small projects, need more emphasis on building larger systems
- E-commerce courses

Question: What program changes would you recommend to increase effectiveness of the program?

- Need more cross-functional team work (e.g. CA/P working with IST students on a project or different streams working on the same project)
- Need to cover purchasing systems, costing out systems, etc.
- Need more coverage of de-bugging and modifying existing systems
- Need more coverage of governance issues
- Need more coverage of requirements gathering and disaster recovery
- Need more coverage of how to handle yourself in the office environment, dealing with office politics, etc.
- Basic program logic course, e.g. learn basic problem solving skills before learning any specific syntax
- Need more web development programming languages, client server is not the way of the future
- Need more emphasis on security issues
- Sequencing of courses could be improved. Term one was a combination of overly basic material and higher level concepts (e.g. Microcomputers too basic, Cisco too high level)
- Some mention of how departments interact in large corporations would be helpful
- Introduction to regular expressions
- Not sure about combining programs, CA/P and IST fulfill different student's needs, but perhaps there should be a stream called systems administration (perhaps instead of database stream)
- Better to have more prior learning assessment than create a common first year for IST and CA/P
- Perhaps more database should be covered in the first year
- Include some networking scripting
- Include some group policy in the Windows server course
- Projects should be moved to last semester

Question: Would you recommend the program to others? Why or why not?

- All graduates would enthusiastically recommend the program to others
- If you enjoy hands-on-practice, this program is way better than computer science degree
- Great program if you are prepared to work hard

5. Graduate Profile

To develop the Graduate Profile for the program, the faculty used the Graduate Skills and Abilities Chart, consisting of the four identified streams - Application Development, Web Development, Database, and Networking. With the help of the Curriculum Validation Facilitator and the Curriculum Consultant, the faculty developed learning outcome statements at the program level on Monday, May 5, 2008. The faculty agreed that the Graduate Profile should consist of a set of outcomes common to all four streams as well as a unique set of outcomes for each stream. The common and stream specific outcomes are listed below.

Common Skills and Abilities

The CAP/IST graduate should be able to:

- A) Ascertain business / client requirements using information gathering techniques to examine and document needs – determining and confirming scope and requirements.
- B) Demonstrate professional and ethical attitudes and behaviour in a variety of settings.
- C) Communicate effectively with a variety of audiences.
- D) Identify project stakeholders, deliverables, and constraints using project tools, according to industry principles, standards, and practices.
- E) Demonstrate initiative, reliability, respect, and objectivity in a positive manner- both individually and in team environments.
- F) Apply testing methodologies to ensure appropriate quality in systems development.
- G) Apply industry governance, standards, and best practices.

The Application Development Stream graduate should be able to:

- H) Analyze solution requirements by translating and documenting business functionality and exploring alternatives to arrive at an integrated solution.
- I) Design applications by translating and prototyping analysis following technology standards and accepted industry methodologies.
- J) Develop applications according to accepted standards using a variety of programming tools to translate specifications into reusable objects based on learned testing and debugging techniques.
- K) Formulate solution architecture by incorporating strategic and tactical solutions to develop models according to business needs.
- L) Construct solution architecture by integrating business rules into a user friendly environment considering accepted technologies such as networking principles, web services, service
- M) Develop business applications by using current, common, and emerging languages and development tools.
- N) Develop applications for a variety of Operating System environments.
- O) Apply current and emerging system development methodologies.
- P) Apply common modeling techniques to processes and data.
- Q) Use middleware to integrate systems by comparing and contrasting systems, identifying core components, and deprogramming the systems.

The Web Development Stream graduate should be able to:

- R) Analyze and document user requirements to identify potential solutions.
- S) Design web applications to current standards and requirements using design tools.
- T) Use development tools and current standards to construct applications that conform to requirements.
- U) Coordinate transition to production through training, documentation, and deployment.
- V) Create interactive web applications to specifications using current technologies.
- W) Maintain systems by controlling application versions and configuring platforms.

The Database Stream graduate should be able to:

- X) Identify data owners and analyze and document their requirements using standard database diagramming tools. Create logical and physical data models and databases from specifications using Structured Query Language (SQL) and scripting languages, while adhering to security guidelines, policies, and practices.
- Y) Analyze and recommend appropriate solutions given proposed database architecture alternatives
- Z) Implement standard and non-standard SQL using a command line interface as well as Relational Database Management System (RDBMS) – specific Graphical User Interface (GUI) tools
- AA) Design, develop and test reusable code to create new databases using SQL and scripts. Support and administer databases using database tools, manage backup and recovery, security, apply troubleshooting procedures and techniques under different operating systems and using diagnostic tools, as well as provide data for audits.
- BB) Demonstrate implementation skills by contributing to transition to production and post-implementation process including clean-up, review and verification.

The Network Stream graduate should be able to:

- CC) Define, analyze, and document a high-level network architecture plan to meet business needs.
- DD) Design, research, and document a network infrastructure to meet business needs incorporating industry standard products and best practices.
- EE) Implement, test, and document network infrastructure from concept to production including standard hardware, network appliances, and software.
- FF) Monitor installed network infrastructure to ensure corporate computing standards and expectations are met in the areas of security, performance, scalability, availability, and data integrity.
- GG) Support installed network infrastructure to ensure corporate computing standards and expectations are met in the areas of security, performance, scalability, availability, and data integrity.

6. Program Renewal Vision & Goals (Appendix D)

The program renewal plan is the result translating the preceding four deliverables into a coherent plan for the renewal of the program. The plan, complete with a vision, goals and actions was developed at a Faculty Visioning Session with participation of the Program Chair.

Craig Edwards and Pat Routledge facilitated the CA/P IST Visioning Workshop, on May 14, 2008. The vision and five goals identified at this session were:

Vision: To meet or exceed industry expectations in the delivery of the highest quality current, relevant, and timely Information and Communication Technology education, and to empower students to select the breadth and/or depth of their ICT education within reasonable timeframes

Goal #1: Course Curriculum Changes

Implement changes to curriculum as required by industry expectations and technological development.

Goal #2: Program Delivery

Develop and implement alternative delivery methods.

Goal #3: Resources

Identify and leverage funding and support to obtain additional personnel, equipment, and physical space resources to support existing and anticipated program and student needs.

Goal #4 Program structural changes

Empower students to select the breadth and/or depth of their ICT education within reasonable timeframes culminating in a capstone project.

Goal #5 External relations/partnerships

Build and enhance relationships within the College, community, nationally and internationally.

7. 5-Year Program Renewal Plan in Gantt Chart Format (Appendix E)

After reviewing the Vision, Goals, and Action items, the Chair and Academic Coordinator finalized the list by adding Goal #6 and identifying the sequencing of the actions within the 5-Year Renewal Plan. The six goals and highlights of the Renewal Plan are included below. Please see the detailed Gantt chart timeline for the renewal plan goals and action items in **Appendix E**.

Goal #1:

Implement changes to curriculum as required by industry expectations and technological development by:

- Establishing a curriculum committee to develop a process for course development and renewal
- Mapping program learning outcomes down to the course level
- Integrating assignments with learning outcomes

Goal #2:

Identify, develop, and implement alternative delivery methods by:

- Assuming responsibility for all existing online IT courses (CE & DE)
- Providing increased course delivery options (blended, satellite, online, evenings, weekends, correspondence, videoconference)

Goal #3:

Identify and leverage resources for additional personnel, equipment, and physical space resources to support existing and anticipated program and student needs by:

- Generating funding through a number of sources

Goal # 4:

Empower students to select the breadth and/or depth of their ICT education within reasonable timeframes culminating in a capstone project by:

- Increasing credential options to include a certificate, advanced diploma, and applied degree
- Adding additional streams e.g. B.A., forensic, security, game development

Goal #5:

Build and enhance relationships within the College, community, nationally and internationally by:

- Increasing cross-department collaboration (BA, Creative Arts, Electronics Technology, GIS, and Health Informatics)
- Working with industry to develop and deliver custom courses and training
- Increasing connections with aboriginal community

Goal #6

Rebrand the programs and selling RRC as the first choice for IT programs in Manitoba

8. Conclusions

The Curriculum Validation – Program Renewal process has resulted in a benchmark and plan to track the renewal of the Computer Analyst/Programmer (CA/P) and Information Systems Technology (IST) programs. The program renewal goals identified will ensure that the programs are recognized as leaders in preparing graduates for a variety of employment opportunities in the IT industry. The program renewal plan will guide the Chair and Dean with the assignment of resources to accomplish the goals within a five-year period.

Appendix A - Environmental Scan and Key Findings

Environmental Scan

	RRC	RRC	BCIT	DOUGLAS	NAIT
College / Contact	<p>Red River College</p> <p>Address P414 – 160 Princess Street, Winnipeg, Manitoba, R3B 1K9</p> <p>Website http://www.rrc.mb.ca</p> <p>Contact Person Brant Long</p> <p>Telephone/Fax 949-8492</p> <p>Email blong@rrc.mb.ca</p>	<p>Red River College</p> <p>Address P414 – 160 Princess Street, Winnipeg, Manitoba, R3B 1K9</p> <p>Website http://www.rrc.mb.ca</p> <p>Contact Person Brant Long</p> <p>Telephone/Fax 949-8492</p> <p>Email blong@rrc.mb.ca</p>	<p>British Columbia Institute of Technology</p> <p>Address 3700 Willingdon Avenue, Burnaby, BC V5G 3H2,</p> <p>Website http://www.bcit.ca/study/programs/550fdiplt</p> <p>Contact Person Maureen Bell</p> <p>Telephone/Fax 604-432-8644</p> <p>Email cstbtech@bcit.ca</p>	<p>Douglas College New Westminster Campus</p> <p>Address 700 Royal Avenue New Westminster BC</p> <p>Website http://www.douglas.bc.ca/calendar/programs/pcsis/diploma.html</p> <p>Contact Person Raymond Yu, Chair</p> <p>Telephone/Fax 604-777-6282</p> <p>Email yuray@douglas.bc.ca</p>	<p>North Alberta Institute of Technology</p> <p>Address 11762 106 Street, Edmonton, Alberta, T5G 2R1</p> <p>Website http://www.nait.ca/13109.htm</p> <p>Contact Person Sia Samimi</p> <p>Telephone: (780) 378-5350 Fax: (780) 471- 8375</p> <p>Email: ssamimi@nait.ca</p>
Name of Program	Computer Analyst/ Programmer	Information Systems Technology	Computer Systems Technology Information Systems	Computer Science and Information Systems	Computer Systems Technology
Size of Program	<p>Number of students</p> <ul style="list-style-type: none"> • 190 <p>Number of Faculty</p> <ul style="list-style-type: none"> • 22 	<ul style="list-style-type: none"> • 65 • 22 	<ul style="list-style-type: none"> • 20 	<ul style="list-style-type: none"> • 80 – in all programs • 12 	
Credential Issued	Diploma	Diploma	Diploma	Diploma	Diploma
Program Features	<p>Length</p> <ul style="list-style-type: none"> • 2 years • semester <p>Regular Admission Requirements</p> <ol style="list-style-type: none"> 1. Manitoba Grade 12 and 	<p>Length</p> <ul style="list-style-type: none"> • 2 years • semester <p>Regular Admission Requirements</p> <ol style="list-style-type: none"> 1. Manitoba Grade 12 and 	<p>Length</p> <ul style="list-style-type: none"> • 2 years • Semester • September and January intakes <p>Entrance Requirements</p> <p>To apply for CST</p>	<p>Length</p> <ul style="list-style-type: none"> • 2 years • semester <p>Entrance Requirements</p> <ol style="list-style-type: none"> 1. General Admission Requirements 	<p>Length</p> <ul style="list-style-type: none"> • 2 years (4 semesters of 16 weeks) + 16 week employment experience for Co-Op Students

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<p>Southern Alberta Institute of Technology Polytechnic</p> <p>Address 1301 - 16th Avenue NW Calgary, Alberta T2M 0L4</p> <p>Website http://www.sait.ca/pages/cometosait/academic/diplomas/ait.shtml</p> <p>Contact Person Pauline Turnbull Academic Chair Computer Technology Information Technology - Software Development Major Bachelor of Applied Information Systems</p> <p>Telephone/Fax 403.284.8353</p>	<p>SIAST -Computer Systems Technology</p> <p>Address Idylwyld and 33rd Street Saskatoon SK</p> <p>Website http://www.siaist.sk.ca/siaist/education/training/oncampusprograms/7266/5580/5850/index.shtml</p> <p>Contact Person Conrad Krueger</p> <p>Telephone/Fax: (306) 933-8127 Fax: (306) 933-7589</p> <p>E-mail krueger@siaist.sk.ca</p>	<p>Niagara College Welland Campus</p> <p>Address 300 Woodlawn Rd Welland, ON L3C 7L3</p> <p>Website http://www.niagaracollege.ca/studying/programs/fulltime/cpa_0414/</p> <p>Contact Person Peter Vanscoy Co-ordinator</p> <p>Telephone/Fax Tel: 905-735-2211, ext. 7483</p> <p>Email pvenscoy@niagaracollege.ca</p>	<p>Seneca College of Applied Arts & Technology</p> <p>Address 1750 Finch Ave. E, Toronto, ON M2J 2X5</p> <p>Website http://www.senecac.on.ca/fulltime/CPD.html</p> <p>Contact Person Libby Langer</p> <p>Telephone/Fax - (416) 491-5050 Ext. 3704</p> <p>Email Libby.Langer@senecac.on.ca</p>	<p>Nova Scotia College</p> <p>Address Annapolis Valley Campus Burring Campus, Institute of Technology Campus Marconi Campus , Truro Campus</p> <p>Contact Person Farrell, Ronald Business Title: Dean Trades & Technology Department: School of Trades</p> <p>Telephone/Fax Phone: 902-491-2176 Email Ronald.Farrell@nsc.ca</p>
Information Technology	Computer Systems Technology	Computer Programmer Analyst (Co-op)	Computer Programmer (CPD)	Information Technology
<ul style="list-style-type: none"> • 44 - ITSD, 38 – ITCS, 49 - ITNS, 8 – ITTS • 9 – ITSD, 9 ITCS, 6 ITNS, 5 ITTS 	<ul style="list-style-type: none"> • 40 - first year, • 36 – second • 17 	<ul style="list-style-type: none"> • 25 • 5 		<ul style="list-style-type: none"> • 221 • 35
Diploma	Diploma	Diploma	Diploma	Diploma
<p>Length</p> <ul style="list-style-type: none"> • 2-years • Fall start • e-Learning <p>Entrance Requirements</p> <ul style="list-style-type: none"> • Alberta High School Diploma 	<p>Length</p> <ul style="list-style-type: none"> • 2 years <ul style="list-style-type: none"> ○ Year 1 - 37 weeks and ○ Year 2 - 37 weeks • Trimester 	<p>Length</p> <ul style="list-style-type: none"> • 3 years • semester <p>Entrance Requirements</p> <p>Minimum admission requirements</p>	<p>Length</p> <ul style="list-style-type: none"> • 2 Years • 4 semesters <p>Entrance Requirements</p> <ul style="list-style-type: none"> • Ontario Secondary School Diploma 	<p>Length</p> <ul style="list-style-type: none"> • 2 years • Semester <p>Entrance Requirements</p> <ul style="list-style-type: none"> • High School graduation diploma or

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Program Features (cont'd)	<p>2. Must write a test to assess aptitudes for training in the information technology field and</p> <p>3. Attend a mandatory information session given by the Computer Analyst/ Programmer department</p> <p>Special Admission Requirements</p> <ul style="list-style-type: none"> Applicants who will be 19 years of age on or before September 30 in their year of registration, and who have been out of high school for a minimum of one year who do not meet the regular admission requirements may apply under the special admission requirements. Individuals applying as a special admission applicant must have successfully completed RRC Introduction to Business or one English 40S credit and one Math 40S credit and must also meet admission requirements 2 and 3 as 	<p>2. Must write a test to assess aptitudes for training in the information technology field and</p> <p>3. Attend a mandatory information session given by the Computer Analyst/ Programmer department</p> <p>Special Admission Requirements</p> <ul style="list-style-type: none"> Applicants who will be 19 years of age on or before September 30 in their year of registration, and who have been out of high school for a minimum of one year who do not meet the regular admission requirements may apply under the special admission requirements. Individuals applying as a special admission applicant must have successfully completed RRC Introduction to Business or one English 40S credit and one Math 40S credit, and must also meet admission requirements 2 and 3 as outlined above. <p>Entrance Requirements</p> <ul style="list-style-type: none"> Successful 	<p>program, you will need to submit</p> <p>1. Official transcripts showing completion of the minimum entrance requirements, which are</p> <ul style="list-style-type: none"> High School Graduation English 12 (C+) or Technical and Professional Communications 12 or English language proficiency Principles of Math 12 (C+) or Applications of Math 12 (B) <p>▪ Check for acceptable equivalent courses taught in BC high schools.</p> <p>▪ For more information on upgrading English or Math requirements at BCIT, please visit the following web pages:</p> <ul style="list-style-type: none"> Meeting English Prerequisites at BCIT Math Entry and Upgrading <p>Note: Many courses offered by other academic institutions will satisfy the admission requirement for either English 12 or Math 12. Please submit complete descriptions of the courses that you have completed with your application</p>	<p>2. English 12 with a minimum grade of "C" or approved substitution</p> <p>3. Principles of Math 11 with "C" grade or better or equivalent</p> <p>General Admission Requirements:</p> <p>4. All applicants are eligible for admission to the College if they meet at least ONE of the following criteria in addition to specific requirement(s). See the previous sections on Limited Enrolment Programs and General Admission Programs for more detailed information on additional admission requirements.</p> <ul style="list-style-type: none"> have completed BC secondary school graduation in any program or have completed the equivalent in another school system; OR lack one course for BC secondary school graduation or the equivalent in another school system OR is 19 years of age or older on the first day of the first semester of attendance; 	<ul style="list-style-type: none"> semester Entrance Requirements Applicants require English 30 or 33 and Pure Mathematics 20 (New), OR Transitional Mathematics 101, OR 65% or greater in Applied Math 30 (New). Applicants should be aware that fluency in English writing and oral communication will be necessary to succeed in this program. Student selection is competitive and is based on criteria that may include academic achievement and skills beyond the minimum prerequisite identified in the NAIT calendar or application form. Minimum academic achievement for competitive selection is typically 65%. <p>Entrance Alternatives</p> <ul style="list-style-type: none"> For prospective students who do not meet the above English and Math requirements, direct entry into semester one of the day program is possible after successful completion of IST110, IST135 and IST140 through the evening program. Students interested in coming into the

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<p>or equivalent with the following courses or their equivalents: 50% Pure Math 30 and 60% in English Language Arts 30-1 or 65% in English Language Arts 30-2.</p> <ul style="list-style-type: none"> • All applicants to SAIT Polytechnic must demonstrate English Language Proficiency prior to admission, including students educated in Canada. English Language Proficiency is a requirement for all SAIT Polytechnic programs. For more information, please refer to English Proficiency. • For upgrading options, please refer to the Academic Foundations program. • For international students, please refer to the International section. • For mature students, please refer to the Admissions section. • Advance credit may be granted to applicants who have completed equivalent education at a post-secondary 	<p>Entrance Requirements</p> <ul style="list-style-type: none"> • Grade 12 • Minimum 70% in Math B30 • Minimum 70% in one of the following sciences: Physics 30, Chemistry 30 or Computer Science 30 • Minimum overall average of 65% • English Language Requirement • SIAST recognizes that adults learn in many different ways and through many different means. This includes acquiring knowledge and skills through life and work experience or non-formal training. Such learning may qualify you for equivalency in a SIAST course through our process for Prior Learning Assessment and Recognition. Prior Learning Assessment and Recognition home page • First Qualified/First Admitted 	<p>for 2008-09 (OSS)</p> <ul style="list-style-type: none"> • Ontario Secondary School Diploma with the majority of Grade 11 and 12 courses at the College (C), University (U) or University/College (M) levels, OR Grade 12 Equivalency, OR Mature Student Status, PLUS • English–Grade 12 (C) or (U). • Mathematics–any Grade 12 (C) or (U), or a minimum grade of 65% in Grade 11 (U) or (M). <p>Recommended Courses and/or Recommended Skills (Not Required for Admission):</p> <ul style="list-style-type: none"> • Computer and Information Science–Grade 11 or Grade 12 (M). • Grade 11 Information Technology Applications in Business–Grade 11 (O). • Information Technology in Business–Grade 12 (C). <p>Selection & Ranking Process:</p> <ul style="list-style-type: none"> • Prior academic performance in required courses only using the most senior final grade level available at the time of 	<p>with a majority of senior credits at the College Preparation (C), University Preparation (U) or University/College Preparation (M) level or Mature Student Status (age 19 or older)</p> <ul style="list-style-type: none"> • Grade 12 English: ENG4(C) or ENG4(U) • Grade 12 Mathematics: (C) or (U) or Grade 11 Mathematics (U) or (M) <p>PLAR</p> <ul style="list-style-type: none"> • http://cs.senecac.on.ca/pla.html 	<p>equivalent</p> <ul style="list-style-type: none"> • Recognized Prior Learning http://www.nsc.ca/Services/RPLProcess.asp

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Program Features (cont'd)	<p>outlined above.</p> <p>PLAR Credit will be granted for courses to applicants with prior post-secondary training and related learning through experience as per the College's Prior Learning Assessment and Recognition (PLAR) policies and procedures. For information on Prior Learning Assessment and Recognition (PLAR) please visit the College's PLAR webpage at www.rrc.mb.ca/prior/default.htm.</p>	<p>completion of 1st year information and Systems Technology.</p> <p>PLAR Credit will be granted for courses to applicants with prior post-secondary training and related learning through experience as per the College's Prior Learning Assessment and Recognition (PLAR) policies and procedures. For information on Prior Learning Assessment and Recognition (PLAR) please visit the College's PLAR webpage at www.rrc.mb.ca/prior/default.htm</p>	<p>for admission.</p> <p>2. It is recommended that a covering letter be submitted describing:</p> <ul style="list-style-type: none"> ▪ the applicant's background and expectations, and ▪ if the applicant intends to (i) complete the two year Diploma program ONLY, or (ii) complete the four year Degree program and receiving the Diploma before going on to the 3rd year of the program.* <p>PLAR</p> <ul style="list-style-type: none"> • Many individuals have acquired skills and knowledge that are relevant to their field of study but they are not acknowledged in formal academic credentials. Examples would include those who have extensive on-the-job learning or learning which does not qualify for transfer credit. BCIT provides the opportunity for these individuals to demonstrate their expertise and to receive credit where appropriate. For more information on this service contact either a Program Advisor or the 	<p>OR is at least 17 years of age on the first day of the first semester of attendance and has not been enrolled at a school for at least one year; OR</p> <ul style="list-style-type: none"> ▪ is a special needs student and has completed a certificate or equivalent from a special program and has been in school for 12 years; AND ▪ meets the English Language proficiency requirement of English 12 with a minimum grade of "C", or one of the acceptable substitutions. 	<p>day program should discuss their options with an Assistant Program Chair. Accepted students would be scheduled into their two remaining semester-one courses and up to three semester-two courses, provided there is sufficient space in the courses and no scheduling conflicts.</p> <ul style="list-style-type: none"> • Evening students may also apply for direct entry into semester two of the day program after successful completion of all semester one courses. <p>Non-academic Requirements</p> <ul style="list-style-type: none"> • As this program trains students for a career in an industry that is dynamic and demanding, applicants should have an analytical ability and enjoy problem-solving. Applicants should also be able to touch type or possess some keyboarding skills. <p>Selection Criteria</p> <ul style="list-style-type: none"> • Selection is competitive, and is based on grades achieved in both English and Math.

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<p>institution. Please refer to the Prior Learning Assessment and Recognition section.</p> <p>Selection Criteria The selection criteria for the Information Technology program are currently under review</p>		<p>selection. (If Grade 12 final grades are not available for required courses in progress, applicants will be evaluated based on Grade 11 final grades).</p> <ul style="list-style-type: none"> • Testing or other supplemental evaluation may be required. <p>Note: Grades from co-op courses and half credit courses are not considered for ranking purposes.</p> <p>Reality Check Is a career in computer programming in your future? Discover more about computer programming before you enroll. Take our Reality Check for Computer Programming</p>		

	RRC	RRC	BCIT	DOUGLAS	NAIT
Program Features (cont'd)			PLAR coordinator Technology Entry (TE) <ul style="list-style-type: none"> The Technology Entry (TE) program is a full-time, day school program which provides academic upgrading to students wishing to enrol in Computing, Engineering, Electronic, and Health Sciences programs at BCIT. The TE program provides courses in chemistry, communication, mathematics, and physics that meet program prerequisites for selected programs at BCIT. The program also includes an introductory course in computer applications and a learning skills course. The program is supportive to those who require English-language training. 		
Curriculum Model	<ul style="list-style-type: none"> OO Project in term 3 6 month coop Programming Stream Full time Most of first year offered distance 	<ul style="list-style-type: none"> OO Project in term 3 6 month coop Streams – Application Development, Networking, Database, Web Development Full time Most of first year offered via distance 	<ul style="list-style-type: none"> Full time Majors: <ul style="list-style-type: none"> Client/Server (CS) Database (DB) Data Communications (DC) Digital Processing (DP) Embedded Systems (ES) – currently inactive 	<ul style="list-style-type: none"> Full or part time Applied Research Project – <ul style="list-style-type: none"> This course enables students in the Computing Science and Information Systems Program to acquire practical experience in 	<ul style="list-style-type: none"> Full and part time Delivery Options Classroom or Lab Setting <ul style="list-style-type: none"> All courses are taught in a Lab/Lecture format in a lab with computers and Projector. Classroom and Study Hours <ul style="list-style-type: none"> Average number of

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<ul style="list-style-type: none"> • Capstone project with industry- • Full and part time • Computer Systems Major: <ul style="list-style-type: none"> ▪ Graduates of the Computer Systems major will have rewarding careers with a diverse set of job titles and 	<ul style="list-style-type: none"> • Programming, • software application projects, • networks, hardware and related issues, • database applications, operating systems, applications and supportive disciplines (statistics, 	<ul style="list-style-type: none"> • Community Sponsored Project Credits: 9 <ul style="list-style-type: none"> ▪ In this course, students will be assigned to a real world team project that is hosted by a community business or college 	<ul style="list-style-type: none"> • Student participate in a practical iSeries development project with an iSeries company • Full and part time 	<ul style="list-style-type: none"> • Common first year • Majors: <ul style="list-style-type: none"> ▪ Database Management Concentration ▪ Programming Concentration ▪ Systems Management/ Networking Concentration ▪ Web Development Concentration

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Curriculum Model (cont'd)			<ul style="list-style-type: none"> • Information Systems (IS) • Systems Integration (SI) - replaced by CIT program • Technical Programming (TP) 	<p>defining, designing, developing and implementing a special computer systems project. Each student, in consultation with a faculty advisor, will select an appropriate computer project. Project topics may vary from in-depth research to systems analysis and design development proposals. The student will learn more about technical documentation. Project management fundamentals will also be covered.</p>	<p>hours in classroom per:week</p> <ul style="list-style-type: none"> ▪ Full time students can expect to spend from 20 to 30 hours per week on average in the classroom. ▪ Average number of hours a student can expect to study outside of class: As a rule of thumb, students should expect to spend 1 to 2 hours outside of class for each hour spent in class for homework and studies. ▪ LOGS Learning Outcome Guides (LOGs). - The project is designed to assist NAIT to become more responsive to the fast changing requirements in industry; to provide instructors with shared curriculum development tools and resources; and to provide students with current, learner-centered learning materials that adhere to a systematic and consistent instructional

SAIT	SIAST	NIAGARA	SENECA	NOVA
<p>descriptions. They help keep computers, communications and information systems installed, connected, maintained and supported. Graduates will often start in entry-level tech support roles (customer support representative, help desk, desktop support level one, etc.) and advance to more sophisticated levels of IT support roles (levels two and three, in larger corporations), management of support teams, or specialize into storage, server administration, or IT security areas. Graduates will have a well-rounded and strong foundation to begin their careers in the growing field of IT technical systems and support, with the opportunity to advance into senior technical analyst, systems administration and IT management roles.</p> <p>Network Systems Major:</p> <ul style="list-style-type: none"> • Graduates of the Network Systems major will have strong technical skills in designing, installing, configuring, maintaining and 	<p>communications, etc).</p> <ul style="list-style-type: none"> • The first year of the program is available online. Anyone taking a CST course via distance education would receive credit for that course towards a CST diploma • Full time program <p>Learning Method(s)</p> <ul style="list-style-type: none"> • Classroom • Distance Learning 	<p>department. Students will work closely with project stakeholders to analyze, design, and implement a new or enhanced system using the prototype development approach. The end result of term work will be the development and handover of an integrated, tested, and fully functional application to project stakeholders.</p>		<ul style="list-style-type: none"> • Some courses are online • Full time

	RRC	RRC	BCIT	DOUGLAS	NAIT
Curriculum Model (cont'd)					design model. • http://www.nait.ca/tci/Services/index.asp?GroupNumber=70

SAIT	SIAST	NIAGARA	SENECA	NOVA SCOTIA
<p>administering local, municipal and wide area networks. This major focuses on the network infrastructure of an organization, but also includes significant discussion of related topics including security, network operating systems and network management. In addition to comprehensive technical skills, graduates will acquire and demonstrate the professional communications, general business and problem solving skills required for success in industry. Students receive in depth training on router, switch and server configuration for support of network infrastructure, data transmission mediums, and new and emerging technologies. Students also receive the training required for industry recognized certifications.</p> <p>Software Development Major:</p> <ul style="list-style-type: none"> • Graduates of the Software Development major will assist with the development of software applications, work collaboratively 				

	RRC	RRC	BCIT	DOUGLAS	NAIT
Curriculum Model (cont'd)					

SAIT	SIAST	NIAGARA	SENECA	NOVA SCOTIA
<p>with teams to design new software, create software on multiple platforms (Windows, Web, Linux) use various languages (i.e. Java, C, .NET, PHP, XML, PL/SQL, SQL) and utilize different technologies (i.e. networks, databases, operating systems, ERP). Graduates can start in a junior position and work their way up to more advanced levels of Software Development or go into specialty areas. This is a field that graduates, right out of a post-secondary institution, can excel at.</p> <p>Telecom Systems Major:</p> <ul style="list-style-type: none"> • Graduates of the Telecom Systems major may find employment as a telecom technologist, production test technologist, cable technician, service technician, associated field engineer, sales and marketing, communication equipment installer and manufacturing technologist. They will be proficient in designing, installing, 				

	RRC	RRC	BCIT	DOUGLAS	NAIT
Curriculum Model (cont'd)					
	<p>Year 1 – Term 1 Credit Hours</p> <ul style="list-style-type: none"> • Network Computing 4 • Operating Systems 4 • Introduction to Business & Economics 3 • Financial Accounting 5 • Business Communications 1 3 • Programming (JAVA) 5 <p>Term 2</p> <ul style="list-style-type: none"> • Database Management Systems 4 • Network Administration 3 • Analysis & Design Methods 1 6 • Programming (.NET Introduction) 4 • Web Development 3 • Programming (Advanced JAVA) 4 <p>Term 3</p> <ul style="list-style-type: none"> • Database Applications 3 • Applied Accounting 4 	<p>IST - Application Development Credit Hours</p> <p>Year 2 - Term 3</p> <ul style="list-style-type: none"> • Database Applications 3 • Applied Accounting 4 • Electronic Commerce 3 • Object Oriented Project 4 • PowerBuilder 5 • Analysis and Design Methods 2 4 <p>Term 4 Elective</p> <ul style="list-style-type: none"> • Co-Op 9 <p>Term 5</p> <ul style="list-style-type: none"> • XML & Mobile Computing 4 • n-Tier Processing/App Integration 4 • Programming (.Net Advanced) 4 • Business Communications 2 3 • Math of Finance & Statistics 5 • Management Issues 3 <p>IST – Database Management</p>	<p>First-year core courses</p> <p>All students pursuing either a CST diploma or degree take the common set of first-year courses listed below,</p> <p>Term One</p> <ul style="list-style-type: none"> • Business Communication 1 • Physical Education • Enhanced Learning Skills • Applied Mathematics • Programming Methods • Introduction to Web Development • Relational Database Systems • Business in a Networked Economy <p>Term Two</p> <ul style="list-style-type: none"> • Business Communication 2 • Portfolio Development • Discrete Mathematics • Procedural 	<p>The student is required to complete 60 credits as follows: <i>30 CSIS credits (10 CSIS core courses)</i></p> <p>Credits</p> <ul style="list-style-type: none"> • Productivity Software and Client Support 3 • Computer Networking Essentials with CCNA 3 • Hardware Maintenance Concepts 3 • Introduction to Windows Programming 3 • Multimedia Web Development 3 • Communication Issues in Information Technology 3 • Systems Analysis and Design 3 • Database Management Systems 3 • Applied Research Projects 3 • Client/Server 	<p>Semester 1 Hours/Credits</p> <ul style="list-style-type: none"> • Logic & Problem Solving 96/6 • Financial Accounting 80/5 • Programming Fundamentals 128/8 • Foundations of Success 64/4 • Fundamental Computer Concepts 80/5 <p>Semester 2</p> <ul style="list-style-type: none"> • Systems Analysis & Design I 96/6 • Client-Server Programming 96/6 • Database Management 80/5 • Networking I 96/6 • Business Communications 80/5 • Co-op Work Experience 640/10 <p>Semester 3</p> <ul style="list-style-type: none"> • Systems Analysis & Design II 96/6 • J2EE Development 96/6

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configuring, commissioning, integrating, maintaining and administering voice, data, and video networks owned telecommunications companies such as TELCO or Information Service Providers (ISP). They also find careers in a wide range of businesses, industries, and government institutions. <ul style="list-style-type: none"> • Full time • Laptop based 				
Unit Course Credit First Year Courses Common Semester 1 <ul style="list-style-type: none"> • Computer Hardware and Operating System Essentials 3.0 • Computer Programming Essentials 3.0 • World of Information Technology 3.0 • Professional Communications and Presentation Skills 3.0 • Introduction to Networking Semester 1 - Total - 15.0 Computer Systems Major Semester 2 <ul style="list-style-type: none"> • Systems Hardware I 3.0 • Scripting for System Administrators 3.0 • Computer Operating Systems 3.0 	Credits <ul style="list-style-type: none"> • Business Principles 3 • Introduction to Networks 2 • Document Management 3 • Data Management 5 • Computer Fundamentals 3 • Operating Systems Fundamentals 3 • Introduction to Structured Programming 7 • Job Search and People Skills 3 • Seminar 1 • Communications 1 2 • Introduction to Database Management 5 • Network Management 4 • Web Site Development 3 • Hardware 4 • Systems Analysis and Design 4 • Intermediate Programming 5 • Statistics 3 	Credits Term 1 <ul style="list-style-type: none"> • Writing Strategies 3 • Programming Logic and Design 3 • Database Fundamentals 4 • Society and The Digital Age 3 • Digital Graphics Techniques 3 • Web Authoring Fundamentals 3 Term 2 <ul style="list-style-type: none"> • Business Technical Writing I 3 • Mathematics I for Computer Studies 4 • Database Driven Websites 4 • Object-Oriented Programming 3 • 3D Animation 3 • Flash Technologies 3 Term 3 <ul style="list-style-type: none"> • Business 	Semester 1 <ul style="list-style-type: none"> • Applied Professional Communications 3 hrs/wk • College English 3 hrs/wk • Introduction to Computers and Applications 2 hrs/wk • Introduction to Operating Systems Using Windows 5 hrs/wk • Introduction to Programming Using C 5 hrs/wk • Introduction to UNIX/Linux and the Internet 5 hrs/wk Semester 2 <ul style="list-style-type: none"> • Introduction to Database Design and SQL 4/wk • iSeries Business Computing 4 hrs/wk • Internet I - Internet Fundamentals 4 hrs/wk 	<ul style="list-style-type: none"> • Intro to Busi IT Professionals 60 hrs • DBMS I 60 hrs • Hardware I 60 hrs • IT On-Ramp 18 hrs • Technical Communications 30 hrs • Hum Rel for IT Professionals 30 hrs • Project Management for IT 30 hrs • Web Development 60 hrs • Internetworking I 90 hrs • Operating Systems – Unix 60 hrs • Operating Systems – Windows 60 hrs • Logic and Problem-Solving 60 hrs • Programming I 60 hrs • Introduction to SAAD 60 hrs

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Curriculum Content	Credit hours	Year 2 – Term 3 Credit Hours		Credits	
	<ul style="list-style-type: none"> • Electronic Commerce 3 • Object Oriented Project 4 • PowerBuilder 5 • Analysis and Design Methods 2 4 <p>Term 4 Elective</p> <ul style="list-style-type: none"> • Co-Operative Work Experience 9 <p>Term 5</p> <ul style="list-style-type: none"> • XML & Mobile Computing 4 • n-Tier Processing/App Integration 4 • Programming (.Net Advanced) 4 • Business Communications 2 3 • Math of Finance & Statistics 5 • Management Issues 3 	<ul style="list-style-type: none"> • Applied DBMS 1 4 • Database Applications 3 • Electronic Commerce 3 • Object Oriented Project 4 • Analysis and Design Methods 2 4 • Advanced SQL 4 <p>Term 4 Elective</p> <ul style="list-style-type: none"> • Co-Op 9 <p>Term 5</p> <ul style="list-style-type: none"> • DBMS System Administration 4 • Applied DBMS 2 4 • Business Communications 2 3 • Management Issues 3 • Data Warehousing 4 • DBMS Performance Tuning 4 <p>IST – Network Management Year 2 – Term 3</p> <ul style="list-style-type: none"> • Advanced NetWare Administration 4 • Database Applications 3 • Applied Network Computing 4 • Electronic Commerce 3 • Object Oriented Project 4 • Analysis and Design Methods 2 4 <p>Term 4 Elective</p> <ul style="list-style-type: none"> • Co-Op 9 <p>Term 5</p> <ul style="list-style-type: none"> • Network Security & Disaster Recovery 4 • Advanced Platform Integration 4 	<ul style="list-style-type: none"> Programming in C • Object Oriented Programming with Java • Computer Organization/ Architecture • Systems Analysis and Design • Projects <p>Second-year core courses</p> <p>The following courses are common to all second-year CST options except as otherwise noted.</p> <p>Term Three</p> <ul style="list-style-type: none"> • Object Oriented Programming in C++ All except SI • Object Oriented Analysis and Design All • Introduction to Data Communications All • Algorithm Analysis and Design All except SI • Computer Projects Practicum 1 All • Programming Windows CS, DC, DP, ES, TP • Organizational Behaviour DB, IS, SI <p>Term Four</p> <ul style="list-style-type: none"> • Computers and the Law All • Career Preparation All except SI • Computer Graphics for Computer Systems Technology All except IS, SI • Introduction to Internet Software Development All except IS, SI • Operating 	<ul style="list-style-type: none"> Systems 3 Any other 12 credit of CSIS elective courses from the three CSIS specialty areas (four courses) 15 non-CSIS credits (5 non-CSIS courses) from the following: • Principles of Accounting I or Principles of Accounting I & II 3 • Management Essentials or The Canadian Economy or Principles of Microeconomics (ECON 1150 or ECON 1250) or • Introductory Marketing 6 • Business Mathematics or • Commercial and Financial Mathematics or • Commercial and Financial Mathematics or • Discrete Mathematics 3 • Practical Writing 3 <p>Additional 3 credits (one course) of general elective courses chosen from the following</p> <ul style="list-style-type: none"> • Management Essentials 3 • Business Law I 3 • Business Mathematics 3 • Java Programming 3 • Advanced Networking with CCNA II, III 3 • Web Server Administration 3 	<ul style="list-style-type: none"> • Enterprise Systems.NET 96/6 • Networking II 80/5 • Organizational Behaviour 80/5 <p>Semester 4</p> <ul style="list-style-type: none"> • Project 160/10 • Project Management, Leadership, and Career Development 96/6 • General Elective 64/4 • Business Elective 64/4 • CST Curriculum Equivalent 64/4 • Oracle 64/4 • Quality Assurance Software Testing 64/4 • Microsoft Business Solutions Integration 64/4 • Advanced Web Application Development Using C# 64/4 • Flash 64/4 • Co-op Work Experience 640/10

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<ul style="list-style-type: none"> Client Server Administration 3.0 Business Dynamics Semester 2 - Total 15.0 First Year Total 30.0 Semester 3 Systems Hardware II 3.0 Server Service Administration 3.0 Web Essentials 3.0 IT Security I 3.0 Project Preparation Semester 3 Total - 15.0 Semester 4 Advanced Server Administration 3.0 Service Management 3.0 Emerging Trends in Technology 3.0 IT Security II 3.0 Capstone Project Semester 4 Total - 15.0 Second Year Total - 30.0 Program Total - 60.0 Network Systems Major Semester 2 Scripting for System Administrators 3.0 Client Server Administration 3.0 	<ul style="list-style-type: none"> Technical Communications 3 Multimedia 2 Systems Design Review 1 Systems Project 7 Database Management Systems 5 Data Communications and Networks 5 Advanced Operating Systems 5 IT Development Project 1 5 Internet Programming 7 Advanced Programming 1 5 Mathematics of Computation 3 Seminar 1 Network Project: E-Commerce 4 Advanced Network Management 6 Service and Support 3 IT Development Project 2 4 Client Server Programming 6 Advanced Programming 2 3 Applied Communications 2 Directory Services 3 Emerging Technologies 3 Helpdesk 1 Security Topics 3 	<p style="text-align: center;">Credits</p> <ul style="list-style-type: none"> Communications II 3 Career Planning and Development 1 Mathematics II for Computer Studies 4 Computer Systems Architecture 4 Advanced Programming Algorithms and Data Structures 3 Client Server Database Programming 4 Systems Analysis 4 <p>Term 4</p> <ul style="list-style-type: none"> Project Management 3 Comparative Programming Studies 3 Enterprise Database Development 4 Fundamental Network Technologies 4 Application Design and Implementation 6 General Education Elective 3 <p>Term 5</p> <ul style="list-style-type: none"> The IT Entrepreneur 3 Co-op Work Placement <p>Term 6</p> <ul style="list-style-type: none"> Community Sponsored Project 9 LINUX 4 C++ 4 Network Security and Remote Communications 4 	<ul style="list-style-type: none"> Introduction to Object Oriented Programming 4 hrs/wk General Education Option 3 hrs/wk Semester 3 Database Design II and SQL Using Oracle 4 hrs/wk Internet II - Web Programming on UNIX 4hrs./wk Requirements Gathering Using OO Models 4 hrs./wk General Education Option 3 hrs/wk And one of Business Applications Using COBOL 4 hrs/wk Object Oriented Programming II Using C++ 4hrs/wk Semester 4 Data Communications Networks 4 hrs/wk Business Report Writing 3hrs/wk General Education Option 3hrs/wk Professional Option 4hrs/wk Any one of Business Programming Using Java 4 hrs/wk Introduction to Java for C++ Programmers 4 hrs/wk Professional Options Business Applications Using COBOL Business Application Using Java 	<ul style="list-style-type: none"> Intro to WHMIS 4 hrs Intro to NS OH&S Act 4 hrs Electives Cooperative Education 420 hrs Applied Portfolio I 120 hrs Stream Courses: Database Management Concentration LAN Management 60 hrs Database Design II 30 hrs Database Application Dev 90 hrs Database Management & Admin 90 hrs Development for IT 30 hrs Applied Portfolio II Database 350hrs Web Programming 90 hrs SQL & Transaction Processing 90 hrs Programming IV – Java 60 hrs Disaster Recovery Planning 30 hrs Programming Concentration Prof Development for IT 30 hrs Applied Portfolio II – Program 350 hrs Web Programming 90 hrs Programming II 90 hrs

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Curriculum Content (cont'd)		<p style="text-align: center;">Credit Hours</p> <ul style="list-style-type: none"> • Advanced Windows Servers 4 • Business Communications 2 3 • Management Issues 3 • Unix & Web Servers 4 <p>IST – Web Development</p> <p>Year 2 – Term 3</p> <ul style="list-style-type: none"> • Database Applications 3 • Electronic Commerce 3 • Server-Side Computing 4 • Object Oriented Project 4 • Web Design 4 • Analysis and Design Methods 2 4 <p>Term 4 Elective</p> <ul style="list-style-type: none"> • Co-Op 9 <p>Term 5</p> <ul style="list-style-type: none"> • Business Communications 2 3 • Management Issues 3 • E-Commerce Integration 4 • Emerging Topics 4 • Mobile Computing 5 • XML Programming 3 	<ul style="list-style-type: none"> • Systems All except SI • Computer Projects Practicum 2 <p>Client/Server</p> <ul style="list-style-type: none"> • Client/Server Computing 1 • Client/Server Computing 2 • Special Topics in Client/Server <p>This option offers specialized courses in the areas of client/server computing, distributed computing and network computing.</p> <p>Students develop client/server systems or based distributed applications using state-of-the-art tools and technology.</p> <p>Topics include architecture, modelling and structural issues, inter-process communications, performance, reliability, scalability, consistency and security in a distributed system. Functional requirements, design methodologies, and implementation details of client/server based systems or distributed systems are also discussed.</p> <p>Students obtain working</p>	<p style="text-align: center;">Credits</p> <ul style="list-style-type: none"> • Network Server Administration 3 • ASP .NET 3 • Software Engineering 3 • The Canadian Economy 3 • Principles of Microeconomics (ECON 1150) 3 • Principles of Microeconomics (ECON 1250) 3 • Commercial and Financial Mathematics 3 • Introductory Marketing 3 • Personal Selling 3 <p>Recommended Program Schedule (for General Diploma)</p> <p>Semester 1</p> <ul style="list-style-type: none"> • Business Mathematics or • Commercial and Financial Mathematics or • Discrete Mathematics 3 • Practical Writing 3 • Productivity Software and Client Support 3 • Hardware Maintenance Concepts 3 • Introduction to Windows Programming 3 <p style="text-align: right;">Total 15</p> <p>Semester II</p> <ul style="list-style-type: none"> • Principles of Accounting I or • Principles of Accounting I and II 3 • Management Essentials or • The Canadian Economy or 	

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<ul style="list-style-type: none"> • Routing/Switching Fundamentals 3.0 • Structured Cabling 3.0 • Business Dynamics 3.0 <p><i>Semester 2</i> <i>Total - 15.0</i> <i>First Year Total - 30.0</i></p> <p>Second Year Semester 3</p> <ul style="list-style-type: none"> • Voice over Internet Protocol 3.0 • Advanced Routing and Remote Access 3.0 • Server Service Administration 3.0 • Project Preparation 3.0 • Statistics for Digital Communications 3.0 <p><i>Semester 3</i> <i>Total 15.0</i></p> <p>Semester 4</p> <ul style="list-style-type: none"> • Network Management 3.0 • Advanced Switching and Network Optimization 3.0 • Wireless Networks 3.0 • Network Security Techniques 3.0 • Capstone Project 3.0 <p><i>Semester 4</i> <i>Total 15.0</i> <i>Second Year Total 30.0</i> <i>Program Total 60.0</i></p> <p>Software Development Major Semester 2</p> <ul style="list-style-type: none"> • Introduction to Application and Interface Design 3.0 			<ul style="list-style-type: none"> • Database Administration • Database Connectivity Using Java • Oracle - Productivity Tools • Stored Procedures Using Oracle's PL/SQL • DB2 • Introduction to Datawarehousing • Domino Designer and Lotus Notes • Data Structures and Algorithms in C++ • EJB Architecture and J2EE • Introduction to Game Programming • Game Customization • Game Programming Techniques • Game Programming Simulation • 3D Modeling Tools • Graphical User Interface (GUI) Programming • Internet III - Web Programming on Windows • Creating Voice-Driven Web Applications • iSeries Practicum • AS/400 Command Language Programming • Novell Netware 5 Administration • Security Considerations for Data Communications • Object Oriented Programming II Using C++ • Open Source Development 	<ul style="list-style-type: none"> • Data Structures 60 hrs • SQL & Transaction Processing 90 hrs • Advanced Object Oriented Programming 60 hrs • Programming IV – Java 60 hrs • Advanced SAAD QA UML 60 hrs <p>Electives</p> <ul style="list-style-type: none"> • Intro to Windows Programming 60 hrs • Business Intel & Data Mining Systems Management/Networking Concentration • Help Desk & Customer Support 60 hrs • Hardware II 60 hrs • Prof Development for IT 30 hrs • Train Techniq/Tech Presnt 60 hrs • Self-directed Study 30 hrs • Systems/Networking Elective 60 hrs • Applied Portfolio II – Systems 175 hrs • NOS Administration – Alternate 60 hrs • Internetworking II 90 hrs • NOS Administration – Windows 120 hrs • Internetworking III 90 hrs • Internetworking IV 60 hrs

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Curriculum Content (cont'd)			<p>knowledge of TCP/IP, Unix, Windows NT, SUN RPC, X Window Systems, CORBA, RDBMS, Visual Basic, Oracle, Java, SQL Server, etc.</p> <p>More information can be found on the client/server catalogue page</p> <p>Database</p> <ul style="list-style-type: none"> • Database Systems 1 • Database Systems 2 • Advanced Topics in Database <p>The database option specializes in the design and implementation of database applications using modern database management systems. Students will work with a number of industry-standard DBMS's such as Oracle, MS SQLServer, and Access and a variety of application development tools such as PL/SQL, T-SQL, JAVA, Perl, Visual Basic and Visual C++.</p> <p>Client/server application development using ODBC, JDBC & E-SQL. Database Administration on Oracle and SQL Server will also be covered.</p> <p>More information</p>	<p>Credits</p> <ul style="list-style-type: none"> • Principles of Microeconomics or (ECON 1150) or • Principles of Macroeconomics (ECON 1250 or • Introductory Marketing 3 • Computer Networking Essentials with CCNA 3 • Multimedia Web Development 3 • Systems Analysis and Design 3 <p>Total 15</p> <p>Semester III</p> <ul style="list-style-type: none"> • Management Essentials or • The Canadian Economy or • Principles of Microeconomics (ECON 1150) or • Principles of Microeconomics (ECON 1250) or • Introductory Marketing 3 • Database Management Systems 3 • Any 3 CSIS elective courses (except CSIS1110) 9 <p>Total 15</p> <p>Semester IV</p> <ul style="list-style-type: none"> • Communication Issues in Information Technology 3 • Applied Research Projects 3 • Client/Server Systems 3 • Any CSIS elective course (except CSIS1110) 3 • Any general elective course 3 	

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<ul style="list-style-type: none"> • Computer Operating Systems 3.0 • Database Design and Programming 3.0 • Object Oriented Programming Essentials 3.0 • Business Dynamics 3.0 <i>Semester 2</i> <i>Total - 15.0</i> <i>First Year</i> <i>Total - 30.0</i> Second Year Semester 3 • Database Programming and Tuning 3.0 • Web Essentials 3.0 • Prototyping 3.0 • Advanced Object-Oriented Programming 3.0 • Project Preparation 3.0 <i>Semester 3</i> <i>Total - 15.0</i> Semester 4 • Enterprise Application Integration 3.0 • Web Application Programming 3.0 • Introduction to Database Administration 3.0 • Emerging Trends in Technology 3.0 • Capstone Project 3.0 <i>Semester 4</i> <i>Total - 15.0</i> <i>Second Year</i> <i>Total - 30.0</i> <i>Program Total - 60.0</i> 			<ul style="list-style-type: none"> • Multimedia Authoring • Business Applications Using RPG • Analysis and Design Using OO Models • UNIX Bash Shell Scripting • UNIX Systems Programming • Visual Basic • Basic Administration of Microsoft Windows 2000 • Web Services Architecture • Extreme Programming 	<p>Web Development Concentration</p> <ul style="list-style-type: none"> • Prof Development for IT 30 hrs • Capstone Project 60 hrs • Applied Portfolio II - Web Dev 350 hrs • Web Programming 90 hrs • User Interface Design I 120 hrs • User Interface Design II 60 hrs • Web Server Administration 60 hrs • Object Oriented Programming with Java 90 hrs • Web Programming with Java 90 hrs

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Curriculum Content (cont'd)			<p>can be found on the database catalogue page.</p> <p>Data Communications</p> <ul style="list-style-type: none"> • Data Communications/Internetworking 1 • Data Communications/Internetworking 2 • Selected Topics in Data Communications/Internetworking <p>Data communications offers highly specialized and netcentric computing. Students design and develop internetworking software using TCP/IP protocol suite in the Linux and Win32 environments. Multimedia communications software design and implementation includes applications that transfer video, audio, and graphical information in a client-server environment.</p> <p>Topics include implementation issues, modularity and efficiency for protocol implementation. Netcentric computing applications on the World Wide Web are implemented using Java and Java networking. Also addressed are wireless</p>		

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<p>Telecom Systems Major Semester 2</p> <ul style="list-style-type: none"> • Routing-Switching Fundamentals 3.0 • Digital Transmission Techniques 3.0 • Structured Cabling 3.0 • Electronics for Information Technology 3.0 • Business Dynamics 3.0 <p style="margin-left: 20px;"><i>Semester 2 Total - 15.0 First Year Total -30.0</i></p> <p>Second Year Semester 3</p> <ul style="list-style-type: none"> • WAN and ISP Routing 3.0 • PBX Switching Principles 3.0 • Telephone Outside Plant 3.0 • Wideband and Personal Communications 3.0 • Project Preparation 3.0 <p style="margin-left: 20px;"><i>Semester 3 Total - 15.0</i></p> <p>Semester 4</p> <ul style="list-style-type: none"> • Voice over Internet Protocol 3.0 • Multi-Protocol Switching and IP QoS 3.0 • Service Provider Switching/Routing 3.0 • Wide Area Networking 3.0 • Capstone Project 3.0 <p style="margin-left: 20px;"><i>Semester 4 Total - 15.0 Second Year Total - 30.0 Program Total - 60.0</i></p>				

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Curriculum Content (cont'd)			<p>protocol implementation issues and serial communications programming. Network administration and security is taught using Linux and Win32 networks.</p> <p>More information can be found on the data communications catalogue page</p> <p>Digital Processing</p> <ul style="list-style-type: none"> • Digital Image, Video and Audio Fundamentals • Advanced Topics in Digital Processing • Gaming Systems <p>Digital processing specializes in the development of digital image, video, and audio systems. Emphasis is placed on construction of the tools for new media applications.</p> <p>Topics include image processing, fundamentals of audio and video streams and realtime animation. Various techniques are studied for making filters (Gaussian, edge-detection, etc.), morphing and warping techniques, and compression (JPEG, Wavelets, and others). Advanced</p>		

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Curriculum Content (cont'd)			<p>programming such as concurrent programming (synchronization techniques, threads) and networking (TCP/UDP using Winsock API) will also be studied.</p> <p>Development of media systems will be done using Win32, DirectX, OpenGL, MFC APIs, and Java's advanced API's using C, C++, and Java programming languages. Special topics based on class and individual choices may also be covered.</p> <p>More information can be found on the digital processing catalogue page</p> <p>Embedded Systems Note: the CST Embedded Systems option is currently on hiatus. Please contact the program head to determine whether this option will be available in future sessions.</p> <ul style="list-style-type: none"> • Embedded Systems 1 • Embedded Systems 2 • Gaming Systems <p>Offers highly specialized courses in non-traditional programming environments. Emphasis is placed on</p>		

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Curriculum Content (cont'd)			<p>developing applications for small and/or embedded applications for small and/or embedded systems where a traditional operating system does not exist. Students will develop applications on multiple platforms and will be required to develop portions of their own real-time operating system.</p> <p>Emphasis will be placed on both language high-level and assembly programming. Students who have an interest in this option should have a good knowledge of hardware as well as programming and should also have an interest in low-level design. More information can be found on the <i>embedded systems catalogue page</i>.</p> <p>Information Systems</p> <ul style="list-style-type: none"> • Information Technology Management • Intranet Planning and Development • Managing IS Development • Special Topics in MIS <p>Provides specialization involving system</p>		

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	RRC	RRC	BCIT	DOUGLAS	NAIT
Curriculum Content (cont'd)			<p>development in the information processing environment, with special emphasis on business systems and software engineering for medium and large computer systems.</p> <p>More information can be found on the information systems catalogue page.</p> <p>Systems Integration Note: The CST Systems Integration option was offered for the last time in Fall 2006. Future students interested in the Systems Integration option are advised to apply to our new Computer Information Technology Program.</p> <p>Technical Programming</p> <ul style="list-style-type: none"> • Technical Programming 1 • Technical Programming 2 • System Programming <p>The Technical Programming option is focused on efficient software development and maintenance in today's world characterized by complex applications requiring different levels of functionality,</p>		

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	RRC	RRC	BCIT	DOUGLAS	NAIT
Curriculum Content (cont'd)			<p>performance, flexibility and integration.</p> <p>Building upon your basic understanding of programming methods, computer architecture and programming languages (C, Java and C++), you will enhance your programming skills and learn advanced techniques needed for software development: GUI, Windows messages, metafiles, process management, concurrent programming (multi-threading, synchronization, interprocess-communication) and networking as well as Web development.</p> <p>Technical Programming helps you develop system-level programming skills relating to the Win32 API and Windows operating system kernel, as well as application-level programming skills in the area of the object oriented programming and Web development, including: distributed Web applications using</p>		

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	RRC	RRC	BCIT	DOUGLAS	NAIT
Curriculum Content (cont'd)			<p>Web Services, dynamically built Web pages with ASP.NET, data access technologies with ADO.NET, and smart client application using the .NET Framework.</p> <p>More information can be found on the technical programming catalogue page.</p>		
Student assessment	<ul style="list-style-type: none"> • Assignments, test and exams (hands on and Theory based) • Assessment for COOP based on employer visit by COOP coordinator 	<ul style="list-style-type: none"> • Assignments, test and exams (hands on and Theory based) • Assessment for COOP based on employer visit by COOP coordinator 	<ul style="list-style-type: none"> • Exams, assignments – hands on and practical • Cooperative Education <ul style="list-style-type: none"> ▪ The optional co-op education component of the CST program provides students with substantial benefits in their IT career preparation, given that employers are more eager to hire graduates who have had some co-op experience. Students opting for co-op education are required to meet year one performance qualification criteria. Students will require a minimum of two four-month co-op terms to graduate with a co-op designation on their CST diploma. These 	<ul style="list-style-type: none"> • Exams and hand-on assignments • Co-operative Education Option <ul style="list-style-type: none"> ▪ Students in this program may be eligible for a Co-operative Education designation. Co-op Education involves alternating full-time academic and work terms. Job opportunities are enhanced after completing the Co-op option. For further information see the Co-op Education section in this calendar or contact the Co-op Education office at 604-527-5100. 	<ul style="list-style-type: none"> • Hands-on and theory exams and assignments • Optional Co-op & Work Experience <ul style="list-style-type: none"> ▪ Co-op is offered each term. It is an optional course, and students are selected based on marks, attitude, and instructor feedback. ▪ Students may choose to take one or both Co-ops. • Possible progress path: <ul style="list-style-type: none"> ▪ Year One Semester 1, Semester 2, Co-op 305 ▪ Year Two Semester 3, Co-op 405, Semester 4

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<ul style="list-style-type: none"> • Exams, assignments – hands-on and theory based 	<ul style="list-style-type: none"> • Hands-on assignments, labs and paper theory tests • 2 project courses – not industry driven though. 	<ul style="list-style-type: none"> • Required coop • Exams • Community Sponsored Project - Credits: 9 <ul style="list-style-type: none"> ▪ In this course, students will be assigned to a real world team project that is hosted by a community business or college department. Students will work closely with project stakeholders to analyze, design, and implement a new or enhanced system using the prototype development approach. The end result of term work will be the development and handover of an integrated, tested, and fully functional application to project stakeholders. 	<ul style="list-style-type: none"> • Exams and assignment – hands-on and theory based • Student participate in a practical iSeries development project with an iSeries company 	<ul style="list-style-type: none"> • Exams and assignments – hands-on and theory based • Portfolios • Optional coop

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Student assessment (Cont'd)			two co-op terms could be back to back, or in two separate terms, but they must happen before the final term of the program.		
Current and coming challenges	<ul style="list-style-type: none"> • Issues include: <ul style="list-style-type: none"> • Attracting females • Attracting students • Keeping staff • Keeping staff current 	<ul style="list-style-type: none"> • Issues include: <ul style="list-style-type: none"> ▪ Attracting females ▪ Attracting students ▪ Keeping staff ▪ Keeping staff current 		<ul style="list-style-type: none"> • Enrollment is the main challenge. • Getting the students to join the co-op program is another 	

SAIT	SIAST	NIAGARA	SENECA	NOVA SCOTIA
<ul style="list-style-type: none"> • IT – recruitment, new curriculum; BAIS – value of applied degree, changes in government and senior management vision. • Advisory committee – meets twice a year 	<ul style="list-style-type: none"> • Advisory committee meets each April • Training for instructors to keep up with changing technology, • Funding for equipment, • Recruiting students, • Student retention. 	<ul style="list-style-type: none"> • Traditional – classroom • Faculty remaining current 		<ul style="list-style-type: none"> • Major challenges are: <ul style="list-style-type: none"> ▪ student recruitment, retention, language skills/maturity and learner engagement - as well as industry awareness that there is a crisis looming as the IT workforce “grays” and competition for employees heats up! Through groups such as NSBI mentioned above, they are beginning to take a more active role in recruitment and messaging about the IT field. • Dean’s Advisory Council that meets regularly with industry reps across the province and Program Advisory Committees for specific disciplines. We sit on several councils including NovaKnowledge, a think tank and

	RRC	RRC	BCIT	DOUGLAS	NAIT
Curriculum Renewal	<ul style="list-style-type: none"> • DACUM every 5 years 	<ul style="list-style-type: none"> • Curriculum Renewal – Program Evaluation every 3-5 years 		<ul style="list-style-type: none"> • Advisory committee meets twice a year • To reflect some of the employers' needs, many courses get updated annually. 	

SAIT	SIAS	NIAGARA	SENECA	NOVA SCOTIA
				<p>economic development group in NS as well as Nova Scotia Business Inc, an arm of the provincial economic development department whose mandate is to connect business and opportunities in N.S.</p> <ul style="list-style-type: none"> • Each campus has an Academic Chair with close ties to industry in their local area. Faculty are also fully engaged with our industry partners.
<ul style="list-style-type: none"> • IT – it is all new, and gets revised annually; • BAIS – revised as needed 	<ul style="list-style-type: none"> • Annually. <ul style="list-style-type: none"> ▪ Unfortunately, we don't have funding to update all the courses every year, so we try to update the ones which have changed the most (i.e: ones using Office 2003 need to update to Office 2007, Windows XP to Vista, etc). 	<ul style="list-style-type: none"> • Active Advisory Committee meets twice per year 4. • Minor changes every year; major every 2-3 years 		<ul style="list-style-type: none"> • Review curriculum annually through a <i>Program Development Team</i> process with <i>Course Development Teams</i> looking after specific subject areas. • The program undergoes a comprehensive <i>Program Review</i> every five years. However, we also conduct an annual <i>Program Report Card</i> and if a program's indicators warrant a look earlier than the scheduled deadline, we will proceed with a review. • Every year we hold a Curriculum Institute where all faculty and Academic Chairs meet to review

	RRC	RRC	BCIT	DOUGLAS	NAIT
Partnerships	<ul style="list-style-type: none"> • Articulation with <ul style="list-style-type: none"> ▪ Tech Voc High School, ▪ University of Winnipeg • CIPS accredited • Union – Manitoba Government Employees Union 	<ul style="list-style-type: none"> • Articulation Agreements: <ul style="list-style-type: none"> ▪ Athabasca University, ▪ University of Winnipeg • Accredited by the <ul style="list-style-type: none"> ▪ Canadian Information Processing Society's (CIPS) ▪ College Program Accreditation Council (CPAC) 	<ul style="list-style-type: none"> • CIPS accredited 		<ul style="list-style-type: none"> • CIPS accredited

SAIT	SIAST	NIAGARA	SENECA	NOVA SCOTIA
				<p>the previous year, address solutions for any challenges prior to the September start-up, identify curriculum changes, assignment changes and hold professional development sessions to prepare for the coming year.</p>
	<ul style="list-style-type: none"> • CIPS accredited • As a member of the Microsoft Developer Network Academic Alliance (MSDNAA), SIAST has incorporated internationally accredited courseware into the program 	<p>Computer Programmer Analyst (Co-op)</p> <ul style="list-style-type: none"> • Australian Catholic University <ul style="list-style-type: none"> ▪ Bachelor of Information Systems (direct entry to year three) • Bond University <ul style="list-style-type: none"> ▪ Bachelor of Information Technology (consider for direct admission with three semester of advanced standing) • Brock University <ul style="list-style-type: none"> ▪ Bachelor of Science Honours or Major (graduate must have a minimum GPA of 3.5) (graduate will be given seven (7.0) credits towards a twenty (20) credit honours 		<ul style="list-style-type: none"> • Atlantic Provinces Community College Consortium : <ul style="list-style-type: none"> ▪ New Brunswick Community College, ▪ College of the North Atlantic, ▪ Nova Scotia Community College, and ▪ Holland College herein referred to as the Atlantic Community Colleges, believe that transfer credit among the region's publicly funded community colleges supports the public policy objectives that students should not have to repeat a formal learning experience and that lifelong learning should be as seamless as possible.

	RRC	RRC	BCIT	DOUGLAS	NAIT
Partnerships (Cont'd)					

SAIT	SIAST	NIAGARA	SENECA	NOVA SCOTIA
		<p>or major degree conditional upon a twenty (20) credit honours or major degree conditional upon a minimum grade of B) (graduate would require thirteen (13.0) additional Brock University credits</p> <ul style="list-style-type: none"> • Brock University <ul style="list-style-type: none"> ▪ Bachelor of Science in Computer Science (graduate must have a minimum GPA of 3.5) (graduate will be given seven (7.0) credits towards a fifteen (15) credit pass degree conditional upon a minimum grade of B in each of the courses) (graduate would require eight (8.0) additional Brock University credits) <p>Computer Programmer Analyst</p> <ul style="list-style-type: none"> • Griffith University <ul style="list-style-type: none"> ▪ Bachelor of Engineering (Software Engineering) (1.5 years awarded) 		

	RRC	RRC	BCIT	DOUGLAS	NAIT
Partnerships (Cont'd)					
Other				<ul style="list-style-type: none"> • Transfer credits to <ul style="list-style-type: none"> ▪ UBC, ▪ SFU, ▪ UVic, ▪ UNBC, ▪ UCFV, ▪ BCIT, ▪ Kwantlen University College, ▪ University of Lethbridge <p>and other institutions are arranged for many Computing Science and Information Systems courses.</p>	

SAIT	SIAST	NIAGARA	SENECA	NOVA SCOTIA
		<ul style="list-style-type: none"> • Niagara University <ul style="list-style-type: none"> ▪ Bachelor of Science in Computer and Information Studies (54 credit awarded) 		

Appendix B – Industry Occupational Analysis (DACUM) Chart

DACUM Skill Rating Scale

- 1 - Can perform some parts of this skill satisfactorily but requires assistance and/or supervision to perform the entire skill.
- 2 - Can perform this skill satisfactorily but requires periodic assistance and/or supervision.
- 3 - Can perform this skill competently without assistance or supervision.
- 4 - Can perform this skill competently without, assistance with more than acceptable quality, and with initiative/adaptability to unique situations.

COMMON SKILLS AND ABILITIES

 ASCERTAIN
 BUSINESS/CLIENT
 REQUIREMENTS
 A

Write business cases A1	Examine needs A1	Use interviewing skills A3	Document wants and needs A4	Determine scope A5	Explain requirements to clients A6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Confirm details A7	Document non-functional requirements A8	Document functional requirements A9	Identify dependencies A10	Identify constraints A11	Manage scope / expectations A12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

 DEMONSTRATE
 PROFESSIONAL
 SKILLS
 B

Demonstrate decision-making skills B1	Participate in continuous learning B2	Follow code of ethics B3	Practice according to regulatory requirements B4	Demonstrate research skills B5	Demonstrate accountability B6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Demonstrate responsibility B7	Adapt to business culture of organization and clients B8	Attain professional development goals B9	Demonstrate ability to multi-task B10	Cultivate common goals B11	Focus on client needs B12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Adhere to standards and procedures B13	Demonstrate attention to details B14	Solve problems B15	Manage time B16	Develop innovative solutions B17	Demonstrate organization skills B18
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Demonstrate critical thinking skills B19	Apply troubleshooting skills B20	Demonstrate continuous improvement B21	Integrate information and ideas in a logical manner B22	Challenge ideas / concepts / plans in a positive way B23	Maintain product currency (changes, fixes, etc.) B24
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Identify risks B25	Apply iterative methodology B26	Evaluate tools B27	Transfer knowledge B28	Demonstrate conflict resolution skills B29	
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	

USE
COMMUNICATION
SKILLS
C

Demonstrate active listening skills C1	Demonstrate verbal skills C2	Adapt communication to the level of the audience C3	Demonstrate technical writing skills C4	Demonstrate presentation skills C5	Select appropriate communication media / tools C6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Interpret non-verbal communication C7	Provide feedback C8	Interpret written material C9	Use www and Internet tools C10	Demonstrate negotiation skills C11	Interpret technical documents C12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Use office productivity tools C13	Use industry terminology C14	Write RFQ;s and RFI's, RFP's C15	Write for business communications C16		
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4		

APPLY PROJECT /
TEAM MANAGEMENT
SKILLS
D

Identify stakeholders D1	Manage resources D2	Advise on budgets D3	Manage tasks D4	Mitigate risk D5	Manage schedule D6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Determine priorities D7	Facilitate meetings D8	Delegate D9	Propose recommendations D10	Build trust D11	Leverage experience D12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Report status (work / tasks) D13	Apply change management processes D14	Estimate work D15	Demonstrate planning skills D16	Demonstrate leadership skills D17	Apply collaborative planning techniques (e.g. brainstorming) D18
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Coordinate cross-functional teams D19	Manage vendor / consultant relationships D20				
1 2 3 4	1 2 3 4				

**DEMONSTRATE
PERSONAL SKILLS
E**

Adapt to change E1	Work as part of a team E2	Demonstrate coaching and mentoring skills E3	Demonstrate initiative E4	Demonstrate reliability E5	Project a positive attitude E6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Accept feedback E7	Demonstrate respect for others E8	Show objectivity E9	Seek feedback E10	Practice life-work balance E11	Demonstrate discipline E12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Manage stress E13					
1 2 3 4					

**APPLY TESTING
SKILLS
F**

Create test cases F1	Conduct integration tests (F.I.T Functional Integration Testing) F2	Conduct stress testing F3	Conduct penetration testing F4	Test security F5	Conduct performance testing F6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Determine test success criteria F7	Coordinate acceptance testing F8	Use automated testing tools (traffic generators J-Unit) F9	Create test plan F10	Conduct accessibility testing F11	Conduct regulatory compliance tests F12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Conduct compatibility testing F13	Interpret test results F14	Analyze test results F15	Assemble data for test cases F16	Sanitize data for test cases F17	Conduct usability testing F18
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Conduct disaster recovery testing F19	Conduct standards compliance assessment F20	Conduct back-up and recovery testing F21	Use a defect tracking tool (Clear Quest, Jira, Bugzilla) F22	Use automated profiling tools F23	
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	

**FOLLOW
GOVERNANCE AND
BEST PRACTICES
G**

Apply standards / best practices G1	Apply security standards G2	Comply with legislation and regulations G3	Apply industry standards (C.O.B.I.T., I.T.I.L.) G4	Apply TOGAF (Governance Architectural Framework) G5	Use ZACHMAN G6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Apply PMBOK (Project Management Body of Knowledge) G7	Apply BABOK (Business Analysis Body of Knowledge) G8	Apply SWEBOK (Software Engineering Body of Knowledge) G9	Create object to relational mapping (ORM) G10	Implement SOA (Service Oriented Architecture) principles G11	
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	

APPLICATION DEVELOPMENT STREAM

**ANALYZE SOLUTION
REQUIREMENTS
H**

Translate business functional requirements H1	Document analysis H2	Draw charts, diagrams, flow charts H3	Apply business logic H4	Use traceability matrix H5	Handle use cases H6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Contrast alternatives H7	Seek alternatives H8	Integrate solutions with business model H9	Integrate solutions with business model H9		
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4		

**DESIGN
APPLICATIONS
I**

Comply with technology standards I1	Align solution with architecture I2	Align solution with infrastructure I3	Translate analysis into high-level design I4	Document detail design I5	Create prototype I6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

DEVELOP
APPLICATIONS
J

Write code from specifications J1	Use programming tools J2	De-bug code J3	Test units J4	Test for functionally J5	Document code J6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Develop database J7	Develop user interface J8	Apply best practices J9	Write reusable code J10	Use reusable code J11	Apply troubleshooting skills J12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Use version control software J13	Adhere to security guidelines, policies, practices J14	Use unit testing matrix J15			
1 2 3 4	1 2 3 4	1 2 3 4			

FORMULATE
SOLUTION
ARCHITECTURE
K

Align solution to business needs K1	Plan holistically K2	Balance strategic and tactical solutions K3	Develop models K4	Create abstract patterns K5
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

CONSTRUCT
SOLUTION
ARCHITECTURE
L

Factor non-functional requirements L1	Design patterns L2	Incorporate networking principles L3	Integrate business rules L4	Integrate web services L5	Determine patterns and practices L6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Lay out user interface L7	Determine service orientated architecture L8	Design work flow L9	Integrate directory services L10	Apply multi-tier development practices L11	
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	

USE DEVELOPMENT LANGUAGES AND TOOLS
M

Write .NET (dot.NET) M1	Use InfoPath M2	Write ETL tools (Extract Transform Load) M3	Write crystal reports M4	Write PowerBuilder M5	Use XML M6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Write Java and Javascript M7	Write XHTML M8	Write COBOL M9	Write NATURAL M10	Write PLI M11	Write RPG M12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Write Mark IV M13	Write Open Road M14	Use TELON M15	Write Lotus Script M16	Write PERL M17	Write scripting languages M18
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Write SQL M19	Write ADAP M20	Use ERP (Enterprise Resource Planning) applications M21	Use collaboration tools M22	Write scheduling tools M23	Write SharePoint M24
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

DEVELOP APPLICATIONS USING OPERATING SYSTEMS
N

Develop applications in UNIX N1	Develop applications in OS390 N2	Develop applications in WINDOWS N3	Develop applications in LINUX N4	Develop applications in AS400 N5
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

APPLY SYSTEM DEVELOPMENT LIFE-CYCLE
O

Utilize work breakdown structure O1	Develop new software O2	Set-up configuration management O3	Provide system support O4	Estimate work/time/resources O5	Apply methodologies (e.g., Waterfall, Agile, Scrum, UP, TDD, MSF) O6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Coordinate change management O7					
1 2 3 4					

APPLY MODELLING PROCESSES AND TOOLS
P

Use UML (Unified Modelling Language)	Model data warehousing	Model BPMN (Business Process management)	Apply data modeling	Read sequence diagrams
P1	P2	P3	P4	P5
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

USE MIDDLEWARE
Q

Apply middleware technologies	Use BIZTALK	Use MESH	Demonstrate package integration
Q1	Q2	Q3	Q4
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

WEB DEVELOPMENT STREAM

ANALYZE SOLUTION REQUIREMENTS
R

Translate business functional requirements	Document analysis	Draw standard charts diagrams, flowcharts (e.g. UML)	Apply business logic	Map solution elements to requirements	Analyze alternatives
R1	R2	R3	R4	R5	R6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Integrate solutions with business model	Document system interaction				
R7	R8				
1 2 3 4	1 2 3 4				

DESIGN APPLICATIONS
S

Comply with technology standards	Define architecture for the solution	Translate analysis into high-level design	Document detail design	Create prototype (use in generic sense)	Conduct proof of technology
S1	S2	S3	S4	S5	S6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Create a data model	Create a class model (UML)	Design for scalability	Use design tools (Enterprise Architecture, Rationale Suite)	Design stateless applications	Design for high availability
S7	S8	S9	S10	S11	S12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Maximize work within limitations of environment					
S13					
1 2 3 4					

DEVELOP APPLICATIONS
T

Write code from specifications T1	Use programming tools T2	De-bug code T3	Conduct unit testing T4	Test for functionality T5	Document code T6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Develop database (s) T7	Develop user interface T8	Write reusable code T9	Use reusable code T10	Use version control software T11	Adhere to security guidelines, policies, practices T12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Determine test coverage T13	Participate in peer reviews T14	Conduct compatibility testing T15	Comply with graphic design specs T16		
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4		

DEMONSTRATE IMPLEMENTATION SKILLS
U

Coordinate transition to production U1	Write developer guide U2	Write operators guide U3	Write user guide U4
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

WRITE CODE FROM SPECS
V

Code in Java script (AJAX) V1	Code in CSS (Dreamweaver) V2	Code in HTML (Dreamweaver) V3	Code in XML / XSLT (SOAP) V4	Code in server side language (JAVA, NET, PHP) V5	Create and use web services (WS-*, R.E.S.T.) V6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Integrate web graphics V7	Code in action script (Flash) V8	Read data model V9	Use integrated development environment (Visual studio / eclipse / Dreamweaver) V10	Integrate coding languages V11	Develop search engine friendly pages V12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Code in SQL V13					
1 2 3 4					

**DEPLOY APPLICATIONS
W**

Use operating systems (Windows, Linux Solaris, Aix, Unix) W1	Demonstrate an understanding of web protocols (Domain Reg / DNS / HTTP / SMTP) W2	Provide support W3	Deploy clustered applications W4	Implement security mechanisms (SSLF, Keys, Certificates, Reverse proxys) W5	Use version control software (Subversion, Source Safe, CVS) W6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Use build tools (ANT, Maven, MS Build) W7	Configure web and application servers (iis, Apache, Tomcat, Web Sphere) W8	Deploy distributed applications W9			
1 2 3 4	1 2 3 4	1 2 3 4			

DATABASE ANALYSIS, ADMINISTRATION, ARCHITECTURE STREAM

**ANALYZE / DESIGN DATABASES
X**

Create dimensional model (warehouse) X1	Identify data owners X2	Interpret standard diagrams, flow-charts (Unified Modeling Language) X3	Create prototype X4	Document detail database design X5	Create logical data model X6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Create physical data model X7	Create entity relationship diagram (ERD) X8	Create object to relational mapping (ORM) X9	Implement SOA (Service Oriented Architecture) principles X10	Write code from specifications X11	Write SQL X12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Write DDL X13	Write DOS scripts X14	Write UNIX scripts X15	Use data modelling tool X16	Adhere to security guidelines, policies, practices X17	Write useable code X18
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Use reusable code X19	Develop database X20	Test for functionality X21	Adhere to privacy legislation X22	De-bug code X23	Document code X24
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Participate in peer reviews X25	Use version control software (CVS Subversion, Source Safe) X26	Conduct unit testing X27	Create regression testing X28		
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4		

DESIGN DATABASE ARCHITECTURE
Y

Evaluate solutions with business model Y1	Estimate size of deliverable Y2	Determine technical scope Y3	Estimate infrastructure requirements Y4	Assess infrastructure implications Y5	Define architecture for solutions Y6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Translate analysis to high level design Y7	Comply with technology standards Y8	Analyze alternatives Y9	Recommend solutions Y10	Document database architecture Y11	Conduct proof technology Y12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Conduct proof of concept Y13	Document system interaction Y14	Map system integration Y15			
1 2 3 4	1 2 3 4	1 2 3 4			

USE DATABASE DEVELOPMENT TOOLS
Z

Use DB2 Z1	Manipulate relational databases Z2	Use INGRES Z3	Use Oracle Z4	USE MS SEQUEL server Z5	Use ADABAS Z6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Construct hierarchical models Z7	Use SYBASE Z8				
1 2 3 4	1 2 3 4				

SUPPORT /
ADMINISTER
DATABASES
AA

Use native database tools AA1	Manage database software upgrades AA2	Implement new fixes AA3	Execute disaster recovery AA4	Manage back-up and recovery AA5	Monitor database performance AA6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Manage database files AA7	Manage database statistics AA8	Identify performance issues AA9	Resolve performance issues AA10	Perform root cause analysis AA11	Use hardware resources AA12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Differentiate infrastructure AA13	Apply troubleshooting procedures / techniques AA14	Differentiate operating systems AA15	Manage database security AA16	Use diagnostic tools AA17	Analyze system logs AA18
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Use monitoring tools S/N AA19	Provide data for audits AA20				
1 2 3 4	1 2 3 4				

DEMONSTRATE
IMPLEMENTATION
SKILLS
BB

Deploy database BB1	Contribute to developer's guide BB2	Contribute to transition to production BB3	Write support administration documentation BB4	Write database connectivity guide BB5	Contribute to post-implementation review BB6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

NETWORK / INFRASTRUCTURE SPECIALIST STREAM

DEFINE NETWORK
ARCHITECTURE
CC

Conceptualize network architecture CC1	Translate business functional requirements CC2	Research emerging technologies CC3	Document analysis CC4	Map solution elements to requirements CC5	Document system interaction CC6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Analyze alternative architecture CC7	Integrate solutions with business model CC8	Apply architectural frameworks CC9			
1 2 3 4	1 2 3 4	1 2 3 4			

DESIGN NETWORK
INFRASTRUCTURE
DD

Assess existing network DD1	Assess networking needs DD2	Craft a logical design DD3	Assess against industry best practices DD4	Adapt to changing protocols DD5	Craft a physical design DD6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Validate design (proof of design) (Pilot) DD7	Select products DD8	Comply with technology standards DD9	Incorporate industry best practices DD10	Document detail design DD11	Adapt to evolving services DD12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Translate architecture documents into network design DD13	Adapt vendor designs / best practices DD14	Participate in peer review DD15	Apply virtualization concept DD16	Apply disaster recovery concepts DD17	Apply high availability concepts DD18
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

IMPLEMENT NETWORK
INFRASTRUCTURE
EE

Interface with other departments EE1	Configure routers EE2	Configure switches EE3	Configure servers EE4	Configure firewalls EE5	Configure network appliances EE6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Apply fundamental network concepts EE7	Apply data center standards EE8	Specify power, environmental, physical requirements EE9	Configure wireless EE10	Apply security standards and best practices EE11	Assemble hardware EE12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Follow installation instructions / procedures EE13	Replicate network infrastructure / design in a number of settings / sites EE14	Write troubleshooting guide EE15	Write operational documents / manual EE16	Contribute toward transition to production EE17	Debug scripts EE18
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Write reusable scripts (PERL, VB, SHELL) EE19	Write scripts EE20	Use re-usable scripts EE21			
1 2 3 4	1 2 3 4	1 2 3 4			

MONITOR NETWORK
INFRASTRUCTURE
FF

Use network tools FF1	Monitor connectivity FF2	Monitor performance FF3	Establish base-lines FF4	Configure monitoring tools FF5	Report against the base-line FF6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Analyze historical reports FF7	Forecast capacity FF8	Identify network problems FF9	Monitor content FF10	Monitor application flows FF11	
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	




SUPPORT NETWORK
INFRASTRUCTURE
GG



Perform hardware maintenance GG1	Respond to incidents GG2	Apply network troubleshooting techniques GG3	Use packet capture tools (sniffers) GG4	Follow incident management methodology GG5	Use security tools GG6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Update network documentation / diagrams GG7	Monitor version control (IOS) GG8	Perform firmware upgrades GG9	Apply security patches GG10	Configure back-up and restore processes GG11	Execute back-up and restore processes GG12
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
interface with vendors GG13	Resolve problems GG14	Manage infrastructure accounts and passwords GG15			
1 2 3 4	1 2 3 4	1 2 3 4			

Appendix C – Graduate Skills and Abilities Chart

DACUM Skill Rating Scale:

- 1 Can perform some parts of this skill satisfactorily but requires assistance and/or supervision to perform the entire skill.
- 2 Can perform this skill satisfactorily but requires periodic assistance and/or supervision.
- 3 Can perform this skill competently without assistance or supervision.
- 4 Can perform this skill competently without assistance, with more than acceptable quality, and with initiative/adaptability to unique situations.

-  Indicates skill rating.
-  DACUM Committee Skill deleted.
-  Skill or Competency added by Faculty or DACUM wording changed.

-  Grey shaded Box = General Areas of Competency (GAC)
-  Unshaded Box = Specific skill within GAC
- Capitalized text in CWLOs = General Area of Competency (GAC)
- Normal text in CWLOs = Specific skills within GAC

COMMON SKILLS AND ABILITIES

Industry DACUM	Faculty Expectations	College-Wide Learning Outcomes (CWLOs)
ASCERTAIN BUSINESS/CLIENT REQUIREMENTS A	ASCERTAIN BUSINESS/CLIENT REQUIREMENTS A	
Write business cases A1 1 2 3 4	Write business cases A1 1 2 3 4	
Examine needs A2 1 2 3 4	Examine needs A2 1 2 3 4	D3 - recognize the human, interpersonal, technical, scientific and mathematical dimensions of a problem D4 - identify the root cause of a problem
Use interviewing skills A3 1 2 3 4	Use interviewing skills A3 1 2 3 4	D4 - identify the root cause of a problem
Document wants and needs A4 1 2 3 4	Document wants and needs A4 1 2 3 4	D4 - identify the root cause of a problem
Determine scope A5 1 2 3 4	Determine scope A5 1 2 3 4	
Explain requirements to clients A6 1 2 3 4	Confirm requirements to clients A6 1 2 3 4	

Confirm details A7 1 2 3 4	Confirm details A7 1 2 3 4	
Document non-functional requirements A8 1 2 3 4	Document non-functional requirements A8 1 2 3 4	D2 - seek different points of view and evaluate them based on facts K3 - work to agreed quality standards and specifications
Document functional requirements A9 1 2 3 4	Document functional requirements A9 1 2 3 4	C2 - observe and record data using appropriate methods, tools and technology
Identify dependencies A10 1 2 3 4	Identify dependencies A10 1 2 3 4	D1 - assess situations and identify problems
Identify constraints A11 1 2 3 4	Identify constraints A11 1 2 3 4	D1 - assess situations and identify problems
Manage scope / expectations A12 1 2 3 4	Work within scope / expectations A12 1 2 3 4	

DEMONSTRATE PROFESSIONAL SKILLS B	DEMONSTRATE PROFESSIONAL SKILLS B	
Demonstrate decision-making skills B1 1 2 3 4	Demonstrate decision-making skills B1 1 2 3 4	
Participate in continuous learning B2 1 2 3 4	Participate in continuous learning B2 1 2 3 4	H1 - be willing to continuously learn and grow
Follow code of ethics B3 1 2 3 4	Follow code of ethics B3 1 2 3 4	E2 - deal with people, problems and situations with honesty, integrity and personal ethics K3 - work to agreed quality standards and specifications
Practice according to regulatory requirements B4 1 2 3 4	Practice according to regulatory requirements B4 1 2 3 4	I1 - be aware of personal and group health and safety practices and procedures, and act in accordance with these

Demonstrate research skills B5 1 2 3 4	Demonstrate research skills B5 1 2 3 4	B1 - locate, gather and organize information using appropriate technology and information systems and information systems H1 - be willing to continuously learn and grow
Demonstrate accountability B6 1 2 3 4	Demonstrate accountability B6 1 2 3 4	F4 - be accountable for your actions and the actions of your group
Demonstrate responsibility B7 1 2 3 4	Demonstrate responsibility B7 1 2 3 4	E1 - feel good about yourself and be confident F4 - be accountable for your actions and the actions of your group
Adapt to business culture of organization and clients B8 1 2 3 4	Adapt to business culture of organization and clients B8 1 2 3 4	
Attain professional development goals B9 1 2 3 4	Attain professional development goals B9 1 2 3 4	F1 - set goals and priorities balancing work and personal life H3 - set your own learning goals H5 - plan for and achieve your learning goals
Demonstrate ability to multi-task B10 1 2 3 4	Demonstrate ability to multi-task B10 1 2 3 4	G2 - carry out multiple tasks or projects
Cultivate common goals B11 1 2 3 4	Strive towards common goals B11 1 2 3 4	F5 - be socially responsible and contribute to your community
Focus on client needs B12 1 2 3 4	Focus on client needs B12 1 2 3 4	D3 - recognize the human, interpersonal, technical, scientific and mathematical dimensions of a problem
Adhere to standards and procedures B13 1 2 3 4	Adhere to standards and procedures B13 1 2 3 4	I1 - be aware of personal and group health and safety practices and procedures, and act in accordance with these
Demonstrate attention to details B14 1 2 3 4	Demonstrate attention to details B14 1 2 3 4	
Solve problems B15 1 2 3 4	Solve problems B15 1 2 3 4	D5 - be creative and innovative in exploring possible solutions

Manage time B16 1 2 3 4	Manage time B16 1 2 3 4	F1 - set goals and priorities balancing work and personal life F2 - plan and manage time, money and other resources to achieve goals
Develop innovative solutions B17 1 2 3 4	Develop effective solutions B17 1 2 3 4	D5 - be creative and innovative in exploring possible solutions D8 - implement solutions G3 - be innovative and resourceful: identify and suggest alternative ways to achieve goals and get the job done
Demonstrate organization skills B18 1 2 3 4	Demonstrate organization skills B18 1 2 3 4	
Demonstrate critical thinking skills B19 1 2 3 4	Demonstrate critical thinking skills B19 1 2 3 4	
Apply troubleshooting skills B20 1 2 3 4	Apply troubleshooting skills B20 1 2 3 4	D5 - be creative and innovative in exploring possible solutions D8 - implement solutions
Demonstrate continuous improvement B21 1 2 3 4	Demonstrate continuous improvement B21 1 2 3 4	D9 - check to see if a solution works, and act on opportunities for improvement H3 - set your own learning goals K6 - continuously monitor the success of a project or task and identify ways to improve
Integrate information and ideas in a logical manner B22 1 2 3 4	Integrate information and ideas in a logical manner B22 1 2 3 4	B2 - access, analyze and apply knowledge and skills from various disciplines (e.g. the arts, languages, science, technology, mathematics, social sciences, and the humanities) C2 - observe and record data using appropriate methods, tools a
Challenge ideas / concepts / plans in a positive way B23 1 2 3 4	Challenge ideas / concepts / plans in a positive way B23 1 2 3 4	G3 - be innovative and resourceful: identify and suggest alternative ways to achieve goals and get the job done
Maintain product currency (changes, fixes, etc.) B24 1 2 3 4	Maintain product currency (changes, fixes, etc.) B24 1 2 3 4	

Identify risks B25 1 2 3 4	Identify risks B25 1 2 3 4	
Apply iterative methodology B26 1 2 3 4	Apply iterative methodology B26 1 2 3 4	D9 - check to see if a solution works, and act on opportunities for improvement K2 - develop a plan; seek feedback, test, revise and implement
Evaluate tools B27 1 2 3 4	Evaluate tools B27 1 2 3 4	
Transfer knowledge B28 1 2 3 4	Transfer knowledge B28 1 2 3 4	J6 - contribute to a team by sharing information and expertise
Demonstrate conflict resolution skills B29 1 2 3 4	Demonstrate conflict resolution skills B29 1 2 3 4	J9 - manage and resolve conflict when appropriate

USE COMMUNICATION SKILLS C	USE COMMUNICATION SKILLS C	
Demonstrate active listening skills C1 1 2 3 4	Demonstrate active listening skills C1 1 2 3 4	A3 - listen and ask questions to understand and appreciate the points of view of others
Demonstrate verbal skills C2 1 2 3 4	Demonstrate verbal skills C2 1 2 3 4	
Adapt communication to the level of the audience C3 1 2 3 4	Adapt communication to the level of the audience C3 1 2 3 4	A5 - use relevant scientific, technological and mathematical knowledge and skills to explain or clarify ideas
Demonstrate technical writing skills C4 1 2 3 4	Demonstrate technical writing skills C4 1 2 3 4	A2 - write and speak so others pay attention and understand A5 - use relevant scientific, technological and mathematical knowledge and skills to explain or clarify ideas
Demonstrate presentation skills C5 1 2 3 4	Demonstrate presentation skills C5 1 2 3 4	A2 - write and speak so others pay attention and understand

Select appropriate communication media / tools C6	Select appropriate communication media / tools C6	A4 - share information using a range of information and communications technologies (e.g. voice, e-mail, computers) K4 - select and use appropriate tools and technology for a task or project
1 2 3 4	1 2 3 4	
Interpret non-verbal communication C7	Interpret non-verbal communication C7	A3 - listen and ask questions to understand and appreciate the points of view of others
1 2 3 4	1 2 3 4	
Provide feedback C8	Provide feedback C8	D9 - check to see if a solution works, and act on opportunities for improvement J5 - accept and provide feedback in a constructive and considerate manner
1 2 3 4	1 2 3 4	
Interpret written material C9	Interpret written material C9	A1 - read and understand information presented in a variety of forms (e.g. words, graphs, charts, diagrams)
1 2 3 4	1 2 3 4	
Use www and Internet tools C10	Use www and Internet tools C10	A4 - share information using a range of information and communications technologies (e.g. voice, e-mail, computers) B1 - locate, gather and organize information using appropriate technology and information systems and information systems
1 2 3 4	1 2 3 4	
Demonstrate negotiation skills C11	Demonstrate negotiation skills C11	J9 - manage and resolve conflict when appropriate
1 2 3 4	1 2 3 4	
Interpret technical documents C12	Interpret technical documents C12	A2 - write and speak so others pay attention and understand
1 2 3 4	1 2 3 4	
Use office productivity tools C13	Use office productivity tools C13	B1 - locate, gather and organize information using appropriate technology and information systems and information systems
1 2 3 4	1 2 3 4	
Use industry terminology C14	Use IT industry terminology C14	A5 - use relevant scientific, technological and mathematical knowledge and skills to explain or clarify ideas
1 2 3 4	1 2 3 4	
Write RFQ;s,RFI's, and RFP's C15	Respond to RFQ;s and RFI's, RFP's C15	
1 2 3 4	1 2 3 4	
Write for business communications C16	Write for business communications C16	A2 - write and speak so others pay attention and understand A4 - share information using a range of information and communications technologies (e.g. voice, e-mail, computers) A5 - use relevant scientific, technological and mathematical knowledge
1 2 3 4	1 2 3 4	

APPLY PROJECT / TEAM MANAGEMENT SKILLS D	APPLY PROJECT / TEAM MANAGEMENT SKILLS D	
Identify stakeholders D1 1 2 3 4	Identify stakeholders D1 1 2 3 4	D3 - recognize the human, interpersonal, technical, scientific and mathematical dimensions of a problem
Manage resources D2 1 2 3 4	Manage resources D2 1 2 3 4	F2 - plan and manage time, money and other resources to achieve goals
Advise on budgets D3 1 2 3 4	Advise on budgets D3 1 2 3 4	F2 - plan and manage time, money and other resources to achieve goals
Manage tasks D4 1 2 3 4	Manage own tasks D4 1 2 3 4	G2 - carry out multiple tasks or projects
Mitigate risk D5 1 2 3 4	Mitigate risk D5 1 2 3 4	F3 - assess, weigh and manage risk
Manage schedule D6 1 2 3 4	Manage own schedule D6 1 2 3 4	K1 - plan, design or carry out a project or task from start to finish with well-defined objectives and outcomes
Determine priorities D7 1 2 3 4	Determine priorities D7 1 2 3 4	J2- ensure that a team's purpose and objectives are clear
Facilitate meetings D8 1 2 3 4	Facilitate meetings D8 1 2 3 4	J6 - contribute to a team by sharing information and expertise
Delegate D9 1 2 3 4	Delegate D9 1 2 3 4	F2 - plan and manage time, money and other resources to achieve goals J7 - lead or support when appropriate, motivating a group for high performance
Propose recommendations D10 1 2 3 4	Propose recommendations D10 1 2 3 4	D7 - evaluate solutions to make recommendations or decisions G3 - be innovative and resourceful: identify and suggest alternative ways to achieve goals and get the job done

Build trust	Build trust	
D11	D11	
1 2 3 4	1 2 3 4	
Leverage experience	Leverage experience	J6 - contribute to a team by sharing information and expertise
D12	D12	
1 2 3 4	1 2 3 4	
Report status (work / tasks)	Report status (work / tasks)	
D13	D13	
1 2 3 4	1 2 3 4	
Apply change management processes	Apply change management processes	G4 - be open and respond constructively to change
D14	D14	
1 2 3 4	1 2 3 4	
Estimate work	Estimate work	C3 - make estimates and verify calculations
D15	D15	
1 2 3 4	1 2 3 4	
Demonstrate planning skills	Demonstrate own planning skills	
D16	D16	
1 2 3 4	1 2 3 4	
Demonstrate leadership skills	Demonstrate leadership skills	J7 - lead or support when appropriate, motivating a group for high performance
D17	D17	
1 2 3 4	1 2 3 4	
Apply collaborative planning techniques (e.g. brainstorming)	Apply collaborative planning techniques (e.g. brainstorming)	J6 - contribute to a team by sharing information and expertise
D18	D18	
1 2 3 4	1 2 3 4	
Coordinate cross-functional teams	Coordinate cross-functional teams	B2 - access, analyze and apply knowledge and skills from various disciplines (e.g. the arts, languages, science, technology, mathematics, social sciences, and the humanities)
D19	D19	
1 2 3 4	1 2 3 4	
Manage vendor / consultant relationships	Manage vendor / consultant relationships	
D20	D20	
1 2 3 4	1 2 3 4	

DEMONSTRATE PERSONAL SKILLS E	DEMONSTRATE PERSONAL SKILLS E									
Adapt to change E1 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	Adapt to change E1 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	G4 - be open and respond constructively to change G6 - cope with uncertainty J3 - be flexible: respect, be open to and supportive of the thoughts, opinions and contributions of others in a group K5 - adapt to changing requirements and information
1	2	3	4							
1	2	3	4							
Work as part of a team E2 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	Work as part of a team E2 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	E3 - recognize your own and other people's good efforts G1 - work independently or as a part of a team J1 - understand and work within the dynamics of a group
1	2	3	4							
1	2	3	4							
Demonstrate coaching and mentoring skills E3 <table border="1"><tr><td style="background-color: yellow;">1</td><td>2</td><td>3</td><td>4</td></tr></table>	1	2	3	4	Demonstrate coaching and mentoring skills E3 <table border="1"><tr><td style="background-color: yellow;">1</td><td>2</td><td>3</td><td>4</td></tr></table>	1	2	3	4	F5 - be socially responsible and contribute to your community
1	2	3	4							
1	2	3	4							
Demonstrate initiative E4 <table border="1"><tr><td>1</td><td style="background-color: yellow;">2</td><td>3</td><td>4</td></tr></table>	1	2	3	4	Demonstrate initiative E4 <table border="1"><tr><td>1</td><td style="background-color: yellow;">2</td><td>3</td><td>4</td></tr></table>	1	2	3	4	E5 - Show interest, initiative and effort G1 - work independently or as a part of a team
1	2	3	4							
1	2	3	4							
Demonstrate reliability E5 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	Demonstrate reliability E5 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	E5 - Show interest, initiative and effort
1	2	3	4							
1	2	3	4							
Project a positive attitude E6 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	Project a positive attitude E6 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	E1 - feel good about yourself and be confident
1	2	3	4							
1	2	3	4							
Accept feedback E7 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	Accept feedback E7 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	G4 - be open and respond constructively to change G5 - learn from your mistakes and accept feedback J5 - accept and provide feedback in a constructive and considerate manner
1	2	3	4							
1	2	3	4							
Demonstrate respect for others E8 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	Demonstrate respect for others E8 <table border="1"><tr><td>1</td><td>2</td><td style="background-color: yellow;">3</td><td>4</td></tr></table>	1	2	3	4	E2 - deal with people, problems and situations with honesty, integrity and personal ethics E3 - recognize your own and other people's good efforts J3 - be flexible: respect, be open to and supportive of the thoughts, opinions and contributi
1	2	3	4							
1	2	3	4							
Show objectivity E9 <table border="1"><tr><td>1</td><td style="background-color: yellow;">2</td><td>3</td><td>4</td></tr></table>	1	2	3	4	Show objectivity E9 <table border="1"><tr><td>1</td><td style="background-color: yellow;">2</td><td>3</td><td>4</td></tr></table>	1	2	3	4	J4 - recognize and respect people's diversity, individual differences and perspectives
1	2	3	4							
1	2	3	4							
Seek feedback E10 <table border="1"><tr><td style="background-color: yellow;">1</td><td>2</td><td>3</td><td>4</td></tr></table>	1	2	3	4	Seek feedback E10 <table border="1"><tr><td style="background-color: yellow;">1</td><td>2</td><td>3</td><td>4</td></tr></table>	1	2	3	4	G5 - learn from your mistakes and accept feedback H2 - assess personal strengths and areas for development J3 - be flexible: respect, be open to and supportive of the thoughts, opinions and contributions of others in a group
1	2	3	4							
1	2	3	4							

Practice life-work balance E11 1 2 3 4	Practice life-work balance E11 1 2 3 4	E4 - take care of your personal health F1 - set goals and priorities balancing work and personal life F5 - be socially responsible and contribute to your community
Demonstrate discipline E12 1 2 3 4	Demonstrate discipline E12 1 2 3 4	
Manage stress E13 1 2 3 4	Manage stress E13 1 2 3 4	E4 - take care of your personal health G6 - cope with uncertainty

APPLY TESTING SKILLS F	APPLY TESTING SKILLS F	
Create test cases F1 1 2 3 4	Create test cases F1 1 2 3 4	C1 - decide what needs to be measured or calculated D1 - assess situations and identify problems
Conduct integration tests (F.I.T Functional Integration Testing) F2 1 2 3 4	Conduct integration tests (F.I.T Functional Integration Testing) F2 1 2 3 4	
Conduct stress testing F3 1 2 3 4	Conduct stress testing F3 1 2 3 4	
Conduct penetration testing F4 1 2 3 4	Conduct penetration testing F4 1 2 3 4	
Test security F5 1 2 3 4	Test security F5 1 2 3 4	D1 - assess situations and identify problems
Conduct performance testing F6 1 2 3 4	Conduct performance testing F6 1 2 3 4	D1 - assess situations and identify problems D4 - identify the root cause of a problem
Determine test success criteria F7 1 2 3 4	Determine test success criteria F7 1 2 3 4	D7 - evaluate solutions to make recommendations or decisions

Coordinate acceptance testing F8 1 2 3 4	Coordinate acceptance testing F8 1 2 3 4	
Use automated testing tools (traffic generators J-Unit) F9 1 2 3 4	Use automated testing tools (traffic generators J-Unit) F9 1 2 3 4	
Create test plan F10 1 2 3 4	Create test plan F10 1 2 3 4	C1 - decide what needs to be measured or calculated K1 - plan, design or carry out a project or task from start to finish with well-defined objectives and outcomes
Conduct accessibility testing F11 1 2 3 4	Conduct accessibility testing F11 1 2 3 4	
Conduct regulatory compliance tests F12 1 2 3 4	Conduct regulatory compliance tests F12 1 2 3 4	
Conduct compatibility testing F13 1 2 3 4	Conduct compatibility testing F13 1 2 3 4	
Interpret test results F14 1 2 3 4	Interpret test results F14 1 2 3 4	C3 - make estimates and verify calculations D2 - seek different points of view and evaluate them based on facts D7 - evaluate solutions to make recommendations or decisions K1 - plan, design or carry out a project or task from start to finish with well-
Analyze test results F15 1 2 3 4	Analyze test results F15 1 2 3 4	D2 - seek different points of view and evaluate them based on facts D7 - evaluate solutions to make recommendations or decisions K2 - develop a plan; seek feedback, test, revise and implement
Assemble data for test cases F16 1 2 3 4	Assemble data for test cases F16 1 2 3 4	
Sanitize data for test cases F17 1 2 3 4	Sanitize data for test cases F17 1 2 3 4	

Conduct usability testing F18 1 2 3 4	Conduct usability testing F18 1 2 3 4	
Conduct disaster recovery testing F19 1 2 3 4	Conduct disaster recovery testing F19 1 2 3 4	
Conduct standards compliance assessment F20 1 2 3 4	Conduct standards compliance assessment F20 1 2 3 4	K3 - work to agreed quality standards and specifications
Conduct back-up and recovery testing F21 1 2 3 4	Conduct back-up and recovery testing F21 1 2 3 4	
Use a defect tracking tool (Clear Quest, Jira, Bugzilla) F22 1 2 3 4	Use a defect tracking tool (Clear Quest, Jira, Bugzilla) F22 1 2 3 4	
Use automated profiling tools F23 1 2 3 4	Covered by F3 1 2 3 4	

FOLLOW GOVERNANCE AND BEST PRACTICES G	FOLLOW GOVERNANCE AND BEST PRACTICES G	
Apply standards / best practices G1 1 2 3 4	Follow standards / best practices G1 1 2 3 4	K3 - work to agreed quality standards and specifications
Apply security standards G2 1 2 3 4	Follow security standards G2 1 2 3 4	
Comply with legislation and regulations G3 1 2 3 4	Comply with legislation and regulations G3 1 2 3 4	I1 - be aware of personal and group health and safety practices and procedures, and act in accordance with these K3 - work to agreed quality standards and specifications
Apply industry standards (C.O.B.I.T., I.T.I.L.) G4 1 2 3 4	Follow industry standards (C.O.B.I.T., I.T.I.L.) G4 1 2 3 4	K4 - select and use appropriate tools and technology for a task or project

Apply TOGAF (Governance Architectural Framework) G5	Follow TOGAF (Governance Architectural Framework) G5	
1 2 3 4	1 2 3 4	
Use ZACHMAN	Use ZACHMAN framework	
G6	G6	
1 2 3 4	1 2 3 4	
Apply PMBOK (Project Management Body of Knowledge) G7	Apply PMBOK (Project Management Body of Knowledge) G7	K1 - plan, design or carry out a project or task from start to finish with well-defined objectives and outcomes
1 2 3 4	1 2 3 4	
Apply BABOK (Business Analysis Body of Knowledge) G8	Apply BABOK (Business Analysis Body of Knowledge) G8	C1 - decide what needs to be measured or calculated
1 2 3 4	1 2 3 4	
Apply SWEBOK (Software Engineering Body of Knowledge) G9	Apply SWEBOK (Software Engineering Body of Knowledge) G9	K1 - plan, design or carry out a project or task from start to finish with well-defined objectives and outcomes
1 2 3 4	1 2 3 4	
Create object to relational mapping (ORM)	Create object to relational mapping (ORM)	
G10	G10	
1 2 3 4	1 2 3 4	
Implement SOA (Service Oriented Architecture) principles G11	Implement SOA (Service Oriented Architecture) principles G11	
1 2 3 4	1 2 3 4	

APPLICATION DEVELOPMENT STREAM

ANALYZE SOLUTION REQUIREMENTS H	ANALYZE SOLUTION REQUIREMENTS H	
Translate business functional requirements	Translate business functional requirements	
H1	H1	
1 2 3 4	1 2 3 4	
Document analysis	Document analysis	
H2	H2	
1 2 3 4	1 2 3 4	
Draw charts, diagrams, flow charts	Draw charts, diagrams, flow charts	
H3	H3	
1 2 3 4	1 2 3 4	

Apply business logic H4 1 2 3 4	Apply business logic H4 1 2 3 4	
Use traceability matrix H5 1 2 3 4	Use traceability matrix H5 1 2 3 4	
Handle use cases H6 1 2 3 4	Develop use cases H6 1 2 3 4	
Contrast alternatives H7 1 2 3 4	Contrast alternatives H7 1 2 3 4	D7 - evaluate solutions to make recommendations or decisions
Seek alternatives H8 1 2 3 4	Seek alternatives H8 1 2 3 4	
Integrate solutions with business model H9 1 2 3 4	Integrate solutions with business model H9 1 2 3 4	

DESIGN APPLICATIONS I	DESIGN APPLICATIONS I	
Comply with technology standards I1 1 2 3 4	Comply with technology standards I1 1 2 3 4	
Align solution with architecture I2 1 2 3 4	Align solution with architecture I2 1 2 3 4	
Align solution with infrastructure I3 1 2 3 4	Align solution with infrastructure I3 1 2 3 4	
Translate analysis into high-level design I4 1 2 3 4	Translate analysis into high-level design I4 1 2 3 4	

Document detail design I5 1 2 3 4	Document detail design I5 1 2 3 4	
Create prototype I6 1 2 3 4	Create prototype I6 1 2 3 4	

DEVELOP APPLICATIONS J	DEVELOP APPLICATIONS J	
Write code from specifications J1 1 2 3 4	Write code from specifications J1 1 2 3 4	
Use programming tools J2 1 2 3 4	Use programming tools J2 1 2 3 4	
De-bug code J3 1 2 3 4	De-bug code J3 1 2 3 4	D4 - identify the root cause of a problem
Test units J4 1 2 3 4	Test units J4 1 2 3 4	
Test for functionally J5 1 2 3 4	Test for functionally J5 1 2 3 4	
Document code J6 1 2 3 4	Document code J6 1 2 3 4	
Develop database J7 1 2 3 4	Develop database J7 1 2 3 4	
Develop user interface J8 1 2 3 4	Develop user interface J8 1 2 3 4	

Apply best practices J9 1 2 3 4	Apply best practices J9 1 2 3 4	
Write reusable code J10 1 2 3 4	Write reusable code J10 1 2 3 4	
Use reusable code J11 1 2 3 4	Use reusable code J11 1 2 3 4	
Apply troubleshooting skills J12 1 2 3 4	Apply troubleshooting skills J12 1 2 3 4	
Use version control software J13 1 2 3 4	Use version control software J13 1 2 3 4	
Adhere to security guidelines, policies, practices J14 1 2 3 4	Adhere to security guidelines, policies, practices J14 1 2 3 4	
Use unit testing matrix J15 1 2 3 4	Use unit testing matrix J15 1 2 3 4	
Develop new software J16 1 2 3 4	Develop new software J16 1 2 3 4	

FORMULATE SOLUTION ARCHITECTURE K	FORMULATE SOLUTION ARCHITECTURE K	
Align solution to business needs K1 1 2 3 4	Align solution to business needs K1 1 2 3 4	
Plan holistically K2 1 2 3 4	Plan holistically K2 1 2 3 4	

Balance strategic and tactical solutions K3 1 2 3 4	Follow strategic and tactical solutions K3 1 2 3 4	
Develop models K4 1 2 3 4	Develop models K4 1 2 3 4	
Create abstract patterns K5 1 2 3 4	Utilize abstract patterns K5 1 2 3 4	

CONSTRUCT SOLUTION ARCHITECTURE L	CONSTRUCT SOLUTION ARCHITECTURE L	
Factor non-functional requirements L1 1 2 3 4	Factor non-functional requirements L1 1 2 3 4	
Design patterns L2 1 2 3 4	Apply patterns L2 1 2 3 4	
Incorporate networking principles L3 1 2 3 4	Incorporate networking principles L3 1 2 3 4	
Integrate business rules L4 1 2 3 4	Integrate business rules L4 1 2 3 4	
Integrate web services L5 1 2 3 4	Integrate web services L5 1 2 3 4	
Determine patterns and practices L6 1 2 3 4	Follow patterns and practices L6 1 2 3 4	
Lay out user interface L7 1 2 3 4	Lay out user interface L7 1 2 3 4	

Determine service orientated architecture	Work with service orientated architecture	
L8	L8	
1 2 3 4	1 2 3 4	
Design work flow	Design work flow	
L9	L9	
1 2 3 4	1 2 3 4	
Integrate directory services	Integrate directory services	
L10	L10	
1 2 3 4	1 2 3 4	
Apply multi-tier development practices	Apply multi-tier development practices	
L11	L11	
1 2 3 4	1 2 3 4	

USE DEVELOPMENT LANGUAGES AND TOOLS M	USE DEVELOPMENT LANGUAGES AND TOOLS M	
Write .NET (dot.NET)	Write .NET (dot.NET)	
M1	M1	
1 2 3 4	1 2 3 4	
Use InfoPath	Use InfoPath	
M2	M2	
1 2 3 4	1 2 3 4	
Write ETL tools (Extract Transform Load)	Write ETL tools (Extract Transform Load)	
M3	M3	
1 2 3 4	1 2 3 4	
Write crystal reports	Write crystal reports	
M4	M4	
1 2 3 4	1 2 3 4	
Write PowerBuilder	Write PowerBuilder	
M5	M5	
1 2 3 4	1 2 3 4	
Use XML	Use XML	
M6	M6	
1 2 3 4	1 2 3 4	

Write Java and Javascript	Write Java and Javascript	
M7	M7	
1 2 3 4	1 2 3 4	
Write XHTML	Write XHTML	
M8	M8	
1 2 3 4	1 2 3 4	
Write COBOL		
M9		
1 2 3 4		
Write NATURAL		
M10		
1 2 3 4		
Write PLI		
M11		
1 2 3 4		
Write RPG		
M12		
1 2 3 4		
Write Mark IV		
M13		
1 2 3 4		
Write Open Road		
M14		
1 2 3 4		
Use TELON		
M15		
1 2 3 4		
Write Lotus Script		
M16		
1 2 3 4		
Write PERL		
M17		
1 2 3 4		
Write scripting languages	Write scripting languages	
M18	M9	
1 2 3 4	1 2 3 4	

Write SQL M19 1 2 3 4	Write SQL M10 1 2 3 4	
Write ADAP M20 1 2 3 4	Write ADAP M11 1 2 3 4	
Use ERP (Enterprise Resource Planning) applications M21 1 2 3 4	Use ERP (Enterprise Resource Planning) applications M12 1 2 3 4	
Use collaboration tools M22 1 2 3 4	Use collaboration tools M13 1 2 3 4	
Write scheduling tools M23 1 2 3 4	Use scheduling tools M14 1 2 3 4	
Write SharePoint M24 1 2 3 4	Use SharePoint M15 1 2 3 4	

DEVELOP APPLICATIONS USING OPERATING SYSTEMS N	DEVELOP APPLICATIONS USING OPERATING SYSTEMS N	
Develop applications in UNIX N1 1 2 3 4	Develop applications in UNIX N1 1 2 3 4	
Develop applications in OS390 N2 1 2 3 4		
Develop applications in WINDOWS N3 1 2 3 4	Develop applications in WINDOWS N2 1 2 3 4	
Develop applications in LINUX N4 1 2 3 4	Develop applications in LINUX N3 1 2 3 4	

Model data warehousing	Model data warehousing	
P2	P2	
1 2 3 4	1 2 3 4	
Model BPMN (Business Process management)	Model BPMN (Business Process management)	
P3	P3	
1 2 3 4	1 2 3 4	
Apply data modeling	Apply data modeling	
P4	P4	
1 2 3 4	1 2 3 4	
Read sequence diagrams	Read sequence diagrams	
P5	P5	
1 2 3 4	1 2 3 4	

USE MIDDLEWARE Q	USE MIDDLEWARE Q	
Apply middleware technologies	Apply middleware technologies	
Q1	Q1	
1 2 3 4	1 2 3 4	
Use BIZTALK	Use BIZTALK	
Q2	Q2	
1 2 3 4	1 2 3 4	
Use MESH	Use MESH	
Q3	Q3	
1 2 3 4	1 2 3 4	
Demonstrate package integration	Demonstrate application integration	
Q4	Q4	
1 2 3 4	1 2 3 4	

WEB DEVELOPMENT STREAM

ANALYZE SOLUTION REQUIREMENTS R	ANALYZE SOLUTION REQUIREMENTS R	
Translate business functional requirements	Translate business functional requirements	
R1	R1	
1 2 3 4	1 2 3 4	

Document analysis	Document analysis	
R2	R2	
1 2 3 4	1 2 3 4	
Draw standard charts diagrams, flowcharts (e.g. UML)	Draw standard charts diagrams, flowcharts (e.g. UML)	
R3	R3	
1 2 3 4	1 2 3 4	
Apply business logic	Apply business logic	
R4	R4	
1 2 3 4	1 2 3 4	
Map solution elements to requirements	Map solution elements to requirements	
R5	R5	
1 2 3 4	1 2 3 4	
Analyze alternatives	Analyze alternatives	
R6	R6	
1 2 3 4	1 2 3 4	
Integrate solutions with business model	Integrate solutions with business model	
R7	R7	
1 2 3 4	1 2 3 4	
Document system interaction	Document system interaction	
R8	R8	
1 2 3 4	1 2 3 4	

DESIGN APPLICATIONS S	DESIGN APPLICATIONS S	
Comply with technology standards	Comply with technology standards	
S1	S1	
1 2 3 4	1 2 3 4	
Define architecture for the solution	Define architecture for the solution	
S2	S2	
1 2 3 4	1 2 3 4	
Translate analysis into high-level design	Translate analysis into high-level design	
S3	S3	
1 2 3 4	1 2 3 4	

Document detail design	Document detail design	
S4	S4	
1 2 3 4	1 2 3 4	
Create prototype (use in generic sense)	Create prototype (use in generic sense)	
S5	S5	
1 2 3 4	1 2 3 4	
Conduct proof of technology	Conduct proof of technology	
S6	S6	
1 2 3 4	1 2 3 4	
Create a data model	Create a data model	
S7	S7	
1 2 3 4	1 2 3 4	
Create a class model (UML)	Create a class model (UML)	
S8	S8	
1 2 3 4	1 2 3 4	
Design for scalability	Design for scalability	
S9	S9	
1 2 3 4	1 2 3 4	
Use design tools (Enterprise Architechure, Rationale Suite)	Use design tools (Enterprise Architechure, Rationale Suite)	
S10	S10	
1 2 3 4	1 2 3 4	
Design stateless applications	Design appropriately for stateless nature of the Web	
S11	S11	
1 2 3 4	1 2 3 4	
Design for high availability	Design for high availability	
S12	S12	
1 2 3 4	1 2 3 4	
Maximize work within limitations of environment	Maximize work within limitations of environment	
S13	S13	
1 2 3 4	1 2 3 4	

DEVELOP APPLICATIONS T	DEVELOP APPLICATIONS T	
Write code from specifications T1 1 2 3 4	Write code from specifications T1 1 2 3 4	
Use programming tools T2 1 2 3 4	Use programming tools T2 1 2 3 4	
De-bug code T3 1 2 3 4	De-bug code T3 1 2 3 4	
Conduct unit testing T4 1 2 3 4	Conduct unit testing T4 1 2 3 4	
Test for functionality T5 1 2 3 4	Test for functionality T5 1 2 3 4	
Document code T6 1 2 3 4	Document code T6 1 2 3 4	
Develop database (s) T7 1 2 3 4	Develop schemes T7 1 2 3 4	
Develop user interface T8 1 2 3 4	Develop user interface T8 1 2 3 4	
Write reusable code T9 1 2 3 4	Write reusable code T9 1 2 3 4	
Use reusable code T10 1 2 3 4	Use reusable code T10 1 2 3 4	

Use version control software T11	Duplicate of W6	
1 2 3 4		
Adhere to security guidelines, policies, practices T12	Adhere to security guidelines, policies, practices T12	
1 2 3 4	1 2 3 4	
Determine test coverage T13	Determine test coverage T13	
1 2 3 4	1 2 3 4	
Participate in peer reviews T14	Participate in peer reviews T14	
1 2 3 4	1 2 3 4	
Conduct compatibility testing T15	Conduct compatibility testing T15	
1 2 3 4	1 2 3 4	
Comply with graphic design specs T16	Comply with graphic design specs T16	
1 2 3 4	1 2 3 4	

DEMONSTRATE IMPLEMENTATION SKILLS U	DEMONSTRATE IMPLEMENTATION SKILLS U	
Coordinate transition to production U1	Coordinate transition to production U1	
1 2 3 4	1 2 3 4	
Write developer guide U2	Write developer guide U2	
1 2 3 4	1 2 3 4	
Write operators guide U3		
1 2 3 4		
Write user guide U4	Write user guide U3	
1 2 3 4	1 2 3 4	

WRITE CODE FROM SPECS V	WRITE CODE FROM SPECS V	
Code in Java script (AJAX) V1 1 2 3 4	Code in Java script (AJAX) V1 1 2 3 4	
Code in CSS (Dreamweaver) V2 1 2 3 4	Code in CSS (Dreamweaver) V2 1 2 3 4	
Code in HTML (Dreamweaver) V3 1 2 3 4	Code in HTML (Dreamweaver) V3 1 2 3 4	
Code in XML / XSLT (SOAP) V4 1 2 3 4	Code in XML / XSLT (SOAP) V4 1 2 3 4	
Code in server side language (JAVA, NET, PHP) V5 1 2 3 4	Code in server side language (JAVA, NET, PHP) V5 1 2 3 4	
Create and use web services (WS-*, R.E.S.T.) V6 1 2 3 4	Create and use web services (WS-*, R.E.S.T.) V6 1 2 3 4	
Integrate web graphics V7 1 2 3 4	Integrate web graphics (links, imap,maps) V7 1 2 3 4	
Code in action script (Flash) V8 1 2 3 4	Code in action script (Flash) V8 1 2 3 4	
Read data model V9 1 2 3 4	Read data model V9 1 2 3 4	
Use integrated development environment (Visual studio / eclipse / Dreamweaver) V10 1 2 3 4	Use integrated development environment (Visual studio / eclipse / Dreamweaver) V10 1 2 3 4	

Integrate coding languages V11 1 2 3 4	Integrate coding languages V11 1 2 3 4	
Develop search engine friendly pages V12 1 2 3 4	Develop search engine friendly pages V12 1 2 3 4	
Code in SQL V13 1 2 3 4	Code in SQL V13 1 2 3 4	

DEPLOY APPLICATIONS W	DEPLOY APPLICATIONS W	
Use operating systems (Windows, Linux Solaris, Aix, Unix) W1 1 2 3 4	Use operating systems (Windows, Linux Solaris, Aix, Unix) W1 1 2 3 4	
Demonstrate an understanding of web protocols (Domain Reg / DNS / HTTP / SMTP) W2 1 2 3 4	Demonstrate an understanding of web protocols (Domain Reg / DNS / HTTP / SMTP) W2 1 2 3 4	
Provide support W3 1 2 3 4	Provide support W3 1 2 3 4	
Deploy clustered applications W4 1 2 3 4	Deploy clustered applications W4 1 2 3 4	
Implement security mechanisms (SSLF, Keys, Certificates, Reverse proxys) W5 1 2 3 4	Implement security mechanisms (SSLF, Keys, Certificates, Reverse proxys) W5 1 2 3 4	
Use version control software (Subversion, Source Safe, CVS) W6 1 2 3 4	Use version control software (Subversion, Source Safe, CVS) W6 1 2 3 4	

Use build tools (ANT, Maven, MS Build)	Use build tools (ANT, Maven, MS Build)	
W7	W7	
1 2 3 4	1 2 3 4	
Configure web and application servers (iis, Apache, Tomcat, Web Sphere)	Configure web and application servers (iis, Apache, Tomcat, Web Sphere)	
W8	W8	
1 2 3 4	1 2 3 4	
Deploy distributed applications	Deploy distributed applications	
W9	W9	
1 2 3 4	1 2 3 4	

DATABASE ANALYSIS, ADMINISTRATION, ARCHITECTURE STREAM

ANALYZE / DESIGN DATABASES X	ANALYZE / DESIGN DATABASES X	
Create dimensional model (warehouse)	Create dimensional model (warehouse)	
X1	X1	
1 2 3 4	1 2 3 4	
Identify data owners	Identify data owners	
X2	X2	
1 2 3 4	1 2 3 4	
Interpret standard diagrams, flow-charts (Unified Modeling Language)	Interpret standard diagrams, flow-charts (Unified Modeling Language)	
X3	X3	
1 2 3 4	1 2 3 4	
Create prototype	Subset of X20	
X4		
1 2 3 4	1 2 3 4	
Document detail database design	Document detail database design	
X5	X4	
1 2 3 4	1 2 3 4	
Create logical data model	Create logical data model	
X6	X5	
1 2 3 4	1 2 3 4	

Create physical data model X7 1 2 3 4	Create physical data model X6 1 2 3 4	
Create entity relationship diagram (ERD) X8 1 2 3 4	Create entity relationship diagram (ERD) X7 1 2 3 4	
Create object to relational mapping (ORM) X9 1 2 3 4	Moved to G10 1 2 3 4	
Implement SOA (Service Oriented Architecture) principles X10 1 2 3 4	Moved to G11 1 2 3 4	
Write code from specifications X11 1 2 3 4	Write code from specifications X8 1 2 3 4	
Write SQL X12 1 2 3 4	Write SQL X9 1 2 3 4	
Write DDL X13 1 2 3 4	Write DDL X10 1 2 3 4	
Write DOS scripts X14 1 2 3 4	Write DOS scripts X1 1 2 3 4	
Write UNIX scripts X15 1 2 3 4	Write UNIX scripts X12 1 2 3 4	
Use data modelling tool X16 1 2 3 4	Use data modelling tool X13 1 2 3 4	
Adhere to security guidelines, policies, practices X17 1 2 3 4	Adhere to security guidelines, policies, practices X14 1 2 3 4	

Write useable code X18 1 2 3 4	Write useable code X15 1 2 3 4	
Use reusable code X19 1 2 3 4	Use reusable code X16 1 2 3 4	
Develop database X20 1 2 3 4	Create/generate databases X17 1 2 3 4	
Test for functionality X21 1 2 3 4	Test for functionality X18 1 2 3 4	
Adhere to privacy legislation X22 1 2 3 4	Adhere to privacy legislation X19 1 2 3 4	
De-bug code X23 1 2 3 4	De-bug code X20 1 2 3 4	
Document code X24 1 2 3 4	Document code X21 1 2 3 4	
Participate in peer reviews X25 1 2 3 4	Participate in peer reviews X22 1 2 3 4	
Use version control software (CVS Subversion, Source Safe) X26 1 2 3 4	Use version control software (CVS Subversion, Source Safe) X23 1 2 3 4	
Conduct unit testing X27 1 2 3 4	Conduct unit testing X24 1 2 3 4	
Create regression testing X28 1 2 3 4	Create regression testing X25 1 2 3 4	

DESIGN DATABASE ARCHITECTURE Y	DESIGN DATABASE ARCHITECTURE Y	
Evaluate solutions with business model Y1 1 2 3 4	Evaluate solutions with business model Y1 1 2 3 4	
Estimate size of deliverable Y2 1 2 3 4	Estimate size of deliverable Y2 1 2 3 4	
Determine technical scope Y3 1 2 3 4	Determine technical scope Y3 1 2 3 4	
Estimate infrastructure requirements Y4 1 2 3 4	Estimate infrastructure requirements Y4 1 2 3 4	
Assess infrastructure implications Y5 1 2 3 4	Assess infrastructure implications Y5 1 2 3 4	
Define architecture for solutions Y6 1 2 3 4	Define architecture for solutions Y6 <i>Zero rating</i> 1 2 3 4	
Translate analysis to high-level design Y7 1 2 3 4	Translate analysis to high-level design Y7 1 2 3 4	
Comply with technology standards Y8 1 2 3 4	Comply with technology standards Y8 1 2 3 4	
Analyze alternatives Y9 1 2 3 4	Analyze alternatives Y9 1 2 3 4	
Recommend solutions Y10 1 2 3 4	Recommend solutions Y10 1 2 3 4	

Document database architecture Y11 1 2 3 4	Document database architecture Y11 1 2 3 4	
Conduct proof technology Y12 1 2 3 4		
Conduct proof of concept Y13 1 2 3 4	Conduct proof of concept Y12 1 2 3 4	
Document system interaction Y14 1 2 3 4	Document system interaction Y13 1 2 3 4	
Map system integration Y15 1 2 3 4	Map system integration Y14 1 2 3 4	

USE DATABASE DEVELOPMENT TOOLS Z	USE DATABASE DEVELOPMENT TOOLS Z	
Use DB2 Z1 1 2 3 4	<i>Not covered</i> 1 2 3 4	
Manipulate relational databases Z2 1 2 3 4	Manipulate relational databases Z1 1 2 3 4	
Use INGRES Z3 1 2 3 4	<i>Not covered</i> 1 2 3 4	
Use Oracle Z4 1 2 3 4	Use Oracle Z2 1 2 3 4	
Use MS SEQUEL server Z5 1 2 3 4	Use MS SEQUEL server Z3 1 2 3 4	

Use ADABAS	<i>Not covered</i>	
Z6		
1 2 3 4	1 2 3 4	
Construct hierarchical models	Construct hierarchical models	
Z7	Z4	
1 2 3 4	1 2 3 4	
Use SYBASE	<i>Not covered</i>	
Z8		
1 2 3 4	1 2 3 4	

SUPPORT / ADMINISTER DATABASES AA	SUPPORT / ADMINISTER DATABASES AA	
Use native database tools	Use native database tools	
AA1	AA1	
1 2 3 4	1 2 3 4	
Manage database software upgrades	Manage database software upgrades	
AA2	AA2	
1 2 3 4	1 2 3 4	
Implement new fixes	Implement new fixes	
AA3	AA3	
1 2 3 4	1 2 3 4	
Execute disaster recovery	Execute disaster recovery	
AA4	AA4	
1 2 3 4	1 2 3 4	
Manage back-up and recovery	Manage back-up and recovery	
AA5	AA5	
1 2 3 4	1 2 3 4	
Monitor database performance	Monitor database performance	
AA6	AA6	
1 2 3 4	1 2 3 4	

Manage database files AA7 1 2 3 4	Manage database files AA7 1 2 3 4	
Manage database statistics AA8 1 2 3 4	Manage database statistics AA8 1 2 3 4	
Identify performance issues AA9 1 2 3 4	Identify performance issues AA9 1 2 3 4	
Resolve performance issues AA10 1 2 3 4	Resolve performance issues AA10 1 2 3 4	
Perform root cause analysis AA11 1 2 3 4	Perform root cause analysis AA11 1 2 3 4	
Use hardware resources AA12 1 2 3 4	Use hardware resources AA12 1 2 3 4	
Differentiate infrastructure AA13 1 2 3 4	Differentiate infrastructure AA13 1 2 3 4	
Apply troubleshooting procedures / techniques AA14 1 2 3 4	Apply troubleshooting procedures / techniques AA14 1 2 3 4	
Differentiate operating systems AA15 1 2 3 4	Use different operating systems AA15 1 2 3 4	
Manage database security AA16 1 2 3 4	Manage database security AA16 1 2 3 4	
Use diagnostic tools AA17 1 2 3 4	Use diagnostic tools AA17 1 2 3 4	

Analyze system logs AA18 1 2 3 4	Analyze system logs AA18 1 2 3 4	
Use monitoring tools S/N AA19 1 2 3 4	Use monitoring tools S/N AA19 1 2 3 4	
Provide data for audits AA20 1 2 3 4	Provide data for audits AA20 1 2 3 4	

DEMONSTRATE IMPLEMENTATION SKILLS BB	DEMONSTRATE IMPLEMENTATION SKILLS BB	
Deploy database BB1 1 2 3 4	Deploy database BB1 1 2 3 4	
Contribute to developer's guide BB2 1 2 3 4	Contribute to developer's guide BB2 1 2 3 4	
Contribute to transition to production BB3 1 2 3 4	Contribute to transition to production BB3 1 2 3 4	
Write support administration documentation BB4 1 2 3 4	Write support administration documentation BB4 1 2 3 4	
Write database connectivity guide BB5 1 2 3 4	Write database connectivity guide BB5 1 2 3 4	
Contribute to post-implementation review BB6 1 2 3 4	Contribute to post-implementation review BB6 1 2 3 4	

NETWORK / INFRASTRUCTURE SPECIALIST STREAM

DEFINE NETWORK ARCHITECTURE CC		
Conceptualize network architecture CC1 1 2 3 4	Conceptualize network architecture CC1 1 2 3 4	
Translate business functional requirements CC2 1 2 3 4	Translate business functional requirements CC2 1 2 3 4	
Research emerging technologies CC3 1 2 3 4	Research emerging technologies CC3 1 2 3 4	
Document analysis CC4 1 2 3 4	Document analysis CC4 1 2 3 4	
Map solution elements to requirements CC5 1 2 3 4	Map solution elements to requirements CC5 1 2 3 4	
Document system interaction CC6 1 2 3 4	Document system interaction CC6 1 2 3 4	
Analyze alternative architecture CC7 1 2 3 4	Analyze alternative architecture CC7 1 2 3 4	
Integrate solutions with business model CC8 1 2 3 4	Integrate solutions with business model CC8 1 2 3 4	
Apply architectural frameworks CC9 1 2 3 4	Apply architectural frameworks CC9 1 2 3 4	

DESIGN NETWORK INFRASTRUCTURE DD	DESIGN NETWORK INFRASTRUCTURE DD	
Assess existing network DD1 1 2 3 4	Assess existing network DD1 1 2 3 4	
Assess networking needs DD2 1 2 3 4	Assess networking needs DD2 1 2 3 4	
Craft a logical design DD3 1 2 3 4	Craft a logical design DD3 1 2 3 4	
Assess against industry best practices DD4 1 2 3 4	Assess against industry best practices DD4 1 2 3 4	
Adapt to changing protocols DD5 1 2 3 4	Adapt to changing protocols DD5 1 2 3 4	
Craft a physical design DD6 1 2 3 4	Craft a physical design DD6 1 2 3 4	
Validate design (proof of design) (Pilot) DD7 1 2 3 4	Validate design (proof of design) (Pilot) DD7 1 2 3 4	
Select products DD8 1 2 3 4	Select products DD8 1 2 3 4	
Comply with technology standards DD9 1 2 3 4	Comply with technology standards DD9 1 2 3 4	
Incorporate industry best practices DD10 1 2 3 4	Incorporate industry best practices DD10 1 2 3 4	

Document detail design DD11 1 2 3 4	Document detail design DD11 1 2 3 4	
Adapt to evolving services DD12 1 2 3 4	Adapt to evolving services DD12 1 2 3 4	
Translate architecture documents into network design DD13 1 2 3 4	Translate architecture documents into network design DD13 1 2 3 4	
Adapt vendor designs / best practices DD14 1 2 3 4	Adapt vendor designs / best practices DD14 1 2 3 4	
Participate in peer review DD15 1 2 3 4	Participate in peer review DD15 1 2 3 4	
Apply virtualization concept DD16 1 2 3 4	Apply virtualization concept DD16 1 2 3 4	
Apply disaster recovery concepts DD17 1 2 3 4	Apply disaster recovery concepts DD17 1 2 3 4	
Apply high availability concepts DD18 1 2 3 4	Apply high availability concepts DD18 1 2 3 4	

IMPLEMENT NETWORK INFRASTRUCTURE EE	IMPLEMENT NETWORK INFRASTRUCTURE EE	
Interface with other departments EE1 1 2 3 4	Interface with other departments EE1 1 2 3 4	
Configure routers EE2 1 2 3 4	Configure routers EE2 1 2 3 4	

Configure switches	Configure switches	
EE3	EE3	
1 2 3 4	1 2 3 4	
Configure servers	Configure servers	
EE4	EE4	
1 2 3 4	1 2 3 4	
Configure firewalls	Configure firewalls	
EE5	EE5	
1 2 3 4	1 2 3 4	
Configure network appliances	Configure network appliances	
EE6	EE6	
1 2 3 4	1 2 3 4	
Apply fundamental network concepts	Apply fundamental network concepts	
EE7	EE7	
1 2 3 4	1 2 3 4	
Apply data center standards	Apply data center standards	
EE8	EE8	
1 2 3 4	1 2 3 4	
Specify power, environmental, physical requirements	Specify power, environmental, physical requirements	
EE9	EE9	
1 2 3 4	1 2 3 4	
Configure wireless	Configure wireless	
EE10	EE10	
1 2 3 4	1 2 3 4	
Apply security standards and best practices	Apply security standards and best practices	
EE11	EE11	
1 2 3 4	1 2 3 4	
Assemble hardware	Assemble hardware	
EE12	EE12	
1 2 3 4	1 2 3 4	
Follow installation instructions / procedures	Follow installation instructions / procedures	
EE13	EE13	
1 2 3 4	1 2 3 4	

Replicate network infrastructure / design in a number of settings / sites EE14	Replicate network infrastructure / design in a number of settings / sites EE14	
1 2 3 4	1 2 3 4	
Write troubleshooting guide EE15	Write troubleshooting guide EE15	
1 2 3 4	1 2 3 4	
Write operational documents / manual EE16	Write operational documents / manual EE16	
1 2 3 4	1 2 3 4	
Contribute toward transition to production EE17	Contribute toward transition to production EE17	
1 2 3 4	1 2 3 4	
Debug scripts EE18	Debug scripts EE18	
1 2 3 4	1 2 3 4	
Write reusable scripts (PERL, VB, SHELL) EE19	Write reusable scripts (PERL, VB, SHELL) EE19	
1 2 3 4	1 2 3 4	
Write scripts EE20	Write scripts EE20	
1 2 3 4	1 2 3 4	
Use re-usable scripts EE21	Use re-usable scripts EE21	
1 2 3 4	1 2 3 4	

MONITOR NETWORK INFRASTRUCTURE FF	MONITOR NETWORK INFRASTRUCTURE FF	
Use network tools FF1	Use network tools FF1	
1 2 3 4	1 2 3 4	
Monitor connectivity FF2	Monitor connectivity FF2	
1 2 3 4	1 2 3 4	

Monitor performance	Monitor performance	
FF3	FF3	
1 2 3 4	1 2 3 4	
Establish base-lines	Establish base-lines	
FF4	FF4	
1 2 3 4	1 2 3 4	
Configure monitoring tools	Configure monitoring tools	
FF5	FF5	
1 2 3 4	1 2 3 4	
Report against the base-line	Report against the base-line	
FF6	FF6	
1 2 3 4	1 2 3 4	
Analyze historical reports	Analyze historical reports	
FF7	FF7	
1 2 3 4	1 2 3 4	
Forecast capacity	Forecast capacity	
FF8	FF8	
1 2 3 4	1 2 3 4	
Identify network problems	Identify network problems	
FF9	FF9	
1 2 3 4	1 2 3 4	
Monitor content	Monitor content	
FF10	FF10	
1 2 3 4	1 2 3 4	
Monitor application flows	Monitor application flows	
FF11	FF11	
1 2 3 4	1 2 3 4	
SUPPORT NETWORK INFRASTRUCTURE GG	SUPPORT NETWORK INFRASTRUCTURE GG	
Perform hardware maintenance	Perform hardware maintenance	
GG1	GG1	
1 2 3 4	1 2 3 4	

Respond to incidents	Respond to incidents	
GG2	GG2	
1 2 3 4	1 2 3 4	
Apply network troubleshooting techniques	Apply network troubleshooting techniques	
GG3	GG3	
1 2 3 4	1 2 3 4	
Use packet capture tools (sniffers)	Use packet capture tools (sniffers)	
GG4	GG4	
1 2 3 4	1 2 3 4	
Follow incident management methodology	Follow incident management methodology	
GG5	GG5	
1 2 3 4	1 2 3 4	
Use security tools	Use security tools	
GG6	GG6	
1 2 3 4	1 2 3 4	
Update network documentation / diagrams	Update network documentation / diagrams	
GG7	GG7	
1 2 3 4	1 2 3 4	
Monitor version control (IOS)	Monitor version control (IOS)	
GG8	GG8	
1 2 3 4	1 2 3 4	
Perform firmware upgrades	Perform firmware upgrades	
GG9	GG9	
1 2 3 4	1 2 3 4	
Apply security patches	Apply security patches	
GG10	GG10	
1 2 3 4	1 2 3 4	
Configure back-up and restore processes	Configure back-up and restore processes	
GG11	GG11	
1 2 3 4	1 2 3 4	
Execute back-up and restore processes	Execute back-up and restore processes	
GG12	GG12	
1 2 3 4	1 2 3 4	

interface with vendors GG13 1 2 3 4	interface with vendors GG13 1 2 3 4	
Resolve problems GG14 1 2 3 4	Resolve problems GG14 1 2 3 4	
Manage infrastructure accounts and passwords GG15 1 2 3 4	Manage infrastructure accounts and passwords GG15 1 2 3 4	

Appendix D – Program Renewal Vision & Goals

CAP IST Program Renewal Project Vision & Goals

5 – Year Renewal Plan Vision, Goals, and Actions

Vision: To meet or exceed industry expectations in the delivery of the highest quality current, relevant, and timely Information and Communication Technology education, and to empower students to select the breadth and/or depth of their ICT education within reasonable timeframes.

Goals:

#1 Course Curriculum Changes

Goal: Implement changes to curriculum as required by industry expectations and technological development

1. Establish a curriculum committee to develop a process for course development/renewal
2. Map DACUM to current learning outcomes
3. Map program learning outcomes down to the course level
4. Review current curriculum to reduce topical overlap
5. Develop and implement an intro logic and design course
6. Integrate assignments with learning outcomes
7. Review all vision/goals suggestions for course development/modification
8. Offer an optional business start-up course

#2 Program Delivery

Goal: Identify, develop, and implement alternative delivery methods

1. Assume responsibility for all existing online IT courses (CE & DE)
2. Expand online course offers
3. Implement flexible scheduling (evening and weekends)
4. Provide more course delivery options (blended, satellite, online, evenings, weekends, correspondence, videoconference)
5. Liaise with ACCESS to ensure Aboriginal student needs are met in programs

#3 Resources

Goal: Identify and leverage resources for additional personnel, equipment, and physical space resources to support existing and anticipated program and student needs.

1. Generate funding through department Innovation Action Teams
2. Generate funding through industry partnership
3. Generate funding through internal and external marketing
4. Generate funding through Corporate Training
5. Generate funding through program course notes publication revenue

#4 Program structural changes

Goal: Empower students to select the breadth and/or depth of their ICT education within reasonable timeframes culminating in a capstone project

1. Iterate required and elective courses for 1 year certificate
2. Iterate required and elective courses for 2 year diploma
3. Iterate required and elective courses for an advanced diploma
4. Iterate required and elective courses for an applied degree
5. Add more streams e.g. B.A., forensic, security, game development
6. Determine required courses (common and by each stream)
7. Add elective courses (common and streamed)
8. Iterate required and elective courses to adapt alternative delivery methods
9. Iterate required and elective courses to limit total contact hours
10. Design capstone projects

#5 External relations/partnerships

Goal: Build and enhance relationships within the College, community, nationally and internationally

1. Increase cross-department collaboration (BA, Creative Arts, Electronics Technology, GIS, and Health Informatics)
2. Work with industry to develop and deliver custom courses and training (e.g. XML to Standard Aero)
3. Develop own marketing strategy
4. Increase connections with aboriginal community
5. Explore increased initiatives with industry partners
6. Increase articulation and joint programs with international post-secondary institutions (Aviation Management, India, Western Michigan University, IT in Hobei China)

#6 Rebrand programs

Goal: Rebrand the programs

1. Change & manage department website to better serve the customer
2. Sell RRC as the first choice for IT programs in Manitoba
3. Market programs to counselors, companies, government, and parents

Appendix E – 5 – Year Program Renewal Plan in Gantt format

