Information Technology

Graduation Requirements

In addition to the requirements listed below, students must satisfy the University regulations, including:

1. the process of Academic Performance Evaluation (see the *Academic Regulations of the University* section of this Calendar).
2. the common regulations applying to all B.I.T. students (see the *Academic Regulations for the Bachelor of Information Technology Degree*).

Students should consult the School when planning their program and selecting courses.

Academic Standing in B.I.T.

Students in the BIT are subject to the process of Academic Performance Evaluation as specified for General programs of 20.0 credits.

In addition, *Good Standing* in the IMD program requires a Core CGPA of at least 4.5 in the core constituted as:

BIT 1400 [0.5]	Introduction to Programming and Problem Solving
IMD 1000 [0.5]	Introduction to Interactive Multimedia Design
IMD 1001 [0.5]	Graphic Design
IMD 1002 [0.5]	Visual Dynamics
IMD 1004 [0.5]	Software Tools
IMD 1005 [0.5]	Web Development
IMD 2900 [1.0]	Design Studio 1
IMD 3900 [1.0]	Design Studio 2
IMD 3901 [1.0]	Design Studio 3
IMD 4901 [1.5]	Senior IMD Project
IMD 4902 [1.0]	Design Studio 4

Course Categories

Electives

- Carleton University Electives
- Algonquin college Electives

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

Program Requirements

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

A. Credits Included in the Major CGPA (13.5 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]	Graphic Design	
IMD 1002 [0.5]	Visual Dynamics	
IMD 1004 [0.5]	Software Tools	
IMD 1005 [0.5]	Web Development	
2. 3.0 credits in:		3.0
BIT 2400 [0.5]	Intermediate Programming	
IMD 2000 [0.5]	Multimedia Data Management	
IMD 2003 [0.5]	Audio and Video	
IMD 2005 [0.5]	Motion Graphics	
IMD 2900 [1.0]	Design Studio 1	
3. 4.0 credits in:		4.0
IMD 3001 [0.5]	Aspects of Product Design Methodology	
IMD 3002 [0.5]	3D Computer Graphics	
IMD 3004 [0.5]	Human Computer Interaction and Design	
IMD 3005 [0.5]	Sensor-Based Interaction	
IMD 3900 [1.0]	Design Studio 2	
IMD 3901 [1.0]	Design Studio 3	
4. 3.5 credits in:		3.5
IMD 4003 [0.5]	3D Computer Animation	
IMD 4005 [0.5]	Advanced Topics in Multimedia	
IMD 4901 [1.5]	Senior IMD Project	
IMD 4902 [1.0]	Design Studio 4	

B. Credits Not Included in the Major CGPA (6.5 credits)

5. 1.5 credit in:		1.5
BIT 1002 [0.5]	Physics for Information Technology I	
BIT 1100 [0.5]	Mathematics I for IMD	
BIT 1101 [0.5]	Mathematics II for IMD	
6. 2.0 credits in:		2.0
BIT 2001 [0.5]	Introduction to Business	
BIT 2002 [0.5]	Marketing in the IT sector	
BIT 2006 [0.5]	Elective	
BIT 2100 [0.5]	Introduction to Statistics for IMD	
7. 0.5 credit in:		0.5
IMD 3003 [0.5]	Communication Skills for IMD	
8. 0.5 credit in:		0.5
IMD 4002 [0.5]	Technology and Culture	
9. 2.0 credits in electives for IMD, and/or		2.0
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 his or her 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 (9.0 credits)

1. 2.5 credits in:		2.5
BIT 1000 [0.5]	Mathematics I for NET	
BIT 1002 [0.5]	Physics for Information Technology I	
BIT 1400 [0.5]	Introduction to Programming and Problem Solving	
NET 1002 [0.5]	Networking Fundamentals	
NET 1006 [0.5]	Routing and Switching	
2. 1.5 credits in:		1.5
BIT 2400 [0.5]	Intermediate Programming	
NET 2000 [0.5]	Intermediate Networking	
NET 2001 [0.5]	Wide Area Networking	
3. 2.5 credits in:		2.5
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:		2.5
NET 4005 [0.5]	Networked Applications	
NET 4007 [0.5]	Multimedia Networking	
NET 4010 [0.5]	Secure Mobile Networking	
NET 4901 [1.0]	Network Technology Project	

B. Credits Not Included in the Major CGPA (11.0 credits)

5. 3.0 credits in:		3.0
BIT 1001 [0.5]	Mathematics II for NET	
BIT 1003 [0.5]	Physics for Information Technology II	
BIT 1006 [0.5]	Elective	
BIT 2001 [0.5]	Introduction to Business	
NET 1001 [0.5]	Computer Technology Basics	
NET 1004 [0.5]	Assembly and Machine Language	
6. 3.0 credits in:		3.0
BIT 2000 [0.5]	Introduction to Statistics for NET	
BIT 2002 [0.5]	Marketing in the IT sector	
NET 2002 [0.5]	Desktop Operating Environments	
NET 2003 [0.5]	Linux Networking	
NET 2004 [0.5]	Communication Skills for NET	
NET 2007 [0.5]	Basics of Transmission Systems	
7. 2.5 credits in:		2.5
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. 2.0 credits in:		2.0
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	
9. 0.5 credit in Arts and Humanities electives for NET.		0.5
Total Credits		20.0

Photonics and Laser Technology
B.I.T. (20.0 credits)

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

1. 3.0 credits in:		3.0
BIT 1203 [0.5]	Physics for Photonics I	
BIT 1400 [0.5]	Introduction to Programming and Problem Solving	
PLT 1001 [0.5]	Laser Safety, WHMIS and Ethics	
PLT 1002 [0.5]	Trends in Photonics	
PLT 1003 [0.5]	Optics/Optical Fibers I (Principles)	
PLT 1005 [0.5]	Introduction to Optics	
2. 2.0 credits in:		2.0
PLT 2000 [0.5]	Optics/Optical Fibers II (Devices)	
PLT 2003 [0.5]	Laser Systems	
PLT 2005 [0.5]	Circuits and Signals	
PLT 2006 [0.5]	Semiconductors	
3. 2.5 credits in:		2.5
PLT 3003 [0.5]	Electro Magnetics I	
PLT 3004 [0.5]	Design of Optical Components and Systems	
PLT 3005 [0.5]	Introduction to Solid State Physics	
PLT 3006 [0.5]	Physical Electronics	
PLT 3007 [0.5]	Electro Magnetics II	
4. 2.5 credits in:		2.5
PLT 4001 [0.5]	Optoelectronic Devices	
PLT 4002 [0.5]	Applied Advanced Optics	
PLT 4005 [0.5]	Fiber Optic Theory	
PLT 4900 [1.0]	Photonics Research Project	

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

5. 2.0 credits in:		2.0
BIT 1200 [0.5]	Mathematics I for PLT	
BIT 1201 [0.5]	Mathematics II for PLT	
BIT 1204 [0.5]	Physics for Photonics II	
PLT 1004 [0.5]	Manufacturing Photonics Components	
6. 4.0 credits in:		4.0
BIT 2001 [0.5]	Introduction to Business	
BIT 2002 [0.5]	Marketing in the IT sector	
BIT 2004 [0.5]	Differential Equations For Photonics	
BIT 2005 [0.5]	Multivariate Calculus for Photonics	
BIT 2300 [0.5]	Introduction to Statistics for PLT	
BIT 2400 [0.5]	Intermediate Programming	
PLT 2001 [0.5]	Fundamentals of Light Sources	
PLT 2002 [0.5]	Fiber Optics Communications I	
7. 2.0 credits in:		2.0
PLT 3000 [0.5]	Fiber Optics Communications II	
PLT 3001 [0.5]	Photonics Manufacturing Systems	
PLT 3002 [0.5]	Real-time Systems	
PLT 3008 [0.5]	Communication Skills for PLT	
8. 1.5 credits in:		1.5
PLT 4000 [0.5]	Applications of Quantum Physics	
PLT 4003 [0.5]	Materials Science	

PLT 4004 [0.5]	Biomedical Photonics	
9. 0.5 credit in Arts and Humanities electives for PLT.		0.5
Total Credits		20.0

Information Technology (BIT) Courses
School of Information Technology
Faculty of Engineering and Design

BIT 1000 [0.5 credit]
Mathematics I for NET
Tailored for students in the Network Technology program, this course covers differentiation and integration of the elementary functions, definite and indefinite integrals, partial differentiation, sequences, series, and techniques and applications of integration.
Precludes additional credit for BIT 1100, 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.
Precludes additional credit for BIT 1101, 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 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. Restricted to students in the B.I.T. degree program.
Precludes additional credit for PHYS 1007.
Lectures three hours a week, tutorial 1.

BIT 1003 [0.5 credit]
Physics for Information Technology II
Electrostatics, electric field and potential. Capacitors, inductors. Study of DC and AC Circuits. Introduction to semiconductors. Practical skills are learned in the laboratory, which is a required part of the course.
Precludes additional credit for PHYS 1008.
Prerequisite(s): BIT 1002.
Lectures three hours a week, tutorial 1.

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 1100 [0.5 credit]
Mathematics I for IMD
Tailored for students in the interactive Multi-media Design program, this course covers limits, differentiation of the elementary functions, including trigonometric functions.Rules of differentiation.Applications of differentiation: max-min problems, curve sketching, approximations.A brief introduction to integration.
Precludes additional credit for BIT 1000, 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.
Precludes additional credit for BIT 1001, 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 and laboratory one hour a week.

BIT 1200 [0.5 credit]
Mathematics I for PLT
Tailored for students in the Photonics program, this course covers differentiation and integration of the elementary functions, definite and indefinite integrals, partial differentiation, sequences, series, and techniques and applications of integration.
Precludes additional credit for MATH 1002, MATH 1007, MATH 1009, MATH 1107, MATH 1119, MATH 1401, MATH 1402.
Prerequisite(s): restricted to students in the B.I.T. degree program.
three hours a week, tutorial/laboratory one hour a week.

BIT 1201 [0.5 credit]
Mathematics II for PLT
Tailored for students in the Photonics 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.
Precludes additional credit for ECON 1401, ECON 1402, MATH 1104.
Prerequisite(s): 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]
Physics for Photonics I
Mechanics, gravitation, oscillations, and thermodynamics. The application of calculus to solve problems in these areas of physics is introduced. This course is intended for students in the physical sciences and engineering. The laboratory is an essential and autonomous part of the course.
Prerequisite(s): Grade 12 Physics or equivalent, plus Grade 12 Advanced Functions or Grade 12 Advanced Functions and Introductory Calculus or equivalent, plus one of MATH 1004 or MATH 1002 (the MATH course may be taken concurrently). Note that Grade 12 Calculus and Vectors or Grade 12 Geometry and Discrete Mathematics is strongly recommended. 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]
Physics for Photonics II
This calculus-based course introduces electricity, magnetism, oscillations, waves and optics. The laboratory is an essential and autonomous part of the course.
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.
Precludes additional credit for IMD 1003, 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 for NET
Tailored for students in the Network Technology program, 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.
Precludes additional credit for STAT 2507.
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.
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.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week.

BIT 2004 [0.5 credit]
Differential Equations For Photonics
First-order differential equations. Second-order linear equations with constant coefficients, undetermined coefficients, variation of parameters. Systems of equations. Sequences and series, convergence tests, estimation of sums. Power series, Taylor series, remainders. Fourier series.
Lectures three hours a week, laboratory three hours a week.

BIT 2005 [0.5 credit]
Multivariate Calculus for Photonics
Curves and surfaces. Polar, cylindrical and spherical coordinates. Partial derivatives, gradients, extrema and Lagrange multipliers. Exact differentials. Multiple integrals over rectangular and general regions. Integrals over surfaces. Line integrals. Vector differential operators. Green's Theorem, Stokes' theorem, Divergence Theorem. Applications.
Also listed as MATH 2004.
Precludes additional credit for MATH 2008, MATH 2009 and MATH 2000.
Prerequisite(s): BIT 1201 or MATH 1107 and BIT 2004 or MATH 2007. Restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial one hour a week.

BIT 2006 [0.5 credit]
Elective
Lectures three hours a week, or as arranged.

BIT 2100 [0.5 credit]
Introduction to Statistics for IMD
Tailored for students in the interactive Multi-media Design program, 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. Precludes additional credit for STAT 2507.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial/laboratory one hour a week.

BIT 2300 [0.5 credit]
Introduction to Statistics for PLT
Tailored for students in the Photonics program, 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.
Prerequisite(s): restricted to students in the BIT degree program.
Lectures three hours a week, tutorial/laboratory 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.
Precludes additional credit for IMD 2004, NET 2006 and PLT 2004.
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

BIT 4000 [0.5 credit]
Directed Studies
A course of 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 programs.
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.

Inter. Multi Media & Design (IMD) Courses
School of Information Technology
Faculty of Engineering and Design

IMD 1000 [0.5 credit]
Introduction to Interactive Multimedia Design
Overview of interactive multimedia design including copyright, computer architecture, web design and mark-up languages, general logic design, multimedia project management, design process for animated film, video game development, special effects in movies, and current trend analysis in the multimedia field.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lecture three hours a week.

IMD 1001 [0.5 credit]
Graphic Design
Introduction to the graphic design process. Topics include the history of graphic design, principles of design, common layouts, and grid systems. Fundamentals are applied to create effective communication for both print and screen. Industry standard software packages are covered.
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.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Workshop three hours a week.

IMD 1004 [0.5 credit]
Software Tools
Application of vector and raster-based image tools for interface design. Topics include: project planning, scope documents, navigation flowcharts, wireframes, design composites, group dynamics, preparation of assets for production, and tools for client communication.
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.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Workshop five hours a week.

IMD 2000 [0.5 credit]
Multimedia Data Management
Issues regarding the back-end organisation of information and multimedia with a specific focus on databases and database design, server-side scripting, the structured query language (SQL), storage and compression of media, handling media over a network (including media streaming), digital rights management, and digital watermarking.
Precludes additional credit for COMP 2006
Prerequisite(s): BIT 1400 and IMD 1005.
Lecture three hours a week, tutorial/ laboratory two 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.
Prerequisite(s): second-year standing in the IMD program.
Workshop four hours a week.

IMD 2005 [0.5 credit]
Motion Graphics
Visual communication through kinetic elements; focusing on dynamic form, speed, rhythm, and quality of motion. Topics include basic animation principles, rhythm and timing, design and composition, kinetic typography, sound synchronization, storyboard development, compositing, and rendering for target platforms.
Precludes additional credit for IMD 2002 (no longer offered).
Prerequisite(s): second-year standing in the IMD program.
Lecture/ workshop three hours a week.

IMD 2900 [1.0 credit]
Design Studio 1
Web application development. Using a multidisciplinary approach, teams develop a comprehensive, Web-based application. Topics include users, storyboarding, data management, prototyping, project and content management, marketing, testing, and product evaluation. Client- and server-side technologies will be used to enhance functionality.
Prerequisite(s): second-year standing in the IMD program.
Studio/lecture eight hours a week.

IMD 3001 [0.5 credit]
Aspects of Product Design Methodology
Important issues in designing successful computerized products, including design guidelines, usability testing and user-needs analysis. Experienced designers and researchers from industry participate.
Also listed as PSYC 4800.
Prerequisite(s): third-year standing in the IMD program.
Lectures three 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, advanced lighting techniques (BRDF, IBL, subsurface-scattering), 2D/3D texturing, local/global illumination, image-based and non-photorealistic rendering, and rendering effects.
Prerequisite(s): BIT 2400 and IMD 3900.
Lectures three hours a week, tutorial/laboratory two hours per week.

IMD 3003 [0.5 credit]
Communication Skills for IMD
Development of competence in written and oral communication related to multimedia design. Needs analyses, use-case scenarios, development and management of content, technical reports, and related project documents; oral presentations.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lecture and tutorial three hours a 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).
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.
Precludes additional credit for IMD 2001 (no longer offered).
Prerequisite(s): BIT 2400.
Lecture/ workshop four hours a week.

IMD 3900 [1.0 credit]
Design Studio 2
Introduction to the artistic perspective on 3D graphics and animation. Practical studio sessions; use of popular modeling and animation packages; modeling, texturing, materials, cameras, lighting, keyframe animation, rendering.
Prerequisite(s): third-year standing in the IMD program.
Studio/lecture eight hours a week.

IMD 3901 [1.0 credit]
Design Studio 3
Device design. Studio-based projects focus on one or more special areas in multimedia, information and interaction design. Device design, form factors, information appliances, and computer-supported collaborative work.
Prerequisite(s): third-year standing in the IMD program and IMD 2900.
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.
Prerequisite(s): third-year standing in the IMD program.
Seminar three hours a week.

IMD 4003 [0.5 credit]
3D Computer Animation
Advanced topics in computer animation: principles of animation, motion capture, forward/inverse kinematics (hierarchical systems), key-framing, motion editing/retargeting/interpolation, soft-body animation (freeform deformation and shape interpolation), character animation (walking/locomotion, rigging, weighting, and facial animation), particle systems, dynamic systems (cloth, fluid, and hair), behavioural animation, match-moving.
Prerequisite(s): IMD 3002.
Lecture three hours a week, tutorial/laboratory two 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.
Precludes additional credit for IMD 4004 (no longer offered).
Prerequisite(s): fourth-year standing in the IMD program.
Lecture three 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.
Prerequisite(s): IMD 2900, IMD 3900, and fourth-year standing in the IMD program.
Tutorial hours arranged.

IMD 4902 [1.0 credit]
Design Studio 4
Lectures and projects on interactive multimedia systems for art and entertainment, especially computer games, covering the production process from idea to design, development and testing, and also discussing related topics and technologies such as management skills, character and story development, game engines, and online games.
Precludes additional credit for IMD 4900.
Prerequisite(s): IMD 2900, IMD 3002 and fourth-year standing in the IMD program.
Studio/lecture eight hours a week.

Network Technology (NET) Courses
School of Information Technology
Faculty of Engineering and Design

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.
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.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 1004 [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.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures three hours a week, tutorial/laboratory one hour a week.

NET 1006 [0.5 credit]
Routing and Switching
Introduction to routed and routing protocols, VLANs and switching concepts. Topics include configuration and troubleshooting routers and switches and resolving common issues with RIP, single-area and multi-area OSPF, virtual LANs, and inter-VLAN routing in both IPv4 and IPv6 networks.
Precludes additional credit for NET 1005 (no longer offered).
Prerequisite(s): NET 1002.
Lecture two 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 DHCP, DNS, OSPF, EIGRP, STP, and VTP in both IPv4 and IPv6 networks.
Prerequisite(s): NET 1006.
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. Topics covered include WAN principles and standards, PPP, frame relay and ATM architecture and concepts, scaling IP addresses using NAT and DHCP, secure networking concepts including use of access control lists (ACLs) and virtual private networks.
Prerequisite(s): NET 2000.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 2002 [0.5 credit]
Desktop Operating Environments
DOS and Windows are used to illustrate desktop operating system concepts such as file system management, system utilities, memory management, boot process troubleshooting, and environment customizations.
Client-server architecture; server configuration settings, connection to a domain, secure remote access including VPN; DHCP, DNS and Active Directory.
Prerequisite(s): restricted to students in the B.I.T. degree program.
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, and 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 is introduced, including the creation of firewalls.
Prerequisite(s): NET 2002.
Lecture two hours a week, tutorial/laboratory two hours a week.

NET 2004 [0.5 credit]
Communication Skills for NET
Development of competence in written and oral communication in relation to network design, development, and management. Focus on technical reports, proposals, and other related project documents; formal and informal oral presentations.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lecture and tutorial three 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.
Prerequisite(s): BIT 1003.
Lectures three hours a week, tutorial/laboratory three hours 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.
Prerequisite(s): second-year standing in the Networking program.
Lecture two hours a week, tutorial/laboratory two hours a week.

NET 3001 [0.5 credit]
Real-time Systems
Principles of event-driven systems, review of computer organization; parallel and serial interfaces; programmable timer; I/O methods; polling and interrupts. Real-time kernels. Critical design consideration: concurrency, dead lock, synchronization. Maintaining and improving system performance. Programming exercises in low and high level languages.
Prerequisite(s): NET 1004 and BIT 2400.
Lectures three hours a week, tutorial/Laboratory two hours a week.

NET 3004 [0.5 credit]
Data Structures
Specification and design of abstract data types and their implementation as stacks, queues, trees, tables and graphs. Common and useful examples. Parsing and finite state machines. Analysis of algorithms, recursion, re-entrance. Special focus: abstraction, interface specification and hierarchical design using object-oriented programming.
Prerequisite(s): NET 2006.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 3006 [0.5 credit]
Network Management and Measurements
Network management fundamentals, standards, and protocols. The Simple Network Management Protocol (SNMP). Structure of Management Information and MIB. SNMP management challenges and the need for real-time measurements. Introduction to tools and applications for network measurements and monitoring.
Prerequisite(s): third-year standing in the Networking program.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 3007 [0.5 credit]
Network Security
Basics of Information Technology security. Students are introduced to the goals of IT security, common threats and countermeasures including firewalls, SSL technologies and IP Masquerading. Several operating environments will be studied as examples. This course will also include a section on computer ethics.
Prerequisite(s): NET 2001.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 3008 [0.5 credit]
Advanced Network Routing
Routing within, and between, autonomous systems. Advanced control and optimization of routing protocols and manipulation of traffic paths with a focus on EIGRP and OSPF. Branch/Home Office connectivity and Internet reachability via BGP. Routing of IPv6 within an enterprise.
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.
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
VLANs and inter-VLAN routing in a multilayer switched environment. Variants of STP and the use of related enhancements. Techniques for network redundancy and load balancing. Securing a switched infrastructure. Supporting advanced services including multicasting, and maintaining QoS for converged traffic (wireless, voice, video).
Prerequisite(s): NET 2001.
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 will be on any technique, technology or architecture that serves to enhance IP delivery and connectivity or provides a service leveraging the IP infrastructure.
Prerequisite(s): NET 3008.
Lectures two hours a week, tutorial/laboratory two hours a week.

NET 3900 [0.5 credit]
Wireless Networks
Study of 802.11 protocol family, Wi-Fi, and authentication protocols. Security and other design issues for WLANs. Deployment considerations for mobile networks, hotspots, bridges and access points. Wireless network management challenges.
Prerequisite(s): third-year standing in the Networking program.
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.
Prerequisite(s): fourth-year standing in the Networking program or permission of the instructor.
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. Simulation exercises including traffic monitoring, congestion, routing protocols, resource utilization and growth planning using OPNET simulation tool.
Prerequisite(s): BIT 2000.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 4003 [0.5 credit]
Computer Systems Architecture
History and evolution of computers. Models and functional descriptions of CPU, bus, memory, I/O. Internal data transfer and storage concepts. Bus protocols. Memory organization and cache principles. Digital logic and simple logic designs of CPU, buses, memory. Concepts of virtual machines, parallel computing, cloud computing.
Prerequisite(s): third year standing in the Networking program, NET 2003 and NET 3001.
Lectures three hours a week, tutorial/laboratory one hour 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.
Prerequisite(s): NET 3004 and NET 3010.
Lectures three hours a week, tutorial/laboratory two hours a week.

NET 4007 [0.5 credit]
Multimedia Networking
Audio and video compression. H.261, JPEG, MPEG and DVI. Accessing audio and video from a web server. Real Time Streaming Protocol (RTSP). Multimedia operating systems. Multimedia database. Network support for multimedia applications. Multimedia synchronization.
Prerequisite(s): fourth-year standing in Networking program or permission of the instructor.
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.
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.
Prerequisite(s): fourth-year standing in Networking program or permission of the instructor.
Lectures three hours a week, tutorial/laboratory one hour 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.
Prerequisite(s): fourth-year standing in the Networking program.
Tutorial hours arranged.

Photonics and Laser Technology (PLT) Courses
School of Information Technology
Faculty of Engineering and Design

PLT 1001 [0.5 credit]
Laser Safety, WHMIS and Ethics
Introduction to sociological and historical perspective on health and safety issues in industrial environments, ethics implementation to modern technology. Laser and electrical safety. Health and safety related to ergonomics. Workplace Hazardous Materials Information System (WHMIS), Material Safety Data Sheets (MSDS).
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures one hour a week, tutorial/laboratory two hours a week.

PLT 1002 [0.5 credit]
Trends in Photonics
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.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures one hour a week, tutorial/laboratory two hours a week.

PLT 1003 [0.5 credit]
Optics/Optical Fibers I (Principles)
Principles of optics, optical fibers and waveguiding and hands-on experience with optical components. Optical fibers manufacturing and variety of industrial applications including telecommunications, and bio/medicine. Optical sources, detectors, fiber splicing, fiber testing in lab environment.
Prerequisite(s): restricted to students in the B.I.T. degree program.
Lectures / laboratory or tutorial four hours a week.

PLT 1004 [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.
Prerequisite(s): PLT 1001. 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.
Prerequisite(s): BIT 1203, restricted to students in the B.I.T. degree program.
Lectures / laboratory or tutorial five hours a week.

PLT 2000 [0.5 credit]
Optics/Optical Fibers II (Devices)
Optical and fiber optical devices used in metrology, sensing, telecommunications, oil/gas civil and biomedical engineering applications. Lectures and lab experiments on fiber modes and mode-coupling, transmitters, couplers, splitters, receivers, wavelength division multiplexers, optical amplifiers, physical layer of optical networks, dispersion, and nonlinear effects management.
Prerequisite(s): PLT 1003, BIT 1201.
Lectures two hours a week, tutorial/laboratory three 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.
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]
Fiber Optics Communications 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.
Prerequisite(s): PLT 2000.
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.
Prerequisite(s): PLT 2001.
Lectures two hours a week, tutorial/laboratory two hours a week.

PLT 2005 [0.5 credit]
Circuits and Signals
Properties of signals. Basic circuit elements: voltage and current sources. Kirchhoff's laws, linearity, superposition. Thevenin and Norton's theorems. Circuit simplification. AC steady-state analysis: impedance, admittance, phasors, frequency response. Transient response of RL and RC circuits: form of response, initial and final conditions. RLC circuits: resonance.
Also listed as ELEC 2501.
Prerequisite(s): BIT 2004 and (BIT 1204 or PHYS 1002).
Lectures three hours a week, laboratory and problem analysis three hours a week.

PLT 2006 [0.5 credit]
Semiconductors
Qualitative semiconductor physics, leading to the diode equation. Diode applications. Operational amplifiers and their application in feedback configurations including active filters. Introduction to bipolar transistors and MOSFETs, analysis of biasing circuits. Transistor applications including small signal amplifiers.
Prerequisite(s): PLT 2005.
Lectures three hours a week, laboratory and problem analysis two hours a week.

PLT 3000 [0.5 credit]
Fiber Optics Communications 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.
Prerequisite(s): PLT 2002.
Lectures two hours a week, tutorial/laboratory three hours a week.

PLT 3001 [0.5 credit]
Photonics Manufacturing Systems
Laser based manufacturing, measurement and control systems, further applications of laser machining, welding, emphasizing industrial real world systems. Extensive hands on laser lab experiments, measurement jigs, scanners, swept wave systems (SWS), motion stages, optics, wavelength measuring, pulse detection, oscilloscopes, digital spectrometers.
Prerequisite(s): PLT 2003.
Lectures two hours a week, tutorial/laboratory two hours a week.

PLT 3002 [0.5 credit]
Real-time Systems
Principles of event-driven systems, review of computer organization; parallel and serial interfaces; programmable timer; I/O methods; polling and interrupts. Real-time kernels. Critical design consideration: concurrency, dead lock, synchronization. Maintaining and improving system performance. Programming exercises in low and high level languages.
Prerequisite(s): BIT 2400.
Lectures three hours a week, tutorial/Laboratory two hours a week.

PLT 3003 [0.5 credit]
Electro Magnetics I
Electrostatics and magnetostatics. Solution of Poisson's and Laplace's equations. The Lorenz equation and force. Time varying fields. Magnetic circuits and transformers. DC and AC motors.
Prerequisite(s): BIT 2005.
Lectures three hours a week, laboratory and problem analysis three hours alternate weeks.

PLT 3004 [0.5 credit]
Design of Optical Components and Systems
Optical ray-tracing for analysing systems of sources, lenses, mirrors, prisms, fibers, diffractive elements, MEMS. Zemax® fundamentals, pupils, aspherics, non-sequential tracing, aberrations, image metrics, optimization/merit functions. Applications: imaging, illumination, lasers. Trade-offs, mechanical constraints, tolerances and cost. Physical optics modeling of bean propagation. Near-field diffraction and waveguides.
Prerequisite(s): PLT 2000.
Lectures / laboratory or tutorial five hours a week.

PLT 3005 [0.5 credit]
Introduction to Solid State Physics
This course provides the students with the study of materials via the techniques of solid state physics. Topics include bonding and structure of crystals, energy band in insulators, semiconductors, and metals. Also included are electrical conductivity, optical properties, lattice vibration, elasticity, point defects and dislocations.
Prerequisite(s): third-year standing in the Photonics and Laser Technology program.
Lectures three hours a week.

PLT 3006 [0.5 credit]
Physical Electronics
Fundamentals of device physics and operation of the pn junction, bipolar transistor and MOSFET. Basic integrated circuit processing and application to diodes, BJTs and MOSFETs. Correlation between processing, structure, operation and modeling. Consideration of parasitic and small-geometry effects, reliability and process variation.
Prerequisite(s): PLT 2006 or permission of the Department.
Lectures three hours a week, problem analysis three hours alternate weeks.

PLT 3007 [0.5 credit]
Electro Magnetics II
Maxwell's equations and EM wave solutions. Polarization. Poynting vector. EM waves in dielectrics and conductors; skin depth. Reflection and refraction. Standing waves. Fresnel relations, Brewster angle. Transmission lines. Line termination, basic impedance matching and transformation. Smith charts. Introduction to guided waves; slab waveguide.
Prerequisite(s): PLT 3003.
Lectures three hours a week, problem analysis two hours a week.

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

PLT 4000 [0.5 credit]
Applications of Quantum Physics
Fabrication, operation and modeling of advanced devices for information technology. Topics: physics of materials, quantum mechanics of solids, optical transitions, physical analysis and models for state-of-the-art electronic/optical technologies and materials. Technologies: MOS and III-V based transistors, solidstate optical devices, MEMS and nano-technology based devices.
Prerequisite(s): PLT 3006.
Lectures three hours a week, problem analysis two hours alternate weeks.

PLT 4001 [0.5 credit]
Optoelectronic Devices
Review of semiconductors, semiconductor lasers, detectors, photovoltaics. Electro, magneto and acousto-optic modulation devices. Transmitters, receivers, photo diodes, fiber sensors, and amplifiers, Mach–Zehnder interferometers. Polarization-mode dispersion. Experiments on non-linear optical elements, Sagnac and ring resonator, optical modulation.
Prerequisite(s): PLT 3005.
Lectures two hours a week, tutorial/laboratory two hours a week.

PLT 4002 [0.5 credit]
Applied Advanced Optics
Wave optics: scalar Kirchhoff's diffraction, Fraunhofer/Fresnel cases, Fourier optics crystal optics. Devices and applications: multilayer coatings, fiber gratings, diffractive optics, spatial-light modulators. Novel microscopies, super-resolution, sub/superluminal light and metamaterials. Labs on diffractionless beams, vectorial focusing, computer generated beams/holograms, nonlinear optics and modeling in Zemax®.
Prerequisite(s): PLT 3004.
Lectures / laboratory or tutorial five hours a week.

PLT 4003 [0.5 credit]
Materials Science
Properties and behavior of materials. Chemistry of materials, interactions between materials and laser energy, including organic and biological substances. Energetics, phases, equilibrium, kinetics in solids, crystals and polymers. Applications of high power laser systems, safety, materials in manufacturing and design. Nanomaterials and nanophotonics.
Prerequisite(s): PLT 3001, PLT 4001.
Lectures / laboratory or tutorial five hours a week.

PLT 4004 [0.5 credit]
Biomedical Photonics
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.
Prerequisite(s): PLT 3007.
Lectures / laboratory or tutorial four hours a week.

PLT 4005 [0.5 credit]
Fiber Optic Theory
Fundamentals of optoelectronics with application to fiber optic communications. Optical fibre: modes, losses, dispersion, splices and coupling to sources. Optical sources: LEDs and laser diodes. Optical detectors: photoconductor, pin and avalanche photodiodes. Optical receiver design. Fiber optic communications systems: intensity modulation/direct detection; coherent homodyne or heterodyne detection.
Prerequisite(s): PLT 4002.
Lectures three hours a week, laboratory three hours alternate weeks.

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.
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