Information Technology

This section presents the requirements for programs in:
• Information Resource Management B.I.T.
• Interactive Multimedia and Design B.I.T.
• Network Technology B.I.T.
• Optical Systems and Sensors B.I.T.

Program Requirements

Course Categories
• Carleton University Electives
• Algonquin college Electives

Please check the current lists of approved electives on the program web site.

Information Resource Management
B.I.T. (20.0 credits)

A. Credits Included in the Major CGPA (12.0)
1. 4.0 credits in: 4.0
   - BIT 1400 [0.5] Introduction to Programming and Problem Solving
   - IRM 1002 [0.5] Reference and Information Services
   - IRM 1003 [0.5] Collections management
   - IRM 1004 [0.5] Reader’s Advisory Services
   - IRM 1005 [0.5] Web Interface Development
   - IRM 1006 [0.5] Subject Analysis and Indexing
   - IRM 1007 [0.5] Cataloguing
   - IRM 1008 [0.5] Introduction to Information Resource Management
2. 3.0 credits in: 3.0
   - BIT 2008 [0.5] Multimedia Data Management
   - BIT 2400 [0.5] Intermediate Programming
   - IRM 2002 [0.5] Legal and Business Information
   - IRM 2003 [0.5] Classification
   - IRM 2004 [0.5] Information Management and Digital Preservation
   - IRM 2005 [0.5] Advanced Cataloguing
3. 2.5 credits in: 2.5
   - IRM 3001 [0.5] Scientific and Medical Information
   - IRM 3003 [0.5] Legal Issues in Information Resource Management
   - IRM 3004 [0.5] Project management
   - IRM 3006 [0.5] Data Analysis and Research Methodology
   - IRM 3008 [0.5] Metadata for IRM
4. 2.5 credits in: 2.5
   - IRM 4000 [0.5] Library Software
   - IRM 4001 [0.5] Archives and Special Collections
   - IRM 4002 [0.5] Network Technology
   - IRM 4900 [1.0] Final IRM Project
B. Credits Not Included in the Major (8.0 credits)
5. 3.0 credits in: 3.0
   - BIT 2000 [0.5] Introduction to Statistics
   - BIT 2001 [0.5] Introduction to Business
   - BIT 2002 [0.5] Marketing in the IT sector

Interactive Multimedia and Design
B.I.T. (20.0 credits)

A. Credits Included in the Major CGPA (14.0 credits)
1. 3.0 credits in: 3.0
   - BIT 1400 [0.5] Introduction to Programming and Problem Solving
   - IMD 1000 [0.5] Introduction to Interactive Multimedia Design
   - IMD 1001 [0.5] Visual Communication
   - IMD 1002 [0.5] Visual Dynamics
   - IMD 1004 [0.5] Design Processes
   - IMD 1005 [0.5] Web Development
2. 3.5 credits in: 3.5
   - BIT 2008 [0.5] Multimedia Data Management
   - BIT 2400 [0.5] Intermediate Programming
   - IMD 2003 [0.5] Audio and Video
   - IMD 2006 [0.5] Introduction to Computer Games
   - IMD 2007 [0.5] Intro to 3D Animation
   - IMD 2900 [1.0] Design Studio 1
3. 4.0 credits in: 4.0
   - IMD 3002 [0.5] 3D Computer Graphics
   - IMD 3004 [0.5] Human Computer Interaction and Design
   - IMD 3005 [0.5] Sensor-Based Interaction
   - IMD 3006 [0.5] Software Design for Multimedia Applications
   - IMD 3900 [1.0] Design Studio 2
   - IMD 3901 [1.0] Design Studio 3
4. 3.5 credits in: 3.5
   - IMD 4005 [0.5] Advanced Topics in Multimedia
   - IMD 4006 [0.5] Advanced Computer Gaming
   - IMD 4007 [0.5] Advanced Animation and Visual FX
   - IMD 4008 [0.5] Mobile User Interface Design and Development
   - IMD 4901 [1.5] Senior IMD Project
B. Credits Not Included in the Major CGPA (6.0 credits)
5. 1.5 credits in: 1.5
   - BIT 1002 [0.5] Physics for Information Technology
   - BIT 1100 [0.5] Mathematics I for IMD
   - BIT 1101 [0.5] Mathematics II for IMD

Notes:
1. **Additional requirements**: students must complete a Minor in another academic discipline.
2. **Language requirement**: all students are expected to improve their current French language skill by one credit. Should a student be assessed as fluently bilingual, 1.0 credit of alternate language courses will be accepted. Canadian Aboriginal languages would be encouraged in such cases.
6. 1.5 credits in:
BIT 2000 [0.5] Introduction to Statistics
BIT 2002 [0.5] Marketing in the IT sector
BIT 2006 [0.5] Elective

7. 0.5 credit in:
CCDP 3003 [0.5] Communication Skills for IMD

8. 0.5 credit in:
IMD 4002 [0.5] Technology and Culture

9. 1.0 Credit in Arts and Humanities elective outside the faculties of Business, Science and Engineering.

10. 1.0 credit in electives for IMD, and/or Directed Studies
BIT 4000 [0.5] Directed Studies

Total Credits 20.0

Retention of Work (Interactive Multimedia and Design Program Only)
A portfolio represents a record of the student’s progress and design experience over the years, and is an indispensable requirement for any future job application. A portfolio is started in first year and continues to expand until graduation. The School, therefore, requires that each student produce reductions (normally 8 1/2 x 11 inch reproductions, colour or black and white, slides, and/or digital format CD) of their work at the end of each term. One copy of the work should be put in the student’s portfolio and the other turned in to the instructor for retention in the School’s archives. (This facilitates retrospective exhibitions of work, accreditation, publications and any future references for pedagogic purposes.) Original work is the property of the students, but the School retains the right to keep work of merit for up to four years after the date of submission. The School will make every effort to preserve the work in good condition, and will give authorship credit and take care of its proper use.

Network Technology
B.I.T. (20.0 credits)

A. Credits Included in the Major CGPA (9.5 credits)

1. 2.5 credits in:
BIT 1000 [0.5] Mathematics I for NET
BIT 1007 [0.5] Physics for NET
BIT 1400 [0.5] Introduction to Programming and Problem Solving
NET 1002 [0.5] Networking Fundamentals
NET 1006 [0.5] Routing and Switching

2. 2.0 credits in:
BIT 2400 [0.5] Intermediate Programming
NET 2000 [0.5] Intermediate Networking
NET 2001 [0.5] Wide Area Networking
NET 2008 [0.5] DevOps

3. 2.5 credits in:
NET 3000 [0.5] Database Concepts and SQL
NET 3001 [0.5] Real-time Systems
NET 3008 [0.5] Advanced Network Routing
NET 3010 [0.5] Web Programming
NET 3900 [0.5] Wireless Networks

4. 2.5 credits in:

B. Credits Not Included in the Major CGPA (10.5 credits)

1. 1.5 credits in:
BIT 1001 [0.5] Mathematics II for NET
BIT 1006 [0.5] Elective
NET 1001 [0.5] Computer Technology Basics

6. 3.5 credits in:
BIT 2000 [0.5] Introduction to Statistics
BIT 2002 [0.5] Marketing in the IT sector
CCDP 2004 [0.5] Communication Skills for NET
NET 2002 [0.5] Desktop and Server Environments
NET 2003 [0.5] Linux Networking
NET 2007 [0.5] Basics of Transmission Systems
NET 2009 [0.5] Assembly and Machine Language

7. 2.5 credits in:
NET 3004 [0.5] Data Structures
NET 3006 [0.5] Network Management and Measurements
NET 3007 [0.5] Network Security
NET 3011 [0.5] Advanced Network Switching
NET 3012 [0.5] IP Architectures and Solutions

8. 2.5 credits in:
NET 4000 [0.5] Emerging Network Technologies
NET 4001 [0.5] Network Simulation
NET 4003 [0.5] Computer Systems Architecture
NET 4009 [0.5] Troubleshooting IP Networks
NET 4011 [0.5] Advanced Topics in Network Security

9. 0.5 credit in Arts and Humanities electives outside the faculties of Business, Science and Engineering.

Total Credits 20.0

Optical Systems and Sensors
B.I.T. (20.0 credits)

A. Credits Included in the Major CGPA (10.0 credits)

1. 3.0 credits in:
BIT 1203 [0.5] Newtonian Physics
BIT 1400 [0.5] Introduction to Programming and Problem Solving
PLT 1002 [0.5] Applications in Photonics & Optoelectronics
PLT 1003 [0.5] Optics/Optical Fibers I (Principles)
PLT 1005 [0.5] Introduction to Optics
PLT 1006 [0.5] Introduction to Automation and Simulation

2. 2.5 credits in:
BIT 2010 [0.5] Differential Equations & Multivariate Calculus
PLT 2003 [0.5] Laser Systems
PLT 2005 [0.5] Circuits and Signals
PLT 2006 [0.5] Integrated Circuits
PLT 2009 [0.5] Assembly and Machine Language

3. 2.0 credits in:
PLT 3003 [0.5] Fundamentals of Electromagnetics
PLT 3004 [0.5]  Design of Optical Components and Systems
PLT 3009 [0.5]  Project Management
PLT 3010 [0.5]  Data Structures

4.  2.5 credits in:
   PLT 4001 [0.5]  Optoelectronic Devices
   PLT 4006 [0.5]  Image Processing
   PLT 4009 [0.5]  Computer Vision
   PLT 4900 [1.0]  Photonics Research Project

B. Credits Not Included in the Major CGPA (10.0 credits)

5.  1.5 credits in:
   BIT 1200 [0.5]  Calculus
   BIT 1201 [0.5]  Linear Algebra
   BIT 1204 [0.5]  Electromagnetism & Modern Physics

6.  4.0 credits in:
   BIT 2000 [0.5]  Introduction to Statistics
   BIT 2001 [0.5]  Introduction to Business
   BIT 2002 [0.5]  Marketing in the IT sector
   BIT 2400 [0.5]  Intermediate Programming
   PLT 2000 [0.5]  Fundamentals of Light Sources
   PLT 2002 [0.5]  Optical Communication Networks I
   PLT 2008 [0.5]  Manufacturing Photonics Components
   PLT 2010 [0.5]  Signals and Systems

7.  3.0 credits in:
   PLT 3000 [0.5]  Optical Communication Networks II
   PLT 3002 [0.5]  Real-time Systems
   PLT 3008 [0.5]  Communication Skills for PLT
   PLT 3012 [0.5]  Digital Signal Processing
   PLT 3013 [0.5]  Software Design for Optical Systems and Sensors
   PLT 3014 [0.5]  Optical Waves, Waveguides, and Sensors

8.  1.0 credit in:
   PLT 4004 [0.5]  Medical Imaging and Biosensors
   PLT 4008 [0.5]  Remote Sensing

9.  0.5 credit in Arts and Humanities elective outside the faculties of Business, Science and Engineering.

Total Credits 20.0

Regulations

The regulations presented in this section apply to all students in the Bachelor of Information Technology program.

In addition to the program requirements, students must satisfy the University regulations common to all undergraduate students including the process of Academic Performance Evaluation (consult the Academic Regulations of the University section of this Calendar).

Joint Status

A student registered in the BIT degree has student status at both Algonquin College and Carleton University. At Algonquin College the student is considered to be a post-secondary student; at Carleton University, the student is considered to be a degree student. Students registered in the BIT degree have access to all student services on the Carleton University campus and selected services on the Algonquin College campus.

Academic Regulations

The academic regulations governing the B.I.T. are the academic regulations of Carleton University. These regulations are defined in full in the Academic Regulations of the University section of this Calendar and apply to B.I.T. students on both campuses. Within the context of these regulations, B.I.T. is considered to be a General degree with a defined Major CGPA and requires 20.0 credits. Courses with the designations BIT, NET or IMD are not normally transferable to Engineering, Computer Science or other programs at Carleton University.

Students should note that there are significant differences between the academic regulations of Carleton University and Algonquin College; it is the regulations of Carleton University that apply in all cases as related both to course registrations and program rules.

At Carleton University, the chief examination officer of the BIT is the Dean of Engineering and Design. At Algonquin College, grades are approved by the Dean of the respective School.

Graduation

In order to graduate with the Bachelor of Information Technology Degree and the Advanced Diploma of Technology or Advanced Diploma of Applied Arts, the student must:

1. satisfy all requirements for the program of study;
2. be recommended for graduation by Bachelor of Information Technology Academic Council;
3. be approved for graduation by the Senate of Carleton University;
4. be approved for graduation by the Registrar of Algonquin College.

Discipline

The regulations, procedures and sanctions that apply to student discipline on either campus, both concerning Instructional Offences and Offences of Conduct are those of Carleton University and are described in the Carleton University Undergraduate Calendar. However, while students are on Algonquin's campus, they are expected to follow Algonquin's Directives regarding Student Misconduct and Use of Electronic Devices.

Co-operative Education

For more information about how to apply for the Co-op program and how the Co-op program works please visit the Co-op website.

All students participating in the Co-op program are governed by the Undergraduate Co-operative Education Policy.

Undergraduate Co-operative Education Policy

Admission Requirements

Students can apply to co-op in one of two ways; directly from high school or after beginning a degree program at Carleton.
If a student is admitted to co-op from high school, their grades will be reviewed two terms to one year prior to their first work term to ensure they continue to meet the academic requirements after their 1st or 2nd year of study. The time at which evaluation takes place depends on the program of study. Students will automatically be notified via their Carleton email account if they are permitted to continue.

Students not admitted to Carleton University with the co-op option on their degree can apply for admission via the co-operative education program website. To view application deadlines, visit carleton.ca/co-op.

Admission to the co-op option is based on the completion of 5.0 or more credits at Carleton University, the CGPA requirement for the students’ academic program as well as any course prerequisites. The articulated CGPA for each program is the normal standard for assessment. Please see the specific degree program sections for the unique admission and continuation requirements for each academic program.

English Language Proficiency

Students admitted to Carleton based on CAEL, IELTS or TOEFL assessments and who are required to take an ESL course must take and pass the Oral Proficiency in Communicative Settings (OPECS) Test. The test must be taken before being permitted to register in COOP 1000. Admission to the co-op program can be confirmed with a minimum score of 4+.

Participation Requirements

COOP 1000

Once a student has been given admission or continuation confirmation to the co-op option s/he must complete and pass COOP 1000 (a mandatory online 0.5 credit course). Students will have access to this course a minimum of two terms prior to their first work term and will be notified when to register.

Communication with the Co-op Office

Students must maintain contact with the co-op office during their job search and while on a work term. All email communication will be conducted via the students’ Carleton email account.

Employment

Although every effort is made to ensure a sufficient number of job postings for all students enrolled in the co-op option of their degree program, no guarantee of employment can be made. Carleton’s co-op program operates a competitive job search process and is dependent upon current market conditions. Academic performance, skills, motivation, maturity, attitude and potential will determine whether a student is offered a job. It is the student’s responsibility to actively conduct a job search in addition to participation in the job search process operated by the co-op office. Once a student accepts a co-op job offer (verbally or written), his/her job search will end and access to co-op jobs will be removed for that term. Students that do not successfully obtain a co-op work term are expected to continue with their academic studies. The summer term is the exception to this rule. Students should also note that hiring priority is given to Canadian citizens for co-op positions in the Federal Government of Canada.

Registering in Co-op Courses

Students will be registered in a Co-op Work Term course while at work. The number of Co-op Work Term courses that a student is registered in is dependent upon the number of four-month work terms that a student accepts.

While on a co-op work term students may take a maximum of 0.5 credit throughout each four-month co-op work term. Courses must be scheduled outside of regular working hours.

Students must be registered as full-time before they begin their co-op job search (2.0 credits). All co-op work terms must be completed before the beginning of the final academic term. Students may not finish their degree on a co-op work term.

Work Term Assessment and Evaluation

To obtain a Satisfactory grade for the co-op work term students must have:

1. A satisfactory work term evaluation by the co-op employer;
2. A satisfactory grade on the work term report.

Students must submit a work term report at the completion of each four-month work term. Reports are due on the 16th of April, August, and December and students are notified of due dates through their Carleton email account.

Workplace performance will be assessed by the workplace supervisor. Should a student receive an unsatisfactory rating from their co-op employer, an investigation by the co-op program manager will be undertaken. An unsatisfactory employer evaluation does not preclude a student from achieving an overall satisfactory rating for the work term.

Graduation with the Co-op Designation

In order to graduate with the co-op designation, students must satisfy all requirements for their degree program in addition to the requirements according to each co-op program (i.e. successful completion of three or four work terms).

Note: Participation in the co-op option will add up to one additional year for a student to complete their degree program.

Voluntary Withdrawal from the Co-op Option

Students may withdraw from the co-op option of their degree program during a study term ONLY. Students at work may not withdraw from the work term or the co-op option until s/he has completed the requirements of the work term.

Students are eligible to continue in their regular academic program provided that they meet the academic standards required for continuation.
Involuntary or Required Withdrawal from the Co-op Option

Students may be required to withdraw from the co-op option of their degree program for one or any of the following reasons:

1. Failure to achieve a grade of SAT in COOP 1000
2. Failure to pay all co-op related fees
3. Failure to actively participate in the job search process
4. Failure to attend all interviews for positions to which the student has applied
5. Declining more than one job offer during the job search process
6. Continuing a job search after accepting a co-op position
7. Dismissal from a work term by the co-op employer
8. Leaving a work term without approval by the Co-op manager
9. Receipt of an unsatisfactory work term evaluation
10. Submission of an unsatisfactory work term report

Standing and Appeals

The Co-op and Career Services office administers the regulations and procedures that are applicable to all co-op program options. All instances of a student's failure during a work term or other issues directly related to their participation in the co-op option will be reported to the academic department.

Any decision made by the Co-op and Career Services office can be appealed via the normal appeal process within the University.

International Students

All International Students are required to possess a Co-op Work Permit issued by Immigration, Refugees and Citizenship Canada before they can begin working. It is illegal to work in Canada without the proper authorization. Students will be provided with a letter of support to accompany their application. Students must submit their application for their permit before being permitted to view and apply for jobs on the Co-op Services database. Confirmation of a position will not be approved until a student can confirm they have received their permit. Students are advised to discuss the application process and requirements with the International Student Services Office.

Bachelor of Information Technology: Co-op Admission and Continuation Requirements

- Maintain full-time status in each study term (2.0 credits);
- Be eligible to work in Canada (for off-campus work)
- Have successfully completed COOP 1000 [0.0]

In addition to the following:

1. Obtained and maintained a major CGPA of 8.0;
2. Successfully completed all required first-year courses, and
3. Registered as a full-time student in the Bachelor of Information Technology program

Students in the Bachelor of Information Technology must complete three (3) work terms to obtain the co-op designation.

Co-op Work Term Course: BIT 3999

Work/Study Pattern:

Interactive Multimedia and Design, Information Resource management, Network Technology, Photonics and Laser Technology

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Legend
S: Study
W: Work
O: Optional
* indicates recommended work study pattern
** student finds own employer for this work-term.

Admission

Degree

- Bachelor of Information Technology (B.I.T.)

The Bachelor of Information Technology is offered jointly with Algonquin College.

Admission Requirements

First Year

To be eligible for admission to the first year of the Bachelor of Information Technology, the applicant must have:

1. The Ontario Secondary School Diploma (OSSD) or equivalent, including a minimum of six 4U or M courses.
2. For Multimedia and Design:
   The six 4U or M courses must include Advanced Functions. In addition, candidates for BIT in Interactive Multimedia and Design must submit a portfolio of any kind of work that demonstrates the applicant's creativity and aptitude in design work.
3. For Network Technology:
   The six 4U or M courses must include one of Advanced Functions or Calculus and Vectors or Mathematics of Data Management (Calculus and Vectors recommended).
4. For Photonics and Laser Technology:
   The six 4U or M courses must include Advanced Functions.
5. For Information Resource Management:
   The six 4U or M courses must include English and one of Advanced Functions or Calculus and Vectors or Mathematics of Data Management.

Advanced Standing

Applications for Advanced Standing towards the program leading to the Bachelor of Information Technology will be evaluated on an individual basis upon admission to the program. Students may request that additional courses be considered toward Advanced Standing. Such requests may be made only once and must be received by the
BIT Joint Council (comprised of instructors from Carleton University and Algonquin College) by August 30 of the year in which the student is admitted to the program. Requests must follow the submission format outlined on the BIT web site.

Only university- and college-level courses in which a student has achieved a grade of C- or higher are eligible to be considered for Advanced Standing.

**Co-op Option**

*Co-op Option Direct Admission to the First Year of the Co-op Option*

Applicants must:

1. meet the required overall admission cut-off average and prerequisite course average. These averages may be higher than the stated minimum requirements;
2. be registered as a full-time student in one of the streams of the Information Technology degree stated in this section;
3. be eligible for work in Canada (for off-campus work placements).

Meeting the above requirements only establishes eligibility for admission to the program. The prevailing job market may limit enrolment in the Co-op option.

Note: continuation requirements for students previously admitted to the co-op option and admission requirements for the co-op option after beginning the program are described in the Co-operative Education Regulations section of this Calendar.

**Information Resource Management (IRM) Courses**

**IRM 1002 [0.5 credit]**

*Reference and Information Services*

Introduction to the theory and techniques needed to conduct reference interviews and interpret reference queries. Students learn to select and use general reference sources such as dictionaries, encyclopedias, directories, bibliographies, periodical indexes, almanacs, and handbooks in print, and electronic formats.

Includes: Experiential Learning Activity

Prerequisite(s): restricted to students in the B.I.T. degree program.

Lectures two hours a week, tutorial/laboratory two hours a week.

**IRM 1003 [0.5 credit]**

*Collections management*

Introduction to the principals of collections management including techniques and procedures for selecting, ordering and receiving library materials, accounting, collection development and automated acquisitions. Students also learn policies and procedures required for circulation, document delivery and interlibrary loans.

Includes: Experiential Learning Activity

Prerequisite(s): restricted to students in the B.I.T. degree program.

Lectures two hours a week, tutorial/laboratory two hours a week.

**IRM 1004 [0.5 credit]**

*Reader’s Advisory Services*

Students become familiar with fiction and non-fiction materials available to various categories of clients and learn how to market them. In addition, students further develop through various assignments their researching, writing, speaking, listening and communication skills.

Includes: Experiential Learning Activity

Prerequisite(s): Restricted to students in the B.I.T. degree program.

Lectures three hours a week.

**IRM 1005 [0.5 credit]**

*Web Interface Development*

Combining graphics, text, audio and video to develop websites on an individual basis and in groups, using latest versions of HyperText Markup Language (HTML), Cascading Style Sheets (CSS), JavaScript and data interchange formats such as Extensible Markup Language (XML) and JavaScript Object Notation (JSON).

Includes: Experiential Learning Activity

Prerequisite(s): Restricted to students in the B.I.T. degree program.

Lectures three hours a week, tutorial/laboratory one hour a week.

**IRM 1006 [0.5 credit]**

*Subject Analysis and Indexing*

Students learn the basic theory of subject analysis and indexing methods used to provide access to library materials and literature. Practical instruction makes use of thesauri, as well as standard subject heading lists, such as Sears and Library of Congress.

Includes: Experiential Learning Activity

Prerequisite(s): Restricted to students in the B.I.T. degree program.

Lectures two hours a week, tutorial/laboratory two hour a week.

**IRM 1007 [0.5 credit]**

*Cataloguing*

The catalogue is the main finding aid to the collection of the library. Students learn the basic principles and concepts of international standards used to describe library materials. In-class exercises, lectures and practical experience help students apply these cataloguing standards.

Includes: Experiential Learning Activity

Precludes additional credit for IRM 1001 (no longer offered).

Prerequisite(s): restricted to students in the B.I.T. program.

Lectures two hours a week, tutorial/laboratory two hours a week.
IRM 1008 [0.5 credit]  
Introduction to Information Resource Management  
Students develop understanding of the concepts of information retrieval, creation, evaluation, organization and client service. Knowledge of legal and ethical implications of information and current trends in the field is studied. Through in-class lectures and hands-on activities, students gain an overview of the field. Precludes additional credit for IRM 1000 (no longer offered). Prerequisite(s): restricted to students in the B.I.T. degree program. Lectures three hours a week.

IRM 2002 [0.5 credit]  
Legal and Business Information  
Students develop skills in planning and executing information searches and evaluating print and electronic resources. Students learn to locate information on selected topics, compile subject-specific annotated bibliographies and instruct library clients in the use of specialized materials and databases. Includes: Experiential Learning Activity Prerequisite(s): IRM 1002. Lectures two hours a week, tutorial/laboratory two hours a week.

IRM 2005 [0.5 credit]  
Advanced Cataloguing  
Libraries purchase and provide access to a wide variety of print and electronic resources. Building on work done in IRM 1007, students learn to interpret international cataloguing standards to describe more complex materials. In-class exercises, lectures and practical experience help students apply these cataloguing standards. Includes: Experiential Learning Activity Precludes additional credit for IRM 2001. Prerequisite(s): IRM 1007. Lectures two hours a week, tutorial/laboratory two hours a week.

IRM 3001 [0.5 credit]  
Scientific and Medical Information  
Students enhance their knowledge of print and electronic reference sources in science and technology. Students learn to compile specialized subject-specific bibliographies and assignments provide training in the use of science and technology reference sources. Includes: Experiential Learning Activity Prerequisite(s): IRM 2002. Lectures two hours a week, tutorial/laboratory two hours a week.

IRM 3003 [0.5 credit]  
Legal Issues in Information Resource Management  
In-depth analysis and assessment of copyright and other forms of intellectual property. Legal issues related to information technology. Topics may include privacy, surveillance and monitoring, access to information, freedom of expression, Charter and human rights issues, and security. Includes: Experiential Learning Activity Prerequisite(s): Restricted to students in the B.I.T. degree program. Lectures three hours a week.

IRM 3004 [0.5 credit]  
Project Management  
Identification, selection, initiation, and organization of projects. Risk assessment, budget issues, communication, project scheduling, performance monitoring and control. Emphasis on practical techniques related to the field of information management using case studies. Includes: Experiential Learning Activity Prerequisite(s): third year standing in the Information resource management program. Lectures two hours a week, tutorial/laboratory two hours a week.
IRM 3006 [0.5 credit]
Data Analysis and Research Methodology
Introduction to the logic and design of research. Qualitative and quantitative research methodology with emphasis on the application and interpretation of statistical techniques for data analysis. These may include but are not limited to bivariate and multivariate analysis, distribution analysis, visual data analysis, market basket analysis.
Includes: Experiential Learning Activity
Precludes additional credit for IRM 3002 (no longer offered). 
Prerequisite(s): BIT 2000.
Lectures three hours a week.

IRM 3007 [0.5 credit]
Practicum for IRM
Students will design and complete a project related to information management under the supervision of a faculty member or librarian. This course provides the opportunity to apply knowledge gained in previous courses.
Includes: Experiential Learning Activity
Prerequisite(s): third-year standing in the Information resource management program.
Tutorial/laboratory eight hours a week.

IRM 3008 [0.5 credit]
Metadata for IRM
Students develop an understanding of key metadata schema and apply standards to describe range of digital resources. The metadata schemes include focus on Dublin Core (DC) and MODS with select coverage of specialist schema. Through in-class lectures and hands-on activities, students apply metadata schemes.
Includes: Experiential Learning Activity
Precludes additional credit for IRM 3000 (no longer offered).
Prerequisite(s): IRM 2005.
Lectures two hours a week, tutorial/laboratory two hours a week.

IRM 4000 [0.5 credit]
Library Software
Using skills and knowledge of automated systems already developed in introductory courses, students learn the theory and receive the hands-on practice needed to use library databases. A component on choosing and comparing library software is included.
Includes: Experiential Learning Activity
Prerequisite(s): Restricted to students in the B.I.T. degree program.
Lectures two hours a week, tutorial/laboratory one hour a week.

IRM 4004 [0.5 credit]
Big Data Analytics and Applications
Introduction to Big Data. Topics include: big data mining and analysis techniques like Association Rule Mining, Classification, Clustering, Linear Regression, using R, Hadoop, Hadoop Distributed File System, and related technologies. Applications on other domains like networks, finance, and/or business.
Includes: Experiential Learning Activity
Prerequisite(s): IRM 3006.
Lectures three hours a week.

IRM 4001 [0.5 credit]
Archives and Special Collections
Principles and methods used by archivists and record managers in organizing their collections for better access and retrieval. Students also learn aspects of physical bibliography, the book trade, preservation and conservation of books and how to exhibit such material.
Includes: Experiential Learning Activity
Prerequisite(s): Restricted to students in the B.I.T. degree program.
Lectures three hours a week.

IRM 4002 [0.5 credit]
Network Technology
Foundation knowledge for computer networks and communications. Topics include basic network design, layered communications models, IP addressing and subnets, and industry standards for networking media and protocols, with an emphasis on TCP/IP protocol suite and Ethernet environments.
Includes: Experiential Learning Activity
Lectures two hours a week, tutorial/laboratory one hour a week.

IRM 4004 [0.5 credit]
Big Data Analytics and Applications
Introduction to Big Data. Topics include: big data mining and analysis techniques like Association Rule Mining, Classification, Clustering, Linear Regression, using R, Hadoop, Hadoop Distributed File System, and related technologies. Applications on other domains like networks, finance, and/or business.
Includes: Experiential Learning Activity
Prerequisite(s): IRM 3006.
Lectures three hours a week.

IRM 4900 [1.0 credit]
Final IRM Project
Student-initiated project developed in association with a project supervisor and external information resource management advisor. Project is supported by a written report, seminar discussions and final presentation. All proposals must be approved by the IRM Program Project Committee.
Includes: Experiential Learning Activity
Prerequisite(s): IRM 3004, IRM 3007 or LIB 2030 and LIB 2047 and fourth year standing in the IRM program.
Tutorial hours arranged.
Information Technology (BIT) Courses

BIT 1000 [0.5 credit]
Mathematics I for NET
Tailored for students in the Network Technology program, this course covers basic concepts in functions (polynomials, exponential, logarithmic) and introduces concepts of limits, derivatives and rules of differentiation, applications of differentiation (max-min problems, curve sketching) and integration.
Includes: Experiential Learning Activity
Precludes additional credit for BIT 1100, BIT 1200, ECON 1401, ECON 1402, MATH 1002, MATH 1004, MATH 1007, MATH 1009, MATH 1401, MATH 1402.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial/laboratory one hour a week.

BIT 1001 [0.5 credit]
Mathematics II for NET
Tailored for students in the Network Technology program, this course covers systems of linear equations, vector space of n-tuples, subspaces and bases, matrix transformations, kernel, range, matrix algebra and determinants, inner products and orthogonality, eigenvalues, diagonalization and applications.
Includes: Experiential Learning Activity
Precludes additional credit for BIT 1101, BIT 1201, ECON 1401, ECON 1402, MATH 1104, MATH 1107, MATH 1119, MATH 1401, MATH 1402.
Prerequisite(s): BIT 1000.
Lectures three hours a week, tutorial and laboratory one hour a week.

BIT 1002 [0.5 credit]
Physics for Information Technology I
An introductory course on energy, thermodynamics, sound and electromagnetic waves, optics, and modern physics. Practical skills are learned in the laboratory, which is a required part of the course.
Includes: Experiential Learning Activity
Precludes additional credit for BIT 1203, PHYS 1001, PHYS 1003, PHYS 1007.
Prerequisite(s): Restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial three hours/ laboratory three hours alternate weeks.

BIT 1006 [0.5 credit]
Elective
Students must choose from among a list of approved Electives at Algonquin College.
Precludes additional credit for BIT 2003 (no longer offered).
Prerequisite(s): restricted to students in the B.I.T. degree program.

BIT 1007 [0.5 credit]
Physics for NET
An introductory course on energy, electrical networks (AC and DC circuits, resistance, impedance, capacitance), electrostatics (electric fields, static electricity), electromagnetism, electromagnetic waves, optics, and other topics in modern physics. Practical skills are learned in the laboratory, which is a required part of the course.
Precludes additional credit for BIT 1003 (no longer offered), BIT 1204, PHYS 1002, PHYS 1004, PHYS 1008.
Prerequisite(s): BIT 1000, Restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial three hours/ laboratory three hours alternate weeks

BIT 1100 [0.5 credit]
Mathematics I for IMD
Tailored for students in the Interactive Multimedia Design program, this course covers basic concepts in functions (polynomials, exponential, logarithmic) and introduces concepts of limits, derivatives and rules of differentiation, applications of differentiation (max-min problems, curve sketching) and integration.
Includes: Experiential Learning Activity
Precludes additional credit for BIT 1100, BIT 1200, ECON 1401, ECON 1402, MATH 1002, MATH 1004, MATH 1007, MATH 1009, MATH 1401, MATH 1402.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial/laboratory one hour a week.

BIT 1101 [0.5 credit]
Mathematics II for IMD
Tailored for students in the interactive Multi-media Design program, this course covers systems of linear equations, vector space of n-tuples, subspaces and bases, matrix transformations, kernel, range, matrix algebra and determinants, inner products and orthogonality, eigenvalues, diagonalization and applications.
Includes: Experiential Learning Activity
Precludes additional credit for BIT 1101, BIT 1201, ECON 1401, ECON 1402, MATH 1104, MATH 1107, MATH 1119, MATH 1401, MATH 1402.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial/laboratory one hour a week.

BIT 1102 [0.5 credit]
Mathematics II for IMD
Tailored for students in the interactive Multi-media Design program, this course covers systems of linear equations, vector space of n-tuples, subspaces and bases, matrix transformations, kernel, range, matrix algebra and determinants, inner products and orthogonality, eigenvalues, diagonalization and applications.
Includes: Experiential Learning Activity
Precludes additional credit for BIT 1203, PHYS 1001, PHYS 1003, PHYS 1007.
Prerequisite(s): Restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial three hours/ laboratory three hours alternate weeks.
BIT 1200 [0.5 credit]

Calculus

Includes: Experiential Learning Activity
Precludes additional credit for BIT 1000, BIT 1100, MATH 1002, MATH 1004, MATH 1007, MATH 1009, MATH 1401/ECON 1401, MATH 1402/ECON 1402.
Prerequisite(s): Ontario Grade 12 Mathematics: Advanced Functions; or MATH 0005 and MATH 0006; or equivalent. Restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial/laboratory one hour a week.

BIT 1201 [0.5 credit]

Linear Algebra
Systems of linear equations; vector space of n-tuples, subspaces and bases; matrix transformations, kernel, range; matrix algebra and determinants. Dot product. Complex numbers (including de Moivre's Theorem, and n-th roots). Eigenvalues, diagonalization and applications. Note: MATH 1119 is not an acceptable substitute for BIT 1201.

Includes: Experiential Learning Activity
Precludes additional credit for BIT 1001, BIT 1101, MATH 1102, MATH 1104, MATH 1107, MATH 1119, MATH 1401/ECON 1401, MATH 1402/ECON 1402.
Prerequisite(s): Ontario Grade 12 Mathematics: Advanced Functions, or MATH 0005, or equivalent, or permission of the School. Restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial and laboratory one hour a week.

BIT 1203 [0.5 credit]

Newtonian Physics
Mechanics, properties of matter, thermodynamics. Applications chosen in part from the life sciences.

Includes: Experiential Learning Activity
Precludes additional credit for BIT 1002, PHYS 1001, PHYS 1003, PHYS 1007.
Prerequisite(s): (i) Grade 12 Mathematics: Advanced Functions or equivalent; or (ii) Grade 12 Mathematics: Calculus and Vectors or equivalent, or MATH 1007 or BIT 1200 (may be taken concurrently); or (iii) permission of the Department. Restricted to students in the B.I.T. degree program.
Lectures three hours a week, laboratory or tutorial three hours a week.

BIT 1204 [0.5 credit]

Electromagnetism & Modern Physics
Electricity and magnetism, DC and AC circuits, wave motion and light. Elements of modern physics. Applications chosen in part from the life sciences.

Includes: Experiential Learning Activity
Precludes additional credit for BIT 1003 (no longer offered), BIT 1007, PHYS 1002, PHYS 1004, PHYS 1008.
Prerequisite(s): BIT 1203 or PHYS 1001 or PHYS 1003 or PHYS 1007 or permission of the Department. Restricted to students in the B.I.T. degree program.
Lectures three hours a week, laboratory or tutorial three hours a week.

BIT 1400 [0.5 credit]

Introduction to Programming and Problem Solving
Introduction to basic concepts of algorithm design and computer programming in C/C++. Topics include computer architecture, algorithms and pseudocode, basic operators, variables and functions, program control with iteration and conditionals, I/O operations, text processing, structures, arrays, pointers, and debugging.

Includes: Experiential Learning Activity
Precludes additional credit for COMP 1005, COMP 1405, IMD 1003, ITEC 1400, NET 1000 and PLT 1000.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial/laboratory three hours a week.

BIT 2000 [0.5 credit]

Introduction to Statistics
This course covers data analysis, introduction to probability theory, some standard discrete and continuous distributions and their application to interval estimation and significance testing, computational aspects of statistics.

Includes: Experiential Learning Activity
Precludes additional credit for BIT 2100 (no longer offered), BIT 2300 (no longer offered), ECON 2201 (no longer offered), ECON 2210, ENST 2006, GEOG 2006, STAT 2507, STAT 2606, and STAT 3502.
Prerequisite(s): restricted to students in the BIT degree program.
Lectures three hours a week, tutorial/laboratory one hour a week.

BIT 2001 [0.5 credit]

Introduction to Business
An overview of the most fundamental business functions. The management of people, human resources, marketing, accounting and finances, business law and operations.

Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures: three hours a week.
BIT 2002 [0.5 credit]
Marketing in the IT sector
Basic problems and practices in marketing. Marketing strategies, planning, packaging, branding and promotion at the level of the individual firm; distribution channels. Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week.

BIT 2006 [0.5 credit]
Elective
Students must choose from among a list of approved Electives at Algonquin College.
Precludes additional credit for BIT 3003 (no longer offered).
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week, or as arranged.

BIT 2008 [0.5 credit]
Multimedia Data Management
Concepts and fundamentals of database systems. Design of relational databases, normalisation, referential integrity, structured query language (SQL), server-side scripting, organisation of multimedia content, dynamic page loading, storage and compression of media, media network considerations, digital watermarking and rights management. Includes: Experiential Learning Activity
Precludes additional credit for ITEC 2000, IMD 2000 (no longer offered), IRM 2000 (no longer offered).
Prerequisite(s): BIT 1400 and IMD 1005 or IRM 1005.
Lecture three hours a week, tutorial/laboratory two hours a week.

BIT 2010 [0.5 credit]
Differential Equations & Multivariate Calculus
Prerequisite(s): BIT 1200.
Lectures three hours a week, tutorial one hour a week.

BIT 2400 [0.5 credit]
Intermediate Programming
Introduction to object-oriented programming using C++ language. Topics include detailed study of pointers and structures, encapsulation of data and code through objects and classes, inheritance, polymorphism, object-oriented program design, class libraries, user interface objects and event-driven systems. Includes: Experiential Learning Activity
Prerequisite(s): BIT 1400. Restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial/laboratory three hours a week.

BIT 3999 [0.0 credit]
Co-operative Work Term
Includes: Experiential Learning Activity

BIT 4000 [0.5 credit]
Directed Studies
Independent study under the supervision of a member of the School of Information Technology, open only to students in the B.I.T. program. Students are required to obtain their supervisor's written approval prior to registration and are limited to one such course in their program. Includes: Experiential Learning Activity
Prerequisite(s): permission of the School of Information Technology.

BIT 4001 [0.5 credit]
Selected Topics in Information Technology
Topics not ordinarily treated in the regular course program due to their contemporary subject matter. The choice of topics varies from year to year.
Prerequisite(s): third-year standing in the BIT Program or permission of the department.
Lecture three hours a week.

Interactive Multimedia and Design (IMD) Courses

IMD 1000 [0.5 credit]
Introduction to Interactive Multimedia Design
Overview of interactive multimedia design including copyright, user-centred design, web design and markup languages, general logic design, multimedia project management, design processes for animated film, video game development, visual effects in movies, ethics and current trends in the field. Includes: Experiential Learning Activity
Precludes additional credit for ITEC 1100.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lecture three hours a week.
IMD 1001 [0.5 credit]
Visual Communication
Visual communication techniques commonly used to draft concepts and ideas to support scripts for film, animation, HCI, and/or game development. Topics include: storyboarding, composition, vanishing point, line quality, visual timing, perspective, depth of field, body language and life drawing. A digital drawing tablet is required. Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Workshop three hours a week.

IMD 1002 [0.5 credit]
Visual Dynamics
Fundamentals of composition with emphasis on realistic rendering. Students learn how to execute thumbnails and design comprehensives. Topics include illustration, type, colour, texture, proximity and unity, alignment, repetition and continuity, contrast, size relationships, balance, rhythm, negative space, cropping and view selection.
Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Workshop three hours a week.

IMD 1004 [0.5 credit]
Design Processes
Design fundamentals using industry standard software techniques and workflow are explored. Topics include: gestalt principles, grids systems, colour, texture, raster and vector image production, and typography. Students design for publication to output such as Web, print, and electronic book formats. Required digital drawing tablet.
Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Workshop three hours a week.

IMD 1005 [0.5 credit]
Web Development
Introduction to Web development. Combining graphics, text, audio, and video to create Web sites; developing different, major working Web sites on an individual basis and in groups, using valid xHTML, cascading style sheets (CSS), JavaScript and XML structures.
Includes: Experiential Learning Activity
Prerequisites: additional credit for ITEC 1005.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Workshop five hours a week.

IMD 2003 [0.5 credit]
Audio and Video
The creation, production and editing of audio and video for multimedia applications. Topics include single camera recording and capture techniques through to post-production editing. Emphasis is placed on production and operation skills while adhering to industry standard costs and deadlines.
Includes: Experiential Learning Activity
Prerequisite(s): second-year standing in the IMD program.
Workshop four hours a week.

IMD 2006 [0.5 credit]
Introduction to Computer Games
Basic concepts in the design and development of computer games, including: fundamentals of production cycle, genres, gameplay and game mechanics, story and character development, level design, artificial intelligence for games, game user interface, and common development tools.
Includes: Experiential Learning Activity
Prerequisite(s): BIT 2400 and second-year standing in the IMD program.
Lecture three hours a week, tutorial/laboratory two hours a week.

IMD 2007 [0.5 credit]
Intro to 3D Animation
Introduction to the basics of 3D computer animation. Topics include: introduction of 3D animation packages, 12 Principles of Animation, character design, character animation (walking/locomotion, motion, and poses), soft-body animation (shape interpolation and facial animation), and acting for animators.
Includes: Experiential Learning Activity
Prerequisites: additional credit for IMD 2005 (no longer offered).
Prerequisite(s): IMD 1001 and second-year standing in the IMD program.
Lecture/workshop three hours a week.

IMD 2900 [1.0 credit]
Design Studio 1
Advanced practical studio-based sessions in project management and web development. Topics include: project management styles, team collaboration techniques, prototyping, project and content management, marketing, testing, and product evaluation culminating into a major group web project using client-side and server-side technologies.
Includes: Experiential Learning Activity
Prerequisite(s): second-year standing in the IMD program.
Studio/lecture eight hours a week.
IMD 3002 [0.5 credit]
3D Computer Graphics
Technical aspects of 3D computer graphics. Homogeneous transformations, viewing pipeline, cinematography, modeling techniques (explicit and implicit), scene composition, level of detail methods, advanced lighting techniques (BRDF, IBL, subsurface-scattering), 2D/3D texturing, local/global illumination, match-moving, rendering methods, and shaders.
Includes: Experiential Learning Activity
Prerequisite(s): BIT 1101, BIT 2400 and IMD 3900.
Lectures three hours a week, tutorial/laboratory two hours per week.

IMD 3004 [0.5 credit]
Human Computer Interaction and Design
Introduction to concepts centered on Human-Computer Interaction from hardware and software perspectives. Topics include design principles, usability principles and engineering, solving user-centred problems, device interaction, and graphical user interface design (2D and 3D interfaces).
Includes: Experiential Learning Activity
Prerequisite(s): third-year standing in the IMD program.
Lectures three hours a week.

IMD 3005 [0.5 credit]
Sensor-Based Interaction
Development of interactive applications that connect the physical and virtual space. Topics include using external devices and sensor hardware, sensing objects and people, gestural input, computer vision, processing of live audio input, and networked software and devices.
Includes: Experiential Learning Activity
Precludes additional credit for IMD 2001 (no longer offered).
Prerequisite(s): BIT 2400.
Lecture/ workshop four hours a week.

IMD 3006 [0.5 credit]
Software Design for Multimedia Applications
Provides students with knowledge and expertise to design and develop complex software systems and programs for common multimedia applications. Topics include: data structures, system and requirement analysis, component identification, common design patterns, and working with reusable components.
Includes: Experiential Learning Activity
Prerequisite(s): BIT 2400.
Lecture three hours a week, tutorial/laboratory two hours a week.

IMD 3000 [1.0 credit]
Design Studio 2
Intermediate practical studio sessions covering the creative aspects of 3D graphics and animation. Topics include: environment and character modeling, texturing, using bump/displacement maps, advanced materials, 3D cameras, various lighting, keyframe animation, and rendering methods.
Includes: Experiential Learning Activity
Prerequisite(s): IMD 2007 and third-year standing in the IMD program.
Studio/lecture eight hours a week.

IMD 3901 [1.0 credit]
Design Studio 3
Studio-based course focuses on interdisciplinary group work, and the use of reality-based/ natural-based interfaces for multiuser interaction, understanding social and environmental context in physical design, basic networking, advanced sound design, and haptic feedback.
Includes: Experiential Learning Activity
Prerequisite(s): third-year standing in the IMD program, IMD 2900 and IMD 3005.
Studio/lecture eight hours a week.

IMD 4002 [0.5 credit]
Technology and Culture
An examination of the relationship between communication technology and society. The course examines the factors that contribute to changes in the collection, storage and distribution of information and the cultural implications of these changes.
Includes: Experiential Learning Activity
Prerequisite(s): third-year standing in the IMD program.
Seminar three hours a week.

IMD 4005 [0.5 credit]
Advanced Topics in Multimedia
Advanced topics in multimedia industry not ordinarily treated in the regular course program due to their contemporary subject matter. The choice of topics varies from year to year.
Includes: Experiential Learning Activity
Precludes additional credit for IMD 4004 (no longer offered).
Prerequisite(s): fourth-year standing in the IMD program.
Lecture three hours a week.

IMD 4006 [0.5 credit]
Advanced Computer Gaming
Provides students with knowledge and expertise to design and develop professional computer games with advanced and novel features. Topics include: target audience and inclusive/accessible design, interaction design and emerging technologies, artificial intelligence, interactive stories, procedural content generation, serious games and gamification.
Includes: Experiential Learning Activity
Prerequisite(s): IMD 2006 and IMD 3002.
Lecture three hours a week, tutorial/laboratory two hours a week.
IMD 4007 [0.5 credit]
Advanced Animation and Visual FX
Advanced topics in animation and visual FX, covering the more technical aspects, including: match-moving, image-based lighting, chromakeying, motion capture of face and body, character rigging (Forward/Inverse kinematics, controls, weighting), retargeting, particle systems, and dynamic systems (cloth, fluid, and hair).
Includes: Experiential Learning Activity
Precludes additional credit for IMD 4003 (no longer offered).
Prerequisite(s): IMD 2007, IMD 3002 and IMD 3900. Lecture three hours a week, tutorial/laboratory two hours a week.

IMD 4008 [0.5 credit]
Mobile User Interface Design and Development
Design, development, and evaluation of user interfaces for mobile applications. Topics include: user-centered design methods and develop mobile applications employing the various input and output capabilities available on mobiles, e.g., multi-touch, device motion/rotation, video/audio capture, vibration.
Includes: Experiential Learning Activity
Prerequisite(s): IMD 3004 and IMD 3006. Lecture three hours a week, tutorial/laboratory two hours a week.

IMD 4901 [1.5 credit]
Senior IMD Project
Student-initiated design project, developed in association with a project supervisor, and external industry advisor, supported by a written report (with printed and electronic versions), seminar discussions, and appropriate methods of two and/or three-dimensional representation. All proposals must be approved by the Program Project Committee.
Includes: Experiential Learning Activity
Prerequisite(s): IMD 2900, IMD 3900, IMD 3901 and fourth-year standing in the IMD program.
Tutorial hours arranged.

Network Technology (NET) Courses
NET 1001 [0.5 credit]
Computer Technology Basics
Construction and function of PCs. Introduces technical concepts and terminology relating to system boards, system busses, input/output devices, memory, microprocessors and peripherals. Interaction of software and hardware; data storage; performance issues.
Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures two hours a week, tutorial/laboratory two hours a week.

NET 1002 [0.5 credit]
Networking Fundamentals
Foundation knowledge for computer networks and communications. Topics include basic network design, layered communications models, IP addressing and subnets, and industry standards for networking media and protocols, with an emphasis on TCP/IP protocol suite and Ethernet environments.
Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 1006 [0.5 credit]
Routing and Switching
Introduction to routing and switching concepts including, static and dynamic routing, trunking and VLANs. Topics include configuring routers and switches and resolving common configuration and reachability issues.
Includes: Experiential Learning Activity
Precludes additional credit for NET 1005 (no longer offered).
Prerequisite(s): NET 1002.
Lecture three hours a week, tutorial/laboratory three hours a week.

NET 2000 [0.5 credit]
Intermediate Networking
Architecture, components and operations of routers and switches in larger and more complex networks. Topics include configuration and troubleshooting of OSPF (with introduction to multi-area), EIGRP, STP, redundancy techniques and WiFi in SOHO environments.
Includes: Experiential Learning Activity
Prerequisite(s): NET 2000.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 2001 [0.5 credit]
Wide Area Networking
Theory and technologies extending LANs to WANs including the relevant networking architectures and services. Data link protocols for WAN, network security, tunneling, VPNs and network monitoring, with a focus on implementation and troubleshooting.
Includes: Experiential Learning Activity
Prerequisite(s): NET 2000.
Lectures three hours a week, tutorial/laboratory two hours a week.
NET 2002 [0.5 credit]
Desktop and Server Environments
Windows Server features such as file system, system utilities, memory management, boot process troubleshooting and UI customizations. Client-server architecture is examined with a focus on server configuration and administration, connection to a domain, remote desktop, and services including DHCP, DNS and Active Directory.
Includes: Experiential Learning Activity
Prerequisite(s): NET 1001.
Lecture two hours a week, tutorial/laboratory two hours a week.

NET 2003 [0.5 credit]
Linux Networking
Introduction to Unix and Linux operating systems, the command line, network server operating environments. Students study Unix/Linux as a network server, including the configuration of services and protocols such as DNS, NTP, SSH, SMB, SMTP, POP3, IMAP, HTTP, and DHCP. Basic server security/firewalls are introduced.
Includes: Experiential Learning Activity
Prerequisite(s): NET 2002.
Lecture two hours a week, tutorial/laboratory two hours a week.

NET 2007 [0.5 credit]
Basics of Transmission Systems
Introduction to the physical layer of digital communication. Coverage of the transmission media (copper, fiber, cable, wireless), modulation, coding, equalization and synchronization. Examples: dial up modems, ADSL, Ethernet, T-carrier, Cable modem, SONET and wireless LAN. Factors affecting transmission error rates. Lab and field test equipment.
Includes: Experiential Learning Activity
Prerequisite(s): BIT 1001 and BIT 1007.
Lectures three hours a week, tutorial/laboratory three hours a week.

NET 2008 [0.5 credit]
DevOps
Exposure to unifying software development (Dev) and software operation (Ops). Use of Python to monitor and automate network management tasks.
Prerequisite(s): BIT 2400.
Lectures three hours a week, tutorial/laboratory three hours a week.

NET 2009 [0.5 credit]
Assembly and Machine Language
Structured approach to assembly language programming. Topics include data and address registers, data and address busses, condition code register and stack pointers, machine code format, instruction sizes, operand encoding, translation of source code into machine language, and how the processor executes instructions. Also listed as PLT 2009.
Precludes additional credit for NET 1004 (no longer offered), PLT 1007 (no longer offered).
Prerequisite(s): BIT 2400.
Structured approach to assembly language programming. Topics include data and address registers, data and address busses, condition code register and stack pointers, machine code format, instruction sizes, operand encoding, translation of source code into machine language, and how the processor executes instructions.
Lectures three hours a week, tutorial/laboratory one hour a week.

NET 3000 [0.5 credit]
Database Concepts and SQL
Concepts and fundamentals of relational database systems. Students learn how to design relational databases starting from a conceptual data model, following accepted logical and physical design principles. Topics include normalisation, referential integrity, SQL, DDL and SQL DML & ODBC and data extraction/filtering techniques.
Includes: Experiential Learning Activity
Prerequisite(s): NET 2009.
Lecture two hours a week, tutorial/laboratory two hours a week.

NET 3001 [0.5 credit]
Real-time Systems
Includes: Experiential Learning Activity
Also listed as PLT 3002.
Prerequisite(s): NET 2009.
Lectures three hours a week, tutorial/laboratory two hours a week.
NET 3004 [0.5 credit]
Data Structures
Includes: Experiential Learning Activity
Precludes additional credit for PLT 3010.
Prerequisite(s): BIT 2400.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 3006 [0.5 credit]
Network Management and Measurements
Key network management models (FCAPS, TMN), protocols and standards, such as SNMP. Introduction to and use of various management tools and methodologies. Current trends in network management and measurement. Security issues in collecting networking management information.
Includes: Experiential Learning Activity
Prerequisite(s): NET 3000 and NET 3004.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 3007 [0.5 credit]
Network Security
Basics of network security. Students are introduced to the goals of IT security, common threats and countermeasures including firewalls, intrusion detection and prevention systems (IDPS) and virtual private networks. Several operating environments will be studied as examples. Also includes a section on computer ethics.
Includes: Experiential Learning Activity
Prerequisite(s): NET 2001.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 3008 [0.5 credit]
Advanced Network Routing
Routing IP at the enterprise level, within and between, autonomous systems. Advanced control and optimization of routing protocols and manipulation of traffic paths with a focus on multi-area OSPF and EIGRP. Working knowledge of Internet reachability via BGP.
Includes: Experiential Learning Activity
Prerequisite(s): NET 2001.
Lectures three hours a week, tutorial/laboratory three hours a week.

NET 3010 [0.5 credit]
Web Programming
Architectures, protocols and languages used to develop dynamic Web content, including HyperText Markup Language (HTML, DHTML), Universal Resource Identifiers (URI) and HyperText Transport Protocol (HTTP) and Common Gateway Interface (CGI). JavaScript and Java are used to model cross-platform Web programming.
Includes: Experiential Learning Activity
Prerequisite(s): BIT 2400, NET 3000.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 3011 [0.5 credit]
Advanced Network Switching
Includes: Experiential Learning Activity
Prerequisite(s): NET 3001.
Lectures three hours a week, tutorial/laboratory three hours a week.

NET 3012 [0.5 credit]
IP Architectures and Solutions
An exploration of various deployment options that can be implemented atop an IP network core. The focus is on techniques, technologies and architectures that serve to enhance IP delivery and connectivity, or provide a service leveraging the IP infrastructure. Includes Layer 2 and 3 VPNs.
Includes: Experiential Learning Activity
Prerequisite(s): NET 3008.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 3900 [0.5 credit]
Wireless Networks
Design and configuration of Wi-Fi networks as used in commercial and enterprise venues. Topics include 802.11 family of protocols, wireless transmission, RF design, security methods and protocols, and system design. Topologies include campus, bridge and remote access.
Includes: Experiential Learning Activity
Prerequisite(s): NET 2007.
Lectures two hours a week, tutorial/laboratory three hours a week.
NET 4000 [0.5 credit]  
Emerging Network Technologies  
Overview of technologies, protocols and techniques related to Information Technology networking that are either in their early stage of adoption or are not yet mainstream (i.e. beta or prototype stage). Focus will vary from year to year to reflect the evolutionary nature of this domain.  
Includes: Experiential Learning Activity  
Prerequisite(s): fourth-year standing in the Networking program or permission of the instructor.  
Also offered at the graduate level, with different requirements, as ITEC 5110, for which additional credit is precluded.  
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 4001 [0.5 credit]  
Network Simulation  
Introduction to discrete event simulation; fundamental stochastic models for networking; queueing theory; deterministic algorithms for networking; confidence intervals; introduction to network modeling. Use of simulation tools to develop and test scenarios including traffic monitoring, congestion, routing protocols, resource utilization and growth planning.  
Includes: Experiential Learning Activity  
Prerequisite(s): BIT 2000.  
Also offered at the graduate level, with different requirements, as ITEC 5113, for which additional credit is precluded.  
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 4003 [0.5 credit]  
Computer Systems Architecture  
Includes: Experiential Learning Activity  
Prerequisite(s): third year standing in the Networking program, NET 2003 and NET 3001.  
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 4005 [0.5 credit]  
Networked Applications  
Architectures for computing in modern data networks that adopt the Internet architecture. Topics covered include socket programming, RPC and RMI. Client-server and peer-to-peer models. Emerging application architectures.  
Includes: Experiential Learning Activity  
Prerequisite(s): NET 3004 and NET 3010.  
Also offered at the graduate level, with different requirements, as ITEC 5114, for which additional credit is precluded.  
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 4007 [0.5 credit]  
Multimedia Networking  
Includes: Experiential Learning Activity  
Prerequisite(s): fourth-year standing in Networking program or permission of the instructor.  
Also offered at the graduate level, with different requirements, as ITEC 5111, for which additional credit is precluded.  
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 4009 [0.5 credit]  
Troubleshooting IP Networks  
Integrates planned maintenance and troubleshooting techniques, including, tools, applications and formalized methodologies. Study of issues in focused areas (such as routed vs. switched environments, addressing services, performance, security, multimedia), culminating in problem resolution throughout a complex enterprise network.  
Includes: Experiential Learning Activity  
Prerequisite(s): NET 3011, NET 3008.  
Lectures three hours a week, tutorial/laboratory three hours a week.

NET 4010 [0.5 credit]  
Secure Mobile Networking  
The concept, principle and rationale of mobile networking. Mobile network architecture, protocols, mobility management, routing and mobile TCP/IP; Security challenges, vulnerabilities and threats in mobile networks; Security defense techniques and countermeasures in mobile networks.  
Includes: Experiential Learning Activity  
Prerequisite(s): fourth-year standing in Networking program or permission of the instructor.  
Also offered at the graduate level, with different requirements, as ITEC 5112, for which additional credit is precluded.  
Lectures three hours a week, tutorial/laboratory one hour a week.

NET 4011 [0.5 credit]  
Advanced Topics in Network Security  
Prerequisite(s): NET 3007.  
Lectures three hours a week, tutorial/laboratory two hours a week.
NET 4901 [1.0 credit]
Network Technology Project
This course provides the opportunity to apply knowledge gained in previous courses towards the design and implementation of a major Networking related project. Working in teams or as individuals under the direction of faculty members, students undertake projects internally or in collaboration with industry.
Includes: Experiential Learning Activity
Prerequisite(s): fourth-year standing in the Networking program.
Tutorial hours arranged.

Photonics and Laser Technology (PLT) Courses

PLT 1002 [0.5 credit]
Applications in Photonics & Optoelectronics
Survey of the history and future of photonics. Photonics benefits and impact on technology and society. Emerging applications of photonics in industry and commercial products. The forces (business, social, political, economic, technical, and educational) that influence the development, adoption and success or failure of technologies.
Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures two hours a week, tutorial/laboratory two hours a week.

PLT 1003 [0.5 credit]
Optics/Optical Fibers I (Principles)
Principles of optics, optical fiber, waveguides and hands-on experience with optical components. Optical fiber manufacturing and variety of industrial applications. Topics covered include: optical sources, detectors, fiber modes and mode-coupling, couplers, multiplexers, optical amplifiers, physical layer of optical networks, dispersion and nonlinear effects management.
Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures / laboratory or tutorial four hours a week.

PLT 1005 [0.5 credit]
Introduction to Optics
Physics of waves, optics and light propagation through lectures and lab experiments. Geometrical optics, refraction and reflection, interference, diffraction and polarization, thin lens equation, laser beams, Michelson interferometer, birefringence, and Abbe theory of imaging. Electromagnetic spectrum, quantum nature of light, photons, and photoelectric effect.
Includes: Experiential Learning Activity
Prerequisite(s): BIT 1203, restricted to students in the B.I.T. degree program.
Lectures / laboratory or tutorial five hours a week.

PLT 1006 [0.5 credit]
Introduction to Automation and Simulation
Introduction to basic programming in both the Matlab and Labview environments. Program development, basic structures (loops, control structures), I/O, data visualization and graphing will be covered. Students will learn to use Labview to develop basic applications and model simple physical systems with Matlab.
Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures two hour a week, tutorial/laboratory two hours a week.

PLT 2001 [0.5 credit]
Fundamentals of Light Sources
Introduction to incoherent light sources and lasers. Lasers operation, energy levels, quantum mechanics basics. Pumping/excitation, population inversion, laser cavity design, gain and loss, and characteristics of laser emission. An extensive lab manual of relevant experiments, variety of lasers, spectrometers, and detection equipment will be used.
Includes: Experiential Learning Activity
Prerequisite(s): BIT 1201. Restricted to students in the BIT degree program.
Lectures two hours a week, tutorial/laboratory two hours a week.

PLT 2002 [0.5 credit]
Optical Communication Networks I
Fiber-laser implementation and optical networks, topologies, OSI, SONET/SDH, synchronous payload envelope, virtual tributaries, optimized mapping techniques, and optical carriers (OC-n/STM-m). Extensive lab manual and hands-on experience using state-of-the-art Optophotonics Lab to work on OAM; P, facility/equipment, synchronization, bandwidth management, and performance monitoring and other functionalities.
Includes: Experiential Learning Activity
Prerequisite(s): PLT 1003.
Lectures two hours a week, tutorial/laboratory three hours a week.

PLT 2003 [0.5 credit]
Laser Systems
Laser theory, devices and systems. Safety procedures, laser power supplies, and laser system applications. Solid state, gas, and other types of lasers. Basic material processing, micro machining, bio/medical, and military applications will be covered. Hands-on experience with advanced laser equipment in lab.
Includes: Experiential Learning Activity
Prerequisite(s): PLT 2001.
Lectures two hours a week, tutorial/laboratory two hours a week.
PLT 2005 [0.5 credit]  
Circuits and Signals  
Students learn properties of electricity and measurement techniques. Topics covered include RMS, average, applied, peak-to-peak and instantaneous values. Lab experiments deal with RC and RL circuits and LC filters. RLC circuits, and series and parallel resonance are also covered.  
Includes: Experiential Learning Activity  
Prerequisite(s): BIT 1204 or PHYS 1004 or PHYS 1002  
Restricted to students in the BIT degree program.  
Lectures two hours a week, laboratory and problem analysis three hours a week.

PLT 2006 [0.5 credit]  
Integrated Circuits  
Fundamentals of logic circuitry in digital systems are studied including basic logic gates, Boolean algebra, signal decoding, logic circuit design, flip-flop circuits, timers and counters. The proper use of semi-conductor components is demonstrated through the use of laboratory experiments.  
Includes: Experiential Learning Activity  
Precludes additional credit for ELEC 2507.  
Prerequisite(s): PLT 2005. Restricted to students in the B.I.T. degree program.  
Lectures two hours a week, laboratory and problem analysis three hours a week.

PLT 2008 [0.5 credit]  
Manufacturing Photonics Components  
Manufacturing techniques and methods used to produce photonics components and devices/systems. Micro assembly, adhesives, optical tests and measurement, lean manufacturing and quality control standards (Telcordia). Laboratory exposure to optical component production processes: grinding, polishing, coating, mounting, tolerance and accuracy.  
Includes: Experiential Learning Activity  
Precludes additional credit for PLT 1004 (no longer offered).  
Prerequisite(s): PLT 1002. Restricted to students in the B.I.T. degree program.  
Lectures / laboratory or tutorial four hours a week.

PLT 2009 [0.5 credit]  
Assembly and Machine Language  
Structured approach to assembly language programming. Topics include data and address registers, data and address busses, condition code register and stack pointers, machine code format, instruction sizes, operand encoding, translation of source code into machine language, and how the processor executes instructions.  
Also listed as NET 2009.  
Precludes additional credit for PLT 1007 (no longer offered), NET 1004 (no longer offered).  
Prerequisite(s): BIT 2400.  
Lectures three hours a week, tutorial/laboratory one hour a week.

PLT 2010 [0.5 credit]  
Signals and Systems  
This course provides a solid theoretical foundation for the analysis and processing of experimental data, and real-time experimental control methods. Topics include various properties of signals and systems, convolution, the Fourier transform, sampling theorem, z-transform, spectral analysis, filter design, and system identification.  
Prerequisite(s): BIT 1200 and BIT 1201.  
Lectures three hours a week, tutorial one hour a week.

PLT 3000 [0.5 credit]  
Optical Communication Networks II  
Operation, management and maintenance of metro/long haul optical network elements and systems. Hands-on skills using GUI, Transaction Language One (TL1), optical network management to perform line and path protection, alarm provisioning, security and data communications, optical network backup and restore, load upgrade and installation management.  
Includes: Experiential Learning Activity  
Prerequisite(s): PLT 2002.  
Lectures two hours a week, tutorial/laboratory three hours a week.

PLT 3002 [0.5 credit]  
Real-time Systems  
Includes: Experiential Learning Activity  
Also listed as NET 3001.  
Prerequisite(s): PLT 2009.  
Lectures three hours a week, tutorial/Laboratory two hours a week.

PLT 3003 [0.5 credit]  
Fundamentals of Electromagnetics  
Review of basic vector calculus followed by an introduction to electrostatics and magnetostatics. Maxwell’s equations and EM wave solutions. EM waves in dielectrics media, reflection, refraction, Fresnel relations and Brewster angle. Introduction to guided waves emphasizing slab waveguides.  
Includes: Experiential Learning Activity  
Prerequisite(s): BIT 1204 and BIT 2010.  
Lecture and tutorial three hours a week.
PLT 3004 [0.5 credit]
Design of Optical Components and Systems
Prerequisite(s): PLT 1003.
Lectures / laboratory or tutorial five hours a week.

PLT 3008 [0.5 credit]
Communication Skills for PLT
Development of competence in written and oral communication. Focus on technical reports, proposals, and other related project documents; formal and informal oral presentations.
Includes: Experiential Learning Activity
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lecture and tutorial three hours a week.

PLT 3009 [0.5 credit]
Project Management
Identification, selection, initiation, and organization of projects. Risk assessment, budget issues, communication, project scheduling, performance monitoring and control. Emphasis on practical techniques related to the field of photonics using case studies.
Includes: Experiential Learning Activity
Prerequisite(s): third year standing in the Photonics and Laser Technology program.
Lectures two hours a week, tutorial/laboratory two hours a week.

PLT 3010 [0.5 credit]
Data Structures
Includes: Experiential Learning Activity
Precludes additional credit for NET 3004.
Prerequisite(s): BIT 2400.
Lectures three hours a week, tutorial/laboratory two hours a week.

PLT 3012 [0.5 credit]
Digital Signal Processing
Operations-related topics including: sampling/reconstruction of continuous time signals, Fourier and Z-transforms, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT). Examination of other time and frequency domain techniques for designing and applying infinite impulse response (IIR) and finite impulse response (FIR) digital filters.
Prerequisite(s): PLT 2010.
Lectures three hours a week, tutorial one hour a week.

PLT 3013 [0.5 credit]
Software Design for Optical Systems and Sensors
Provides students with knowledge and expertise to design and develop complex software systems and programs for common optical systems and sensors. Topics include: system and requirement analysis, algorithms, component identification, common design patterns, and working with reusable components.
Prerequisite(s): BIT 2400.
Lectures three hours a week, tutorial two hours a week.

PLT 3014 [0.5 credit]
Optical Waves, Waveguides, and Sensors
Analysis of guided-wave propagation and sensors. Topics include Maxwell’s time-dependent wave equations, dielectric waveguides (slab, planar, segmented, rib, strip), optical fibres (modes, dispersion relations, propagation in dispersive media, nonlinear fibres), beam propagation methods, free space beam propagation, waveguide devices, and study of sensors technology.
Prerequisite(s): PLT 3003.
Lectures three hours a week, tutorial two hours a week.

PLT 4001 [0.5 credit]
Optoelectronic Devices
Includes: Experiential Learning Activity
Prerequisite(s): PLT 3004.
Lectures two hours a week, tutorial/laboratory two hours a week.

PLT 4004 [0.5 credit]
Medical Imaging and Biosensors
Biological and medical photonics. Effect of light on biological systems, medical imaging, medical treatments, biological research and bio/medical applications. Laser manipulation of cells, laser surgery, and photo-therapy. Biophotonic lab experiments with scanning confocal microscopes, endoscopes, DNA scanners.
Includes: Experiential Learning Activity
Prerequisite(s): PLT 3003.
Lectures two hours a week, tutorial/laboratory two hours a week.
PLT 4006 [0.5 credit]
**Image Processing**
Developing and evaluating algorithms for extracting the necessary information signals. Topics include filter design, fast transforms, adaptive filters, spectrum estimation and modeling, sensor array processing, image processing, motion estimation from images, applications in biomed, computer-aided tomography, image restoration, robotic vision, and pattern recognition.
Includes: Experiential Learning Activity
Prerequisite(s): BIT 2400.
Lectures two hours a week, tutorial/laboratory two hours a week.

PLT 4008 [0.5 credit]
**Remote Sensing**
Introduction to the basics of remote sensing, characteristics of remote sensors, and applications. Topics include: image acquisition and data collection, LIDAR sensors and platforms and derived digital products, imagery analysis, topographic mapping, and 3D modeling of urban infrastructure for autonomous vehicles.
Prerequisite(s): PLT 3014.
Lectures three hours a week, tutorial two hours a week.

PLT 4009 [0.5 credit]
**Computer Vision**
Introduction to topics in computer vision, including: fundamentals of image formation, camera imaging geometry, camera models, camera calibration, structure from motion, feature detection and matching, depth and stereo, image stabilization, image classification, automated alignment, scene understanding, recognition, and image searching.
Prerequisite(s): PLT 4006.
Lectures three hours a week, tutorial two hours a week.

PLT 4900 [1.0 credit]
**Photonics Research Project**
Research project develops students' ability to direct own learning and pursue advanced study in variety of subjects. Select topic, perform literature search, theoretical background, preliminary measurements, calculations, and design. Present findings in a preliminary thesis. Encourage writing technical papers. Research opportunities with industry and academia.
Includes: Experiential Learning Activity
Prerequisite(s): fourth-year standing.
Tutorial hours arranged.

**Summer session:** some of the courses listed in this Calendar are offered during the summer. Hours and scheduling for summer session courses will differ significantly from those reported in the fall/winter Calendar. To determine the scheduling and hours for summer session classes, consult the class schedule at central.carleton.ca

Not all courses listed are offered in a given year. For an up-to-date statement of course offerings for the current session and to determine the term of offering, consult the class schedule at central.carleton.ca