GEOMATICS ENGINEERING
(Geodesy & Geomatics Engineering)

DEPARTMENT OF GEODESY & GEOMATICS ENGINEERING

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FACULTY

- Chrzanowski, Adam, Dipl.Eng., MSc, PhD (Krakow), Dr.h.c. (Olsztyn), Dr.h.c. (Krakow), PEng, Prof (1966), Professor Emeritus - 1998
- Coleman, David, BScE, MScE (UNB), PhD (Tas), PEng, Prof and Dean (Engineering) - 1993
- Dare, Peter, BSc (East London), MASc (Erindale College), PhD (E.Lond), Assoc Prof & Chair - 2000
- Faig, Wolfgang, Dipl.Ing. (Stuttgart), M.Sc.E. (UNB), Dr.Ing. (Stuttgart), PEng, Prof (1971), Dean and Professor Emeritus - 1999
- Hamilton, Angus, B.A.Sc, M.A.Sc (Tor), PEng, Prof (1971), Professor Emeritus - 1987
- Hughes Clarke, John E., BA (Oxf), MSc (S'ton), PhD (Dal), Prof and Chair in Ocean Mapping - 1991
- Kim, Donghyun, BS, MS, PhD (Seoul National), Senior Research Assoc. - 2002
- Langley, Richard B., BSc (Wat), PhD (York), Prof - 1981
- Maher, Robert, BSc(Birm), MSc, PhD (W.Ont), Adjunct Prof - 2003
- McLaughlin, John D., BScE, MScE (UNB), PhD (Wis), PEng, Prof Emeritus and President Emeritus – 1972
- Monahan, Dave, BSc (Dal), MA (Carl), MScE (UNB), Adjunct Prof – 2003
- Nichols, Susan, BSc (Acad), Meng, PhD (UNB), PEng, Prof – 1992
- Santos, Marcelo, BSc (Rio de Janeiro), MSc (National Observatory), PhD (UNB), PEng, Assoc Prof – 2000
- Secord, James M., BScE, MScE, PhD (UNB), PEng, Sr Teaching Assoc – 1986
- Szostak-Chrzanowski, Anna, MSc (Warsaw), Meng (UNB), PhD (Krakow), PEng, Sr. Research Assoc. – 2000
- Vanicek, Petr, Geodetic Eng, PhD (Prague) PEng, Prof (1971), Professor Emeritus – 2001
- Wells, David, BScE (Mt.All), MASc (BrCol), PhD (UNB), PEng, Prof (1980), Professor Emeritus – 1999
GENERAL INFORMATION

The Geomatics Engineering program is offered by the Department of Geodesy and Geomatics Engineering. Interesting and challenging professional careers in land or cadastral surveying, engineering surveying, mapping, photogrammetry and geodesy are open to graduates. They can find positions with federal, provincial and municipal government agencies, with the oil, gas and mining industries and with numerous private organizations, such as photogrammetric mapping firms, geological and geophysical exploration companies and consulting engineers, or they can be self employed as professional engineers or registered land surveyors.

A variant of the concept of cooperative education has been adopted in the Geomatics Engineering Programme. Cooperative education is based upon the principle that a sound academic program combined with relevant technical experience can provide the most effective professional development during the undergraduate years. With this in mind, undergraduate geomatics students are required to obtain at least six months relevant practical experience and to prepare a technical report, normally based on this experience, prior to graduation. Many geomatics organizations have agreed to participate in this programme. The Department will make available to the students a list of organizations that provide the opportunity for appropriate experience. Students will then be responsible for selecting and negotiating suitable placement.

Curriculum

With a minimum of 160 credit hours (ch) in the program, students are required to complete:

a. a core of basic engineering subjects;
b. a core of mathematics, computer science, general science, and geomatics engineering (GGE) subjects;
c. approved technical electives, with at least one GGE 5000 level course;
d. a minimum of 6 ch of approved complementary studies electives; and
e. at least 6 months of relevant practical experience approved by the Department.

Students who have other post-secondary educational efforts are advised to write to the Chair of the Department for information on credits that may be awarded.

Students intending to become registered land surveyors or accredited hydrographic surveyors are required to take certain electives in geomatics engineering and other fields and should consult with the Department.

The program has been designed to be completed in 8 terms, with reasonable course loads. However, students may proceed at a slower rate but all requirements must be completed within 8 consecutive years. Detailed program information is available from the Department.
Courses

Descriptions of courses offered by the various Departments are given in the “Fredericton Courses” Section of this Calendar.

CORE COURSES:

CHEM 1982 General Applied Chemistry
CHEM 1987 General Applied Chemistry Laboratory
CE 3963 Engineering Economy
CS 1003 Introduction to Computer Programming
CS 3113 Introduction to Numerical Methods
ECON 1073 Economics for Engineers
EE 1813 Electricity and Magnetism
ENGG 1003 Engineering Technical Communication
ENGG 1015 Intro Engg Design & Problem Solving
ENGG 1001 Engineering Practice Lecture Series
ENGG 1082 Mechanics for Engineers
ENGG 4013 Law and Ethics for Engineers
GGE 1001 Introduction to Geodesy & Geomatics
GGE 2012 Advanced Surveying
GGE 2013 Advanced Surveying Practicum
GGE 2413 Mapping Concepts and Technology
GGE 2501 Land Administration I
GGE 3022 Survey Design and Analysis
GGE 3023 Surveying Design Practicum
GGE 3042 Space Geodesy
GGE 3111 Introduction to Adjustment Calculus
GGE 3122 Advanced Adjustment Calculus
GGE 3202 Geodesy I
GGE 3342 Imaging and Mapping I
GGE 3353 Imaging and Mapping II
GGE 4022 Precision Surveying
GGE 4211 Geodesy II
GGE 4313 Imaging and Mapping III
GGE 4403 Geographic Information Systems
GGE 4512 Land Administration II
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td><strong>GGE 4700</strong></td>
<td>Design Project and Report</td>
</tr>
<tr>
<td><strong>MATH 1003</strong></td>
<td>Introduction to Calculus I</td>
</tr>
<tr>
<td><strong>MATH 1013</strong></td>
<td>Introduction to Calculus II</td>
</tr>
<tr>
<td><strong>MATH 1503</strong></td>
<td>Introduction to Linear Algebra</td>
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<tr>
<td><strong>MATH 2513</strong></td>
<td>Multivariable Calculus for Engineers</td>
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<tr>
<td><strong>MATH 3543</strong></td>
<td>Differential Geometry for GGE</td>
</tr>
<tr>
<td><strong>PHYS 1081</strong></td>
<td>Physics for Engineers</td>
</tr>
<tr>
<td><strong>STAT 2593</strong></td>
<td>Probability and Statistics for Engineers</td>
</tr>
<tr>
<td><strong>TME 3313</strong></td>
<td>Managing Engineering &amp; IT Projects</td>
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**TECHNICAL ELECTIVES:**

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<tr>
<th>Course Code</th>
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<tr>
<td><strong>GGE 5013</strong></td>
<td>Oceanography for Hydrographers</td>
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<tr>
<td><strong>GGE 5023</strong></td>
<td>Tides and Water Levels</td>
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<tr>
<td><strong>GGE 5033</strong></td>
<td>Marine Geology for Hydrographers</td>
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<tr>
<td><strong>GGE 5041</strong></td>
<td>Engineering Surveying</td>
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<tr>
<td><strong>GGE 5042</strong></td>
<td>Kinematic Positioning</td>
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<tr>
<td><strong>GGE 5043</strong></td>
<td>Marine Geophysics for Hydrographers</td>
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<tr>
<td><strong>GGE 5061</strong></td>
<td>Mining Surveying</td>
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<tr>
<td><strong>GGE 5072</strong></td>
<td>Hydrographic Data Management</td>
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<tr>
<td><strong>GGE 5093</strong></td>
<td>Industrial Metrology</td>
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<tr>
<td><strong>GGE 5131</strong></td>
<td>Special Studies in Adjustments</td>
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<tr>
<td><strong>GGE 5222</strong></td>
<td>Gravity Field and Geodetic Networks</td>
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<tr>
<td><strong>GGE 5242</strong></td>
<td>Special Studies in Geodesy</td>
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<tr>
<td><strong>GGE 5322</strong></td>
<td>Digital Image Processing</td>
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<tr>
<td><strong>GGE 5332</strong></td>
<td>Special Studies in Photogrammetry</td>
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<tr>
<td><strong>GGE 5413</strong></td>
<td>Special Studies in Digital Mapping</td>
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<tr>
<td><strong>GGE 5521</strong></td>
<td>Survey Law</td>
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<tr>
<td><strong>GGE 5532</strong></td>
<td>Land Economy &amp; Administration</td>
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<tr>
<td><strong>GGE 5543</strong></td>
<td>Marine Policy, Law, and Administration</td>
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<tr>
<td><strong>GGE 5813</strong></td>
<td>Urban Planning for Geomatics</td>
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<td><strong>GGE 5842</strong></td>
<td>Site Planning for Geomatics</td>
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<tr>
<td><strong>GGE 5701</strong></td>
<td>Special Studies in Geomatics I</td>
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<td><strong>GGE 5702</strong></td>
<td>Special Studies in Geomatics II</td>
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<tr>
<td><strong>GGE 5703</strong></td>
<td>Special Studies in Geomatics III</td>
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Other technical electives may be taken in engineering, science, computer science, or forestry, subject to Departmental approval.

Students are cautioned that not all technical electives may be offered every year.

In addition to the above list, a minimum of 6 ch of complementary studies electives is also required. These require approval by the Department.

**Cadastral Surveying Option within Geomatics Engineering**

Students who obtain a Bachelor of Science in Engineering degree in Geomatics Engineering at UNB, and who complete a set of four specified technical electives (CE 5313 or GGE 5813, CE 5342 or GGE 5842, GGE 5521, GGE 5532), will have the following notation placed on their UNB transcripts: “COMPLETED CADASTRAL SURVEYING OPTION”. This option has been accredited by the Canadian Council of Land Surveyors.

**Concurrent Degrees in Geomatics Engineering and Computer Science**

Rewarding career opportunities now emerging in large-scale spatial database management, geomatics systems integration, and custom applications programming demand a deeper foundation in computer science and a stronger understanding of spatial systems and sciences than found in other programs.

The Faculty of Computer Science and the Department of Geodesy and Geomatics Engineering are cooperating to make it possible for a student to graduate with both a BCS degree and a BScE(Geomatics Engg) degree in five years. Several specializations are available in both Computer Science and Geomatics Engineering but these may lengthen the period of study.

The concurrent program is designed so that, if a student decides to opt for either degree alone part way through the program, the transition can be made easily.

Students in the concurrent program are able to count many of their courses toward the requirements of both degrees so it is important to select courses carefully from the start. Advising is available at every level from pre-entry inquiries through to graduation.

**Certificate of Academic Proficiency in Hydrographic Surveying**

Those wishing to acquire a proficiency in hydrographic surveying which meets international standards may apply for admission to this Certificate program. This Certificate is awarded to students who have completed a set of 17 specified courses, totalling 61 ch. Admission to the program requires successful completion of all prerequisites, or equivalents, for each course in the Certificate program. Students obtaining a Bachelor of Science in Engineering degree in Geomatics Engineering at UNB, including the electives, GGE 5013, GGE 5023, GGE 5033, GGE 5042, GGE 5043, GGE 5072, GGE 5543, will have satisfied all the requirements, except for GGE 5083. Other
students may receive credit for up to 50% of the Certificate courses from equivalent courses taken elsewhere. Detailed Certificate information is available from the Department.

**Courses required to complete the Certificate:**

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CS 3113</td>
<td>Introduction to Numerical Methods</td>
</tr>
<tr>
<td>ENGG 4013</td>
<td>Law and Ethics for Engineers</td>
</tr>
<tr>
<td>GGE 3022</td>
<td>Survey Design and Analysis</td>
</tr>
<tr>
<td>GGE 3023</td>
<td>Surveying Design Practicum</td>
</tr>
<tr>
<td>GGE 3042</td>
<td>Space Geodesy</td>
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<tr>
<td>GGE 3122</td>
<td>Advanced Adjustment Calculus</td>
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<tr>
<td>GGE 3353</td>
<td>Imaging and Mapping II</td>
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<tr>
<td>GGE 4403</td>
<td>Geographical Information Systems</td>
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<tr>
<td>GGE 4700</td>
<td>Design Project and Report</td>
</tr>
<tr>
<td>GGE 5013</td>
<td>Oceanography for Hydrographers</td>
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</tr>
<tr>
<td>GGE 5072</td>
<td>Hydrographic Data Management</td>
</tr>
<tr>
<td>GGE 5083</td>
<td>Hydrographic Surveying Operations</td>
</tr>
<tr>
<td>GGE 5543</td>
<td>Marine Policy, Law, and Administration</td>
</tr>
</tbody>
</table>

**Certificate of Field Proficiency in Hydrographic Surveying**

Students who have been awarded the Certificate of Academic Proficiency in Hydrographic Surveying by the University of New Brunswick may apply for admission to this Certificate program. This Certificate will be awarded to students who (a) present logbook records demonstrating completion of at least 24 months of supervised field experience in marine surveying, at least 50% of which is at sea, and (b) submit a satisfactory report on a practical hydrographic surveying project related to field operations for which they were responsible or significantly involved. Typically, a complex multi-disciplinary project is envisaged for this report. Full details on the Certificate can be obtained from the Department of Geodesy and Geomatics Engineering.

**Diplomas in Geomatics**

The Department of Geodesy and Geomatics Engineering offers programs leading to diplomas in the areas of specialization of Cadastral Studies, Engineering and Exploration Surveying, Geodetic Surveying, Land Information Management, and Mapping and Geographic Information Systems (GIS). These programs offer an opportunity for practising surveyors and other technical
professionals to gain a thorough understanding of the theory and principles of specific applications of new technologies and methodologies. Each program area consists of selected courses as regularly offered in the undergraduate program. A total of at least 30 credit hours of specified and elective courses is required in each program. All of the courses in these programs are degree-credit courses. Those who successfully complete a diploma program and who are subsequently admitted to a degree program may receive credit for them. Students enrolled in a diploma program will be subject to all relevant university undergraduate regulations and to the General Regulations of the Faculty of Engineering.

It is recommended that applicants to the Diploma programme have successfully completed a programme of technology, of at least two years, which should have included or have been supplemented with courses in calculus, computer science, and probability and statistics at a level equivalent to first year university. It is important that applicants have a working knowledge of these three subject areas and have at least three years of relevant work experience (at least one of which should be as a party chief or equivalent).

_Cadastral Studies_

- **GGE 5813** Urban Planning for Geomatics
- **GGE 5842** Site Planning for Geomatics
- **GGE 2501** Land Administration I
- **GGE 3342** Imaging & Mapping I
- **GGE 4512** Land Administration II
- **GGE 5521** Survey Law
- **GGE 5532** Land Economy and Administration
- **CE 3963** Engineering Economy
- **TME 3313** Managing Engg & IT Projects

_Engineering and Exploration Surveying_

- **GEOL 4501** Applied Geophysics I
- **GEOL 4512** Applied Geophysics II
- **GGE 3022** Survey Design and Analysis
- **GGE 3111** Introduction to Adjustment Calculus
- **GGE 3122** Advanced Adjustment Calculus
- **GGE 5041** Engineering Surveying
- **GGE 5061** Mining Surveying
- **MATH 1503** Introduction to Linear Algebra
- **MATH 2513** Multivariable Calculus for Engineers
Geodetic Surveying

- **GGE 3022** Survey Design and Analysis
- **GGE 3111** Introduction to Adjustment Calculus
- **GGE 3122** Advanced Adjustment Calculus
- **GGE 3202** Geodesy I
- **GGE 4211** Geodesy II
- **GGE 5242** Special Studies Geodesy
- **MATH 1503** Introduction to Linear Algebra
- **MATH 2513** Multivariable Calculus for Engineers

Land Information Management

- **GGE 2413** Mapping Concepts & Technology
- **GGE 2501** Land Administration I
- **GGE 4403** Geographic Information Systems
- **TME 3213** Quality Management

  OR

- **TME 3413** Technology, Creativity and Innovation

Electives: At least 14 credit hours

Mapping and Geographic Information Systems

- **GGE 2413** Mapping Concepts & Technology
- **GGE 3111** Introduction to Adjustment Calculus
- **GGE 4313** Imaging and Mapping III
- **GGE 4403** Geographic Information Systems

Electives: at least 11 credit hours

Minor in Geomatics

A Minor in Geomatics is offered to students in programmes of study other than Geomatics Engineering and comprises a minimum of 24 credit hours [ch] of GGE courses. Normally a background in calculus [e.g., **MATH 1003**, **MATH 1013**], statistics [e.g., **STAT 2593**], linear algebra [e.g., **MATH 1503**, **MATH 2513** or **MATH 2213**], and computer science [e.g., **CS 1003** or **CS 1073**] would be a prerequisite to the Minor.

**GGE 1001** [5 ch] must be done for the Minor. The remaining minimum of 19 ch may be chosen from other GGE courses with the following collections of courses as recommended areas of
concentration. Other combinations of courses may be arranged with approval by the Department prior to starting the Minor.

**Land Administration and Information Management:** GGE 2413, GGE 2501, GGE 4512, GGE 5532, GGE 5543, plus at least 1 ch of approved GGE course(s).

**Mapping and Geographic Information Systems:** GGE 2413, GGE 3342, GGE 4403, GGE 4313.

**Hydrography and Oceanography:** GGE 3342, GGE 3353, GGE 5013, GGE 5072, GGE 5543.

**Positioning:** GGE 2012, GGE 2013, GGE 3042, GGE 3202, GGE 4211.