York University
Faculty of Pure and Applied Science
Department of Mathematics and Statistics
April 2004

Proposal for the Establishment of an

International Dual Degree Program in Mathematics and Statistics

(B.Sc. and Specialized Honours B.Sc.)

Summary

In cooperation with the University of L'Aquila (Italy) a new intensive and rigorous Bachelor of Science program in Mathematics and Statistics is proposed. The program provides York students with the opportunity to gain international experience and earn, in addition to their Honours B.Sc. degree at York the Italian *laurea di primo livello* at the University of L'Aquila within the normal four-year time frame, while L'Aquila students are given the opportunity to earn, in addition to the *laurea specialistica* at L'Aquila, a York B.Sc. Admissions to this small program will take place on a reciprocal basis, based on close consultation between the partner universities.

Background Information and General Considerations

York has had a general student exchange agreement with the University of L'Aquila since 1991. In addition, from 1998 to 2002, the two institutions were partners in the Canada/European Union-sponsored exchange project "Atlantis – New Avenues in the Teaching of Mathematics", with York in the lead role for the Canadian consortium (formed by Dalhousie, UBC and York). As the Canadian sponsor of such exchange projects, Human Resources Development Canada encourages participating institutions to develop plans for sustainable exchanges following the specific projects. In December of 2001, a letter of intent was signed by York's VP Academic and the Rector of the University of L'Aquila in order to develop an international degree program in mathematics and statistics. Walter Tholen of the Department of Mathematics and Statistics received a York Internationalization Grant in order to examine with the Italian partners the relevant course syllabi at both institutions and establish comparable degree program requirements. During meetings with representatives from L'Aquila over a two-year period a

common list of mandatory and equivalent courses for the program was compiled. A special Departmental committee examined a first program proposal in March 2003, and the Department of Mathematics and Statistics approved the current proposal in April 2003. Meanwhile, the University of L'Aquila has approved the Italian counterpart of the proposal and was successful in seeking funding from the Italian Government and from the Abruzzo Region (of which L'Aquila is the capital) in order to facilitate exchanges under the program (EUR 100,000 over a five-year period).

Admission to the program will require continuous consultation between the two partner universities, with the involvement of the international offices and the relevant academic units. Walter Tholen of the Department of Mathematics and Statistics at York and Anna Tozzi of the Department of Pure and Applied Mathematics at L'Aquila have volunteered to be the initial coordinators and advisors for the program. All York exchanges under this program will be administered by York International in consultation with the academic units at York and at L'Aquila. Exchanges will follow the established criteria of reciprocity and payment of fees. However, a truly new aspect of exchanges taking place within the framework of this program is that exchange students from L'Aquila will be given the possibility of earning a York degree upon completion of the York requirements, just as exchange students from York will be given the opportunity of earning a degree at L'Aquila. This aspect of the proposal will require special administrative arrangements by the Registrar's Office.

This program proposal entails special requests regarding the General Education Requirements in the Faculty of Pure and Applied Science, by not only permitting a foreign language course to satisfy this requirement in part, but by making it in fact mandatory for the program. For exchange students from L'Aquila, the rule that the courses of the General Education Requirements must be from "different areas of study" has also been modified to some extent for the purpose of this program. These modifications are not only necessary, in order to keep the goal of earning a dual degree within reach, but are also very justified, in consideration of the immense "general education value" gained from the experience of living and learning for a year in a culture so very much different from the home environment.

The program's long-term success will clearly depend on the quality of the cooperation between the sponsoring faculties and departments of the partner universities. Continuous communication and exchange of ideas about course contents and changes, as well as teaching philosophies and techniques, will be needed in order to maintain fully comparable and up-to-date programs at both institutions. A firmly established and funded faculty exchange program will be the best guarantor for achieving these goals. Experience shows that such exchanges also play an important role in student recruitment. Visiting professors teaching courses at the partner university will naturally arouse a lot of interest with the students in their home institution and will likely play a pivotal role in encouraging and facilitating student exchanges.

According to the letter of intent signed by the two universities, a review of the program is to be undertaken after the first four years of its operation.

1. Context of Proposal

a. Statement of Purpose

It is the purpose of the new program that students of both institutions be given the opportunity to acquire international education and competency in mathematics and statistics in order to gain employment in an increasingly global economy. This intensive and rigorous program provides students with good theoretical knowledge and at the same time introduces them to the mathematical and statistical techniques relevant for the business world. Based on a large preset array of mandatory and mutually recognized courses offered at both institutions, this program allows its successful students to earn degrees at both institutions, fully recognized in the European Union and in North America.
Typically a successful York student in the program will study during the first two years at York and during the third year at L'Aquila, with the possibility of earning the three-year Italian degree *Laurea di primo livello*, and will then return to York for the fourth year of study in order to complete the degree program requirements for an Honours B.Sc. from York. Successful graduates will be well prepared for graduate studies in North America or Europe, especially for entering a Master's program at York or completing the requirements of the Italian *Laurea specialistica* at L'Aquila during a fifth year of study. A typical L'Aquila student in the program, after two years of study in Italy, will stay at York during the third year of study and may earn a York B.Sc. before returning to L'Aquila for the completion of the *Laurea Specialistica*. While the proposed 90-credit York B.Sc. is primarily intended for students whose home university is L'Aquila, York students are not prevented from earning the degree. However, the program is so demanding that any successful York student in the program would unlikely settle for the B.Sc. but aim to complete the requirements of the 120-credit Specialized Honours degree. Likewise, students whose home university is L'Aquila are not prevented from earning the York Specialized Honours degree but are in fact not likely to be able to satisfy all the degree program requirements during a one-year stay at York as arranged under the framework of the program, unless they postpone their stay at York until their fourth year of study.

b. Relationship of Proposal to University and Faculty Plans

The proposal should be seen as an important contribution to York's *internationalization* agenda. Unlike students in languages, linguistics and many other programs, students of mathematics and statistics (as well as of the sciences) usually do not see the immediate benefit of a stay abroad to their course of study. In addition, their tightly organized curricula usually make it objectively difficult for them to participate in international exchanges without "loss of time", even in the presence of financial incentives. For some time now it has been recognized by several European universities that an effective measure of overcoming such difficulties is to offer fully comparable degree programs at the partner universities in different countries. The prospect of earning a degree at the foreign host institution, in addition to the degree earned at the home institution, is expected to make exchanges under this program especially attractive and lead to a lasting cooperation that, once successfully implemented, could serve as a model for initiating similar cooperations with other international partner universities.

c. Admission Requirements

We must distinguish between students whose home university is (1) York and (2) L'Aquila.

(1) The admission requirements for students whose home university is York are the same as for the B.Sc. Program in Mathematics, except that 12U Physics is required for the proposed program. However, since exchanges with the University of L'Aquila will take place on a reciprocal basis, admission to the program will be very restrictive and be based on prior academic performance, as demonstrated by GPA. Normally, students declare for admission to the program in Fall of their second year of study. Given the high academic demands during the first two years of study in the program, a significant attrition rate must be expected. Typically, $2n$ students should be admitted to the first year of study in order to be able facilitate n exchanges in the third year. (For more details see e. below.)
(2) Students whose home university is L'Aquila and are recommended as exchange students to York by the University of L'Aquila, must apply to York for admission to the program if they wish to pursue a York degree. Admissions will be facilitated by the Admissions Office, based on the principle of reciprocity of exchanges and after consultation with the relevant academic units and the international offices at York and the partner university. Like for other international exchanges, these students do not pay York tuition fees while studying at York (just like students whose home is York do not pay L'Aquila tuition fees while on exchange at L'Aquila).

d. Consultation

i. Identify similar programs elsewhere at York

The proposed program will be the first international dual degree program established at York (outside Osgoode and the Schulich School of Business) and likely the first dual degree program in science between a North American and a European institution.

ii. Describe the nature and extent of consultation

The main features of the program requirements were established during meetings with representatives from the University of L'Aquila in December 2002 at York, with further fine tuning taking place in August 2003 at the University of L'Aquila. The proposal was examined by a special Departmental committee in order to make it as coherent as possible with the existing B.Sc. programs in Mathematics, Applied Mathematics, and Statistics, so that these programs may serve as "fall back" options. Advice was also sought from the AVP International. His comments and recommendations have been taken into account in the proposal. The proposal has

also been presented at the “Science and Internationalization Symposium” organized by the AVP International at York in February 2004 where further valuable advice was received.

iii. Consult with the Vice-President Academic on resource aspects of the proposal

As this program is entirely based on existing courses without expectation for any significant changes in course enrolments, no new resources are required.
See letter attached **(to follow)**.

e. Need and Demand

i. General

International experience has undoubtedly been recognized as a tremendous asset in the global economy. Overcoming initial anxieties (foreign language, unfamiliar culture) at an early stage is a key ingredient to a successful international career. Given the success of international programs in mathematics recently established in Europe (as for example at the University of Darmstadt, Germany), we trust that the proposed program will be particularly appealing to our most talented students in mathematics and statistics. The prospect of earning within a reasonable period of time two degrees that are fully recognized in both North America and Europe should be attractive to students who aspire to gain leadership roles. Such students should actually welcome the opportunity to learn a foreign language and to live and study in a foreign culture and university system for a year. In fact, in a subject like mathematics and statistics, the language hurdle for native English speakers is objectively very low, with many technical terms being very similar in all major European languages. Furthermore, the Italian university system used to differ from ours significantly but has in recent years adopted many North American features, through the introduction of (the equivalent of) 90-credit degree programs (in accordance with the standards set by the European Union in the “Bologna Accord”) and the increased use of written examinations in introductory courses. Generally, York students used to living in a big metropolis and studying at a very large university may well welcome the opportunity of a year’s stay in a relatively small mountain town (which, however is easily reachable from Rome by bus, in about one hour), and to study at a smaller university (with currently about 18,000 students) which is dominated by large engineering and medical faculties.

ii. Enrolment projection

The aim is to admit up to 6 students (whose home university is York) during each of Years 1 and 2 and up to 10 students during each of Years 3 and 4. Since an above-average attrition rate must be expected, these admissions will likely lead to 3-5 exchanges per year once the students have reached their third year of studies. The steady state enrolment in the program at York is not expected to exceed 20.

iii. Preparation for graduate studies

Students having completed this degree program will be very well prepared for graduate studies either in Mathematics or Statistics, depending on their choice of courses during the fourth year of studies. Such graduate studies could be undertaken in North America or Europe.

2. Program Requirements

a. Outline of Course Requirements

i. Courses currently offered

A summary of the Degree Program Requirements and a Standard Plan of Study for the program are presented in Appendix A. All courses are currently mounted; some upper-level courses without stringent prerequisites may be offered in alternate years. Detailed course descriptions are to be found on Appendix B. Appendix A also gives a comparative list of York and L'Aquila courses relevant to this program that are deemed to be equivalent. A credit obtained for any of these courses at the host university will also count as a credit at the student's home university.

ii. New courses

There are no new courses necessary for the implementation of the proposed program.

iii. Required courses mounted by other units

Students whose home university is York are required to complete the Italian language course IT 1000 6.0 *Elementary Italian* (or equivalent) before being considered for an exchange, and the course *Lingua e Cultura Italiana* (3 York credits) or equivalent while on exchange at L'Aquila. (The language requirements are considered to be minmal. Students are encouraged to take further courses, such as IT 2000 6.0.)
Students whose home university is L'Aquila must take *Lingua inglese* 1, 2 at L'Aquila (6 York credits) before being considered for an exchange, and the course HUMA 1220 9.0 *Canadian Language and Culture* (or equivalent) while on exchange at York. (The language requirements are to be considered minimal. Normally a TOEFL score of 550 is expected prior to York admission.)

3. Calendar Copy

Intended calendar copy describing the new program. All references are to the 2003-2004 Undergraduate Calendar.

Under **Mathematics and Statistics** , add a fifth bullet:
mathematics and statistics (international dual degree programs)

MATHEMATICS AND STATISTICS

The Department of Mathematics and Statistics offers BSc and BSc (Hons.) degree programs in **five** subject areas:

I. Applied Mathematics

II. Computational Mathematics (BSc. Honours only)
III. Mathematics
IV Mathematics and Statistics (International Dual Degree Program)
V. Statistics

The BSc and BSc (Hons.) degree programs in each subject area are listed separately below. A student should choose one of these subject areas based on interest and employment goals, but it is possible to change subject areas provided the requirements of the desired subject area can be met.

i) All BSc and BSc (Hons.) degree candidates must complete a program core (see program specifications below).

ii) All BSc and BSc (Hons.) degree candidates must comply with general regulation 4 (Science section IV) by completing the following (in addition to the 1000-level COSC and MATH requirements specified for their program):

- 12 credits from SC/BIOL 1010 6.0 or SC/BIOL 1410 6.0, SC/CHEM 1000 3.0 and SC/CHEM 1001 3.0, SC/EATS 1010 3.0 and SC/EATS 1011 3.0, SC/MATH 2041 3.0 and SC/MATH 2042 3.0, SC/PHYS 1410 6.0 or SC/PHYS 1010 6.0;

- additional 1000-level Science credits (excluding SC/CHEM 1500 4.0, SC/MATH 1510 6.0, SC/MATH 1515 3.0, SC/PHYS 1510 4.0 and all Natural Science courses) - as required for a total of at least 24 1000-level Science credits;

- 12 general education credits (see "General Education Requirements" in Science section IV).

Note: special regulations apply for the International Dual Degree Program in Mathematics and Statistics (see V. below).

Insert details of new program:

V. International Dual Degree Programs Mathematics and Statistics

In collaboration with the Dipartimento di Matematica Pura ed Applicata at the University of L'Aquila (Italy), the Department of Mathematics and Statistics offers an International Dual Degree Program Mathematics and Statistics (BSc and Specialized Honours BSc only). This program is particularly demanding and will be of interest to students with academic performances of B average and better. Students in the program, after two years of study at York, but before the completion of the York degree program requirements, will be eligible to study as York international exchange students for up to one year at the University of L'Aquila, earn York credits for specified courses taken at L'Aquila towards their York degree program, and at the same time fulfill the degree program requirements for the *Laurea di primo livello* at L'Aquila, the Italian equivalent of a 90-credit BSc. All exchanges under this program are administered by York International in collaboration with the *Ufficio Internazionale* at the University of L'Aquila.

Upon completion of the York degree program requirements, students of the University of L'Aquila studying as exchange students at York are eligible to earn a York degree in this program.

All BSc and Honours BSc degree candidates must complete the program core: SC/COSC 1520 3.0; SC/COSC 1540 3.0; SC/PHYS 1410 6.0 or SC/PHYS 1010 6.0; SC/MATH 1190 3.0; SC/MATH 1000 3.0 or SC/MATH 1013 3.0; SC/MATH 1010 or SC/MATH 1014 3.0; SC/MATH 1021 3.0, SC/MATH 2022 3.0; SC/MATH 2030 3.0; SC/MATH 2131 3.0; SC/MATH 2320 3.0; SC/MATH 2310 3.0 or SC/MATH 2015 3.0; SC/MATH 2041 3.0; SC/MATH 2042 3.0; SC/MATH 2270 3.0; SC/MATH 2280 3.0; SC/MATH 3241 3.0; SC/MATH 3242 3.0; SC/MATH 3410 3.0; SC/MATH 3271 3.0; SC/MATH 3170 6.0; SC/MATH 4430 3.0 or SC/MATH 4431 3.0; or equivalent.
Notes: 1. SC/MATH 1190 3.0 may be replaced by SC/MATH 1019 3.0, in which case SC/MATH 2320 3.0 must be replaced by another 2000- or 3000-level SC/MATH course not already contained in the program core, preferably by SC/MATH 3260 3.0.
2.For an up-to date list of equivalent courses offered at the University of L'Aquila, contact the Department of Mathematics and Statistics.

All BSc and Honours BSc degree candidates must satisfy a Specified General Education Requirement in lieu of the General Education Requirements of the Faculty of Pure and Applied Science, as follows. For students whose home university is York, the Specified General Education Requirement consists of: AS/IT 1000 or equivalent; the course *Lingua e Cultura Italiana* offered by the University of L'Aquila (3 York credits) or equivalent; 3 more credits, in accordance with the General Education Requirements of the Faculty of Pure and Applied Science. (Note in particular that for York students in the program, AS/IT 1000 is exempted from Restriction 2 in the General Education Requirements of the Faculty of Pure and Applied Science.) For students whose home university is the University of L'Aquila, the Specified General Education Requirement consists of: Lingua Inglese 1, 2 offered by the University of L'Aquila (6 York credits) or equivalent; AS/HUMA 1220 9.0 or equivalent.

Bachelor Program

- the program core;
- the Specified General Education Requirement;
- additional elective credits for an overall total of at least 90 credits.

Specialized Honours Program

- the program core;
- the Specified General Education Requirement;
- at least 9 additional credits from SC/MATH courses at the 4000 level;

- additional elective credits, as required for an overall total of at least 120 credits, including at least 90 credits from science courses and at least 42 credits at the 3000 or higher level.

The GPA requirements for continuing and graduating are as for other Mathematics and Statistics programs (see below for calendar copy).

BACHELOR PROGRAMS (formerly ORDINARY PROGRAMS - before 2000-2001)

To graduate in a Bachelor program. For students admitted to York University for 2001-2002 and subsequent years, the Senate of York University requires a minimum overall grade point average of 4.0 in order to be eligible to graduate with a BSc degree (Bachelor program).

HONOURS PROGRAMS
To declare Honours requires successful completion of at least 24 credits and a minimum cumulative credit-weighted grade point average of 5.0 over all courses completed, subject to the exceptions in the notes below.

To proceed in each year of an Honours program requires a minimum cumulative credit-weighted grade point average of 5.0 over all courses completed, subject to the exceptions in the notes below.

To graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses and a minimum cumulative credit-weighted grade point average of 5.0 over all courses completed, subject to the exceptions in the notes below.

4. Human and Physical Resource Requirements

a. Faculty Members

No new requirements.

b. Administration

No new requirements.

c. Library

No new requirements.

d. Computing

No new requirements.

e. Special equipment

No new requirements.

f. Space

No new requirements.

5. Attachments

a. Statement of support from the relevant Dean(s)/Principal, attesting to the adequacy of resources: space, computing, staff, faculty, etc.

Dean Wu: Please comment

b. Comment on resource implications from the Office of the Vice-President(Academic)

VP Embleton: Please comment

c. Statement from the University Librarian confirming the adequacy of library holdings

University Librarian Archer and Science Librarian: Please comment

d. Statement from the University Registrar regarding the proposed implementation schedule

Registrar Tiffin: Please comment.

e. Confirmations from “interested” programs that their comments have been solicited

AVP Shubert (York International): Please Comment

International Dual Degree Program in Mathematics and Statistics
at
York University – Toronto (Ontario, Canada)
and
Universita' dell'Aquila – L'Aquila (Italy)

Synopsis

Degree Programs to be established at York	*Standard Plan of Study*	*Degree Programs to be established at L'Aquila*
Years 1-3: Bachelor of Science **(new degree program)**	Study at the home university during Years 1 and 2 and study at the partner university during Year 3, completing the ordinary degree program requirements at the partner university. Obtain first degree from partner university.	Years 1-3: *Laurea di primo livello* **(new degree program)**
Year 4: Bachelor of Science (Honours) **(new degree program)**	Return to home university for Year 4 and complete the Honours degree program requirements. Obtain second degree from home university.	Year 4: *Master di primo livello* **(under consideration)** (Currently Year 4 may count only towards the *Laurea specialistica* – see Year 5.)
Year 5: Master of Science / Master of Arts in Mathematics or Statistics **(existing)**	Consider entering an existing Mathematics or Statistics Master's program at the home university OR at the partner university to obtain a third degree, subject to Graduate Faculty admission. (Students with an Honours degree from York may enter Year 5 at L'Aquila for the *Laurea specialistica*.)	Year 5: *Laurea specialistica* **(new degree program)**
PhD **(existing)**	Optional	*Dottorato di ricerca* **(existing)**

Comparative List of Mandatory Science Courses (Program Core) Deemed to be Equivalent

NOTE: ***6 credits at L'Aquila correspond to 3 credits at York***

Course Offered at L'Aquila	**Credits**	**Course Offered at York**	**Code**	**Credits**
Elementi di Matematica	6	Introduction to Sets and Logic*	MATH 1190	3
Analisi Matematica 1	6	Differential Calculus **	MATH 1000	3
Analisi Matematica 2	6	Integral Calculus **	MATH 1010	3
Geometria 1	6	Linear Algebra I	MATH 1021	3
Geometria 2	6	Linear Algebra II	MATH 2022	3
Calcolo delle Probabilita'	6	Elementary Probability	MATH 2030	3
Statistica	6	Introduction to Statistics II	MATH 2131	3
Programmazione	6	Introduction to Computer Use I	COSC 1520	3
Laboratorio di Informatica	6	Introduction to Computer Use For The Nat. Sci.	COSC 1540	3
Fisica 1	6	Physical Science ***	PHYS 1410	6
Fisica 2	6			
Matematica Discreta	6	Discrete Mathematics	MATH 2320	3
Analisi Matematica 3	6	Calculus of Several Variables With Appl. **	MATH 2310	3
Analisi Numerica 1	6	Numerical Methods I	MATH 3241	3
Analisi Numerica 2	6	Numerical Methods II	MATH 3242	3
Equazioni Differenziali Ordinarie	6	Differential Equations	MATH 2270	3
Ulteriori Abilita' Informatiche Specifiche 1	6	Symbolic Computation I	MATH 2041	3
Ulteriori Abilita' Informatiche specifiche II	6	Symbolic Computation II	MATH 2042	3
Matematica Finanziaria ed Attuariale	6	The Mathematical Theory of Interest	MATH 2280	3
Analisi complessa	6	Complex Variables	MATH 3410	3
Equazioni della Fisica Matematica	6	Partial Differential Equations	MATH 3271	3
Ricerca Operativa	6	Operations Research I	MATH 3170	6
Modelli Matematici dei Mercati Finanziari	6			
Processi Stocastici	6	Stochastic Processes ****	MATH 4430	3
TOTAL	144			72

* MATH 1190 may be replaced by MATH 1019 if MATH 2320 is replaced by MATH 3260. **The sequence MATH 1000, 1010, 2310 may be replaced by MATH 1013, 1014, 2015. *** PHYS 1410 may be replaced by PHYS 1010. **** MATH 4430 may be replaced by MATH 4431.

Comparative List of Further Mandatory Courses (Part of the Specified General Education Requirement)

NOTE: ***6 credits at L'Aquila correspond to 3 credits at York***

Course Offered at L'Aquila	Credits	Course Offered at York	Code	Credits
Lingua Inglese 1, 2 *(to be taken by L'Aquila students only)*	12	Elementary Italian *(to be taken by York students only)*	IT 1000	6
Lingua e Cultura Italiana *(to be taken by York students only)*	6	Canadian Language and Culture *(to be taken by L'Aquila students only)*	HUMA 1220	9

Note: These language requirements are to be considered minimal. It is strongly recommended that York students take further language courses, such as IT 2000 6.0. Especially York students with advanced language skills are strongly encouraged to consider alternative levels of Italian language study in lieu of IT 1000 6.0. L'Aquila students are expected to have passed a TOEFL score of 550 or higher prior to York admission.

Degree Requirements (Summary)

York University International Degree in Mathematics and Statistics

BSc: Complete the 72 York credits of mandatory Science courses as listed above, plus 18 additional credits, in accordance with Faculty regulations. For students whose home university is York, these additional credits must include IT 1000 (6 York credits) and *Lingua e cultura italiana* (3 York credits) or euivalent, and 3 further credits in fulfillment of the general education requirements. For students whose home university is L'Aquila, the additional credits must include *Lingua inglese 1, 2* (6 York credits) and HUMA 1220 (9 York credits) or equivalent.

Specialized Honours B.Sc.: Complete the requirements for the B.Sc., plus 30 additional York credits, in accordance with Faculty regulations. At least 9 SC/MATH credits must be at the 4000 level.

University of L'Aquila International Degree in Mathematics and Statistics

Laurea di primo livello: Complete the 144 L'Aquila credits of mandatory Science courses, plus 36 additional L'Aquila credits in accordance with Faculty regulations The additional credits must include a survey paper (*Prova finale*, 3 L'Aquila credits *). Furthermore, for students whose home university is L'Aquila, the additional credits must include *Lingua inglese 1*, *2* (12 L'Aquila credits) and HUMA1220 (18 L'Aquila credits) or euivalent. For students whose home university is York, the additional credits must include IT 1000 (12 L'Aquila credits) and *Lingua e cultura italiana* (6 L'Aquila credits) or euivalent.

Laurea specialistica: Complete the requirements for the *Laurea di primo livello*, plus 120 additional L'Aquila credits, in accordance with Faculty regulations. The additional credits *must* include the courses *Meccanica razionale* (6 L'Aquila credits) and *Algebra concreta* (6 L'Aquila credits) or equivalent, as well as a thesis (*Tesi di laurea)*.

* If successfully continued as MATH 4000 at York the respective project may lead to 3 or 6 York credits.

Suggested Study Plan for a York Student

Year 1 (at York)
MATH 1190 3.0, 1000 3.0, 1010 3.0, 1021 3.0, COSC 1520 3.0, 1540 3.0, PHYS 1410 6.0, IT 1000 6.0
(MATH 1000, 1010 may be replaced by 1013, 1014; PHYS 1410 may be replaced by PHYS 1010, and MATH 1190 may be replaced by MATH 1019, in which case MATH 2320 (see Year 2) *must* be replaced by another 2000- or 3000-lel MATH course, preferably MATH 3260)

Year 2 (at York)
MATH 2022 3.0, 2320 3.0, 2030 3.0, 2131 3.0, 2310 3.0, 2270 3.0, 2041 3.0, 3241. 3.0, 3242 3.0, 2280 3.0
(MATH 2310 may be replaced by MATH 2010 or 2015).

Year 3 (at L'Aquila) *(courses are listed under their equivalent York numbers)*
MATH 3410 3.0, 3271 3.0, 3170 6.0, 4430 3.0, 2042 3.0; *Lingua e cultura italiana* 3.0; 9 credits to be chosen in view of fourth-year goals.

York students having successfully followed this course selection will have completed all *mandatory* courses required for the 90- and 120-(York) credit IMS programs at L'Aquila and at York. To obtain the Italian *Laurea di primo di livello* students must, in addition, write a survey paper

(*prova finale*). Hence, York students spending their third year of study at L'Aquila and planning to obtain the L'Aquila degree are advised to stay at L'Aquila for part of the summer before returning to York.

To obtain an Honours B.Sc. from York students must return to York and complete courses worth 30 credits, according to Faculty requirements, taking at least 21 credits at the 3000 level or higher (for a total of 42) and at least 18 SC credits (for a total of 90). At least 9 credits must be at the 4000 level. Students may want to consider putting emphasis on either applied mathematics, pure mathematics, or statistics courses The following *suggested* selection of courses maximizes "fall-back options" to other York programs in Mathematics or Statistics and keeps the options for entering graduate programs open.

Year 4 (at York)
MATH 3010 3.0, 3020 6.0, 3210.03*, 3330 3.0, 3034 3.0, 4000 3.0 **, 6 further SC credits at the 4000 level, 3 further credits to satisfy the General Education Requirement.
* Students having followed MATH 1013/1014 instead of 1000/1010 must have taken MATH 3110 prior to 3210.
** The individual project could be a continuation of the work begun at L'Aquila for the *Prova finale.*

Exit Strategies

To the Mathematics BSc Program

A student having completed the courses suggested for Year 1 in the International Dual Degree Program in Mathematics and Statistics and wanting to switch to the Mathematics BSc program will have completed all of the specifically required MATH courses, except for MATH 2022 and MATH 2310 (which are mandatory courses of the Dual Degree programs suggested to be taken in Year 2). The student can count COSC 1520 towards the Computing Requirement and PHYS 1410 towards the Lab Requirement. Both requirements could then be completed by taking MATH 2041 plus any of MATH 2042, EATS 1010, or CHEM 1000. (Note that MATH 2041 and MATH 2042 are mandatory courses of the Dual Degree programs , suggested to be taken in Year 2.) The student cannot count IT 1000 as part of the General Education Requirement, but these 6 credits will still count towards the overall 90-credit requirement. Any MATH credits suggested to be taken in Years 2 and 3 of the Dual Degree programs would also count towards the Mathematics BSc.

To the Applied Mathematics BSc Program

A student having completed the courses suggested for Year 1 in the International Dual Degree Program in Mathematics and Statistics and wanting to switch to the Applied Mathematics BSc program will have completed all of the specifically required MATH courses,

except for MATH 2015 (which is one of the mandatory IMS courses suggested to be taken in Year 2) and the 1-credit courses MATH 1016 and MATH 1017. The student will have completed the Computing Requirement and can count PHYS 1410 towards the Lab Requirement which could then be completed by taking MATH 2041 and 2042. (Note that MATH 2041 and MATH 2042 are mandatory courses of the Dual Degree programs, suggested to be taken in Year 2.) The student cannot count IT 1000 as part of the General Education Requirement, but these 6 credits will still count towards the overall 90-credit requirement. Any MATH credits suggested to be taken in Years 2 and 3 of the Dual Degree programs would also count towards the Applied Mathematics BSc.

To the Statistics BSc Program

A student having completed the courses suggested for Year 1 in the IMS program and wanting to switch to the Statistics BSc program will have completed all of the specifically required MATH courses, except for MATH 2022 and MATH 2310 (which are mandatory courses of the Dual Degree Program suggested to be taken in Year 2), and MATH 1131 , 3131, and one of MATH 3033 or 3330.. The student will have completed the Computing Requirement and can count PHYS 1410 towards the Lab Requirement which could then be completed by taking MATH 2041 and one of MATH 2042, EATS 1010, or CHEM 1000. (Note that MATH 2041 and MATH 2042 are mandatory courses of the Dual Degree programs, suggested to be taken in Year 2.) The student cannot count IT 1000 as part of the General Education Requirement, but these 6 credits will still count towards the overall 90-credit requirement. Any MATH credits suggested to be taken in Years 2 and 3 of the Dual Degree programs would also count towards the Statistics BSc.