

## **QBS Rules and Regulations for Masters Students**

### Overview and Statement of Purpose

#### QBS Administration

- I. Program Requirements for the Master of Science
  - A. Grading System
  - B. Journal Clubs
  - C. Independent Study
  - D. Masters Students Transferring to the QBS PhD Program
  - E. Teaching by Graduate Students
- II. Procedures in the Case of Potential Separation from the Program
- III. Attendance and Vacations
- IV. 4+1 Program
- V. Internal QBS Master of Science Program

### **Overview and Statement of Purpose**

The primary goal of the Quantitative Biomedical Sciences (QBS) Graduate Program at Dartmouth is the cross-disciplinary training of students in Biostatistics, Bioinformatics, Epidemiology, Health Data Science, and Medical Informatics to be highly qualified for productive careers in industry, research, and academia in a broad range of quantitative and investigative areas. The Master's Program offers three concentrations, Health Data Science, Epidemiology, and Medical Informatics.

The QBS Master of Science Degree in Health Data Science provides training in data wrangling, exploratory data analysis, statistical modelling, machine learning, data visualization and communication. Graduates will have competencies in the management, analysis and interpretation of data from health care, medicine, computational biology, pharma and genomics. Health Data Science students have access to interdisciplinary courses that position individuals to have competitive advantages for careers in biostatistics, epidemiology and the burgeoning field known as data science, including artificial intelligence, with specific emphasis on problems in healthcare and biomedicine that translate to academia and industry. Students complete 14 required units of coursework, including a capstone that brings together data wrangling, exploratory data analysis, programming, statistical learning, epidemiology, data visualization and communication. In addition, 4 elective units of coursework are required during the 5 quarters in

residence. Students also have the option to pursue an internship during the summer as their Capstone Experience

The QBS Master of Science Degree in Epidemiology provides advanced training in epidemiologic methods and supporting training in biostatistics, bioinformatics, data analysis and translational research. Graduates will have competencies in the theory and application of epidemiologic methods to complex problems in population health. Epidemiology students will receive interdisciplinary training for careers in biomedical research, government agencies, private industries, and nonprofit health organizations. Students complete 14 required units of coursework, including a Capstone Experience, in which students will develop and complete a research project with a faculty advisor. They also have the option to pursue an internship during the summer as their Capstone Experience. In addition, 4.5 units of elective courses are required during the 5 quarters in residence.

The QBS Master of Science Degree in Medical Informatics provides students access to interdisciplinary courses positioning individuals to have competitive advantages for data driven careers in healthcare and biomedicine that translate to academia and industry. Students complete 14 units of required coursework, including a capstone that brings together data wrangling, exploratory data analysis, programming, statistical learning, epidemiology, medical informatics, health services research, data visualization and communication. In addition, at least 4 units of elective coursework are required during the 5 quarters in residence. Students are required to pursue an applied capstone project through local projects or internships.

Students will need to declare their choice of concentration in Health Data Science, Epidemiology, or Medical Informatics at the beginning of the first term of the Master's Program. Completion of core courses for either concentration are prerequisites to enroll in QBS 185: QBS MS Capstone course. Students may be allowed to transfer between concentrations but must obtain the formal approval from QBS Leadership & Administration identifying:

- Reasons for transferring
- Residual Core & Elective courses
- Revised date of degree completion, if the duration of the program extends beyond 15 contiguous months from the date of matriculation

\*Tuition & Fees Apply for additional terms of coursework

The guidelines that follow have been adopted by the QBS Director, Associate Director, Administration and Program Faculty to ensure that each student completing these graduate

programs will have acquired the necessary skills and knowledge to be effective in the career path of their choice.

### **QBS Administration**

QBS is overseen by the Director of the program, the Associate Director, and the QBS Advisory Committee, each position involving a two-year term. The QBS Director and administrative team oversee the daily activities of the program. The QBS Associate Director is second in command and petitions the Advisory Committee for election to said position. If elected, the Associate Director serves a term of 2 years, after which it is expected that they then assume the position of QBS Director. The election of the Associate Director is determined by a majority vote of the Advisory Committee. The Associate Director is essentially the director-in-training and holds distinct and shared responsibilities that aid the QBS Director and Administration of the program.

The Advisory Committee consists of seven members, two from each of the represented disciplines (Bioinformatics, Biostatistics, and Epidemiology) to be appointed with voting privileges by their respective department chairs. The QBS Director is the seventh member serving as the Chair of the Advisory Committee, in an officiating, nonvoting role. The QBS Director will cast the deciding vote in cases of a tie or plurality vote. The Associate Director remains one of the six voting members of the Advisory Committee. The term for all Advisory Committee Members is a minimum of two years. In the absence of the Director, the Associate Director will assume authority of the Advisory Committee and programmatic matters as they arise.

Intention to resign from the committee except under unexpected personal or professional circumstances, must be expressed to the committee and their respective Department Chair at least 2 months in advance such that a suitable replacement can be found. The Advisory Committee meets at least twice per year at approximately 6-month intervals or as needed. Decisions regarding major programmatic issues are put to a vote and implemented by the Director, Associate Director, Program Administration and QBS faculty where appropriate. For routine decisions, the Director and Associate Director will act in his or her best judgment. The QBS Advisory Committee also serves as members of the PhD or Masters admission committees in conjunction with selected QBS PhD Student Representatives and Chair approved ad -hoc members appointed to either when necessary.

### **QBS Curriculum Committees**

The QBS Curriculum Committee chairs are selected from the QBS Advisory Committee and committee composition is established by discipline and specific departments: Epidemiology, Biomedical Data Science, and Bioinformatics. The primary responsibility of each Curriculum Committee is to oversee the quality of QBS courses. They evaluate the content and sequence of the QBS PhD and Masters program curriculum and suggest appropriate modifications to department chairs and the QBS Advisory Committee. All QBS courses that have 4 or more students registered are provided course and instructor feedback through student course evaluations in Banner at the end of each quarter. Feedback is reviewed by the Director of Academic and Student Affairs, the QBS Director, and QBS Curriculum Committee chairs quarterly. Students may also express concerns about a course to the QBS Administration and Leadership at any time during the quarter. The Curriculum Committee chairs discuss feedback from courses with Course Directors after receipt. When a concern is raised about a course's quality by the QBS Curriculum Committee chair, QBS Leadership, or members of the QBS Curriculum Committee, the chair and the committee will provide support to the Course Director and relevant Department Chair in creating an action plan for course improvement. The Curriculum Committee and/or Department Chairs are responsible for evaluating whether the concerns have been sufficiently addressed after the next offering of the course. Curriculum Committees may also identify scientific gaps and market competitiveness; review syllabi, sample lecture slides, and homework assignments from each course when it is first offered by an instructor or substantially modified.

Note that in the sections following, the term 'first-year student' is used to describe a student entering the program. Under most circumstances a first-year student may not begin satisfying the requirements described in this document prior to the fall term of their first year in the program, however this remains an exception for those accepted to the QBS Master's Program (see section V). Also, the word 'faculty' where not specified otherwise, refers to QBS Program faculty.

All students are expected to adhere to the Honor Principle and the Student Code of Conduct as described in the Dartmouth Graduate Student Handbook:

<https://graduate.dartmouth.edu/academics/graduate-school-forms/academic-policies>).

## **I. PROGRAM REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE**

The QBS MS in Health Data Science, Epidemiology, or Medical Informatics Programs are designed to be completed in 15 contiguous months, starting the Fall of the academic year of matriculation and ending the Fall of the following academic year. Each concentration requires completion of 18 units of coursework comprised of 14 units of core courses and 4 units of approved elective courses.

Upon matriculation to the QBS MS program there are certain pre-requisites and expectations that are required from first year students. Entering students must have fulfilled the requirement of having coursework in calculus in addition to statistical coursework or experience and programming coursework or experience on their transcript or otherwise stated. Health Data Science students may also choose to satisfy linear algebra or multivariable calculus as pre-requisites. Students are expected to arrive in the Fall ready to employ the techniques of calculus (including differentiation and integration of multivariable functions), and that you will be comfortable with programming/scripting languages (procedural and Object Oriented, e.g in R or Python) and concepts (incl. algorithms, data structures). If students lack any of these skills, or it has been a while since they employed them, they are strongly encouraged to acquire them before the program start. Regardless, every student is required to participate in an R Programming Bootcamp in the weeks prior to the Fall Quarter.

Students who matriculated Fall 2021 and beyond may not take more than 4 units of course work per quarter unless approved by QBS administration and leadership.

For the Fall Quarter, this unit limit does not include pre-term mandatory courses QBS 103: Foundations of Data Science, QBS 700: Responsible and Ethical Conduct of Research, or the elective QBS 110: Integrative Biomedical Sciences Seminar.

***Requirements for the Master of Science degree in Quantitative Biomedical Sciences with a Concentration in Health Data Science***

Health Data Science students have access to interdisciplinary courses positioning individuals to have competitive advantages for careers in biostatistics, data science, artificial intelligence with particular focus on problems in healthcare and biomedicine situated in both academia and industry. Students complete 14 units of required coursework, including a capstone that brings together data wrangling, exploratory data analysis, programming, biostatistics, statistical

learning, epidemiology, data visualization and communication. In addition, up to 4 units of elective courses are required during the 5 quarters in residence.

1. Satisfactory completion of the following courses:

QBS 101: Foundations of Programming for Data Scientists (.5 unit each term- F/W/Sp)

QBS 103: Foundations of Data Science (.5 unit Fall pre-term)

QBS 108: Machine Learning (1unit)

QBS 119: Applied Biostatistics or QBS 120: Foundations of Biostatistics I (1unit)

QBS 121: Foundations of Biostatistics II (1unit)

**Choose one of the following::**

- QBS 122: Biostatistics III: Modeling Complex Data (1unit)
- QBS 124: Advanced Biomedical Data Analysis
- QBS 146: Bioinformatics I

QBS 130: Foundations of Epidemiology I (1unit)

QBS 177: Methods of Statistical Learning for Big Data (1unit)

QBS 181: Data Wrangling (1unit)

QBS 180: Data Visualization (.5unit)

QBS 194 or QBS 270: Biostatistics Journal Club (.5unit)

QBS 185.5: Capstone Preparation Course (.5 unit - W/Sp)

QBS 185: QBS MS Capstone Experience (3 units)

2. Satisfactory completion of 4 units of approved graduate level elective course

3. Completion of mandatory first year ethics course (QBS 700) required of all first-year graduate students but does not count toward core or elective degree credit

***Requirements for the Master of Science degree in Quantitative Biomedical Sciences with a Concentration in Epidemiology***

The QBS Master of Science degree in Epidemiology provides training in epidemiologic methods, biostatistics, bioinformatics, data analysis and translational research. Graduates will have competencies in the theory and application of epidemiologic methods to complex problems in population health. Epidemiology students will receive interdisciplinary training for careers in biomedical research, government agencies, private industries, and nonprofit health organizations. Students complete 14 units of required coursework, including a capstone, in

which students will develop and complete a research project with a faculty advisor. In addition, up to 4 units of elective courses are required during the 5 quarters in residence.

1. Satisfactory completion of the following courses:

QBS 101: Foundations of Programming for Data Scientists (.5 unit each term- F/W/Sp)

QBS 103: Foundations of Data Science (.5 unit Fall pre-term)

QBS 119: Applied Biostatistics or QBS 120: Foundations of Biostatistics I (1unit)

QBS 121: Foundations of Biostatistics II (1unit)

QBS 130: Foundations of Epidemiology I (1unit)

QBS 131: Foundations of Epidemiology II (1unit)

QBS 136: Applied Epidemiological Methods I (.5unit)

QBS 137: Applied Epidemiological Methods II (.5unit)

**Choose two of the following:**

○ QBS 132: Molecular Biologic Markers in Human Health & Disease (1unit)

○ QBS 134: Topics in Epidemiology (1unit)

○ QBS 133: Clinical Epidemiology (1unit)

QBS 146: Foundations of Bioinformatics I (1unit)

QBS 185.5: Capstone Preparation Course (.5 unit - W/Sp)

QBS 185: QBS MS Capstone (3units)

2. Satisfactory completion of up to 4 units of approved graduate level elective course

3. Completion of mandatory first year ethics course (QBS 700) required of all first-year graduate students but does not count toward core or elective degree credit

**Requirements for the Master of Science degree in Quantitative Biomedical Sciences with a Concentration in Medical Informatics**

Medical Informatics students have access to interdisciplinary courses positioning individuals to have competitive advantages for data driven careers in healthcare and biomedicine that translate to academia and industry. Students complete 14 units of required coursework, including a capstone that brings together data wrangling, exploratory data analysis, programming, statistical learning, epidemiology, medical informatics, health services research, data visualization and communication. In addition, at least 4 units of elective coursework are required during the 5 quarters in residence. Students are required to pursue an applied capstone project through local projects or internships.

1. Satisfactory completion of the following courses:

- QBS 101: Foundations of Programming for Data Scientists (.5 unit each term- F/W/Sp)
- QBS 103: Foundations of Data Science (.5 unit Fall pre-term)
- QBS 119: Applied Biostatistics or QBS 120: Foundations of Biostatistics I (1unit)
- QBS 121: Foundations of Biostatistics II (1unit)
- QBS 130: Foundations of Epidemiology I (1unit)
- QBS 192: Health Informatics (1unit)
- QBS 139: Advanced Methods in Health Services Research (1.5units)
- QBS 140: Decision and Cost Effectiveness Analysis (1unit)
- QBS 181: Data Wrangling (1unit)
- QBS 180: Data Visualization (.5unit)
- QBS 101: Foundations of Programming for Data Scientists (F/W/Sp\_.5unit each term)
- QBS 185.5: Capstone Preparation Course (.5 unit - W/Sp)
- QBS 185: QBS MS Capstone (3units)

2. Satisfactory completion of up to 4 units of approved graduate level elective courses
3. Completion of mandatory first year ethics course (QBS 700) required of all first-year graduate students but does not count toward core or elective degree credit

\*4+1 Students must satisfy the degree requirements listed above, completing 3 courses from the list during their Dartmouth undergrad training. GRE submission requirements are waived.

### **A. Grading System**

All grading should be in accordance with the Guarini School of Graduate and Advanced Studies (<https://graduate.dartmouth.edu/policy/satisfactory-progress>) QBS MS core, Capstone, and elective courses are graded as HP (High Pass), P (Pass), or LP (Low Pass). QBS Journal Clubs are graded on a CT (Credit), NC (No Credit) scale.

Grades of "LP" or "NC" in in core course work have serious consequences, as follows:

One grade of "LP" or "NC" in any term in any course results in the student immediately being placed on academic probation. Once placed on probation, any one of the following three conditions will be considered by the QBS Advisory Committee at an assessment hearing should the student not maintain a HP or P in additional coursework:

- a. No action is necessary.



- b. The deficiency must be removed either by repetition of the course, special examination, or other arrangement.
- c. The student is removed from the QBS program.

The following guidelines will be used for arriving at a recommendation

1. If a grade of "NC" is earned in any core course in any subsequent term the QBS Administration will recommend option (c).
2. If an additional "LP" is earned in any subsequent course the QBS Administration may recommend options (b) or (c).
3. If more than two "LPs" are earned the QBS Administration may recommend option (c).  
If a student fails to sufficiently improve his/her performance within one academic year after a performance review recommendation, the QBS Advisory Committee may recommend option (c).

All of the above options will be considered for grades obtained in elective courses at the discretion of the Advisory Committee. Should an assessment hearing be required, the student will be allowed to prepare a statement that may indicate any extenuating circumstances that may have influenced their grades.

## **B. QBS JOURNAL CLUB**

The QBS Program offers a wide variety of journal clubs. Masters students may fulfil elective credit requirements by taking up to and no more three Journal Club courses. All QBS journal clubs are 0.5 Units. No more than 1 independent journal club may count toward elective credit.

Students can pursue an independent journal club option. Students must identify a faculty member as an instructor and send the QBS Administration a description that entails the theme and material covered during the quarter. This does not have to include specific papers but should outline the plan per week and how often the student and instructor plan to meet and review the literature (at least 1- 1.5hrs/week in addition to at least 3hrs per week of out of class work). If multiple students are interested in one Independent Journal Club, these students will need to inform the QBS Administration of their intentions to and only one description/syllabus needs to be sent. All proposal are due on a defined date **before the end of the drop/add period for that quarter**. All QBS Journal Clubs are equivalent to 0.5 units, but units may for Journal Clubs offered through other departments and programs. QBS 193 does not count toward Epidemiology concentration elective credit.

## **C. Independent Study**

Students may also opt to pursue QBS 195: Independent Study as an elective credit. Students may use this to get credit for approved online courses (at their own cost). Otherwise the Independent study in QBS is structured to allow students to explore subject matter and enhance their knowledge in QBS related fields. The arrangement and a course outline are to be developed between the student and a QBS faculty member prior to the start of the quarter as well as submitted to the QBS Administration **before the end of the drop/add period for approval**. This should reflect 3.3 hours of instruction per week and a minimum of 6.6 hours of student work per week for the entirety of the term. The student and faculty will work together to structure the study program and set goals that are to be met by the end of the quarter. The course of study may include, but is not limited to, literature review, seminar attendance, online course material, small projects, and presentations related to the specific field being studied. The faculty member is responsible for tracking and evaluating the student's progress in order to provide a grade to QBS administration at the end of the term. No more than 1 independent study may count toward elective credit.

#### **D. MASTERS STUDENTS TRANSFERRING TO THE PHD PROGRAM**

Masters students may apply to the QBS PhD Program in either their first or second years. Submission of an application during the appropriate admissions cycle for intended year of matriculation into the PhD Program is required. Applications will be reviewed and measured against the quality of all applications submitted that year. No preference will be given to applications of QBS MS students, although it is recognized that greater familiarity with a student's work is often an advantage. If granted an offer of admission to the QBS PhD program, the following matriculation options are available:

1. There are three alternatives if offer of admissions is received the first year of the MS Program:
  - i. Complete spring term Masters courses:
    - Three independent studies can count as three rotations and final lab placement can be made at the end of spring term. Payment of spring tuition and fees still applies. This allows matriculation at the end of the Spring term and transition into the PhD Program in June. Stipend payments and lab work can begin at this time.
  - ii. Complete Masters courses during spring and summer terms:
    - Matriculation will be in the fall term. Three previous independent studies can count as three rotations and final placement can be made at the end of spring term but lab work and stipend payment cannot begin until the Fall. Payment of spring tuition and fees still applies

- iii. Take a leave of absence during the spring and summer terms, returning in the fall to avoid tuition & fees.
  - iv. Applies to all three alternatives: No MS Degree will be received. QBS PhD degree requirements are effective upon date of matriculation into the PhD Program. Any courses completed that apply to the PhD program will count toward PhD degree requirements. Up to three independent studies can count as three rotations.
2. If offer of admissions is received the first year of the MS Program and matriculation begins the following Winter after MS degree completion:
- a. Complete the remainder of the MS Program through fall term. Tuition and Fees still apply.
  - b. Begin PhD rotations the fall term prior to the Winter term of PhD matriculation.
    - i. The rotation can either be an independent study or noncredit bearing effort in addition to remaining MS courses. The independent study can count as 1 of 6 units that can carry over to the PhD Program. Independent study from the prior academic year will not count for the new year.
    - ii. MS Degree will be granted at the end of fall term upon completion of degree requirements.
    - iii. Six units can be shared between the Masters and PhD degree requirements
    - iv. Residual PhD degree requirements must be completed after identifying the six courses that will be shared between both degrees. Rotations are a requirement.
3. If offer of admissions is received the first year of the MS Program and matriculation begins the fall following the completion of the MS Program, or if offer of admissions is received the second year of the MS Program and matriculation begins the fall following the completion of the MS Program:
- a. Complete the remainder of the MS Program through fall term. Tuition and Fees still apply.
  - b. MS Degree will be granted at the end of fall term upon completion of degree requirements.
  - c. Return the following fall to begin the PhD Program.
  - d. Six units can be shared between the Masters and PhD degree requirements.
  - e. Residual PhD degree requirements must be completed after identifying the six courses that will be shared between both degrees. Rotations are a requirement.

## **E. TEACHING BY GRADUATE STUDENTS**

Teaching Assistantships are not required of Masters students and undertaking one will not directly waive tuition or fees. However, students have the option to pursue available Teaching Assistantship positions posted through Dartmouth College. QBS offers paid teaching assistantships; QBS Administration will notify the student body of the availability of these positions.

## **II. PROCEDURES IN THE CASE OF POTENTIAL SEPARATION FROM THE PROGRAM**

In the event that a student faces potential separation from the program due to course grades or other reasons that conflict with the standard policies of the Guarini School of Graduate and Advanced Studies (<https://graduate.dartmouth.edu/policy/graduate-student-nondiscrimination-grievance-procedures>), the QBS Advisory Committee will be convened to review the student's overall record and the pending separation prior to final action. The QBS Director will serve as chair of the meeting unless there is a conflict of interest. In such case, a senior member of the QBS Advisory Committee will serve as chair. Faculty members who feel they might have a conflict of interest that would compromise their ability to make a fair and impartial decision should remove themselves from associated meetings. The Advisory Committee will function as a democratic committee with a single vote for each faculty member present and the final decision will be arrived at by a majority vote. The Assistant Director of MS programs will have voting rights in such cases. The overall performance of the student will be reviewed with respect to whether the student is qualified for a productive scientific, or related, career and as to their potential capacity for achieving a MS level of scientific expertise within a reasonable timeframe. They will also consider any extenuating circumstances brought to their attention by the student or other informed party that may have contributed to the poor performance. In extraordinary instances, the Advisory Committee may recommend an alternative course of action to that which would normally be stipulated by the QBS rules and regulations for the particular circumstances that prompted the review process. Such a recommendation requires a 2/3 majority vote of the Advisory Committee. In cases where financial hardship is the reason for separation, the student will have three years from the date of matriculation to complete the MS Degree requirements for either concentration.

### **QBS Student Grievance Policy**

The process for guiding graduate student progress in QBS, while primarily designed to oversee scientific progress and direction, is also intended to guard against biased treatment of any individual. We have also established a grievance process consisting of multiple stages, to

ensure that student grievances will be investigated fully and fairly, treated confidentially and resolved in a timely manner. With an effective oversight/grievance committee structure, few grievances or disputes will reach the stage where they require formal resolution from the Guarini Graduate School Offices. However, when resolution is not feasible or successful at the program level, the Guarini Graduate Office is the next place to turn. A grievance may be handled as appropriate in the following stages:

1. When possible, speak directly to the person who bears responsibility for the complaint or who is the alleged cause of the complaint.
2. Speak to the research advisor and/or members of the Dissertation Committee.
3. Speak to the QBS Director or Administration.
4. If a satisfactory resolution cannot be reached within the department or program, the aggrieved student may request a meeting with the Dean of Graduate Studies to discuss the issue.
5. If the Dean, working together with the aggrieved student and appropriate faculty member(s), or representatives of the QBS Program is unable to reach a satisfactory resolution, the student can request in writing a formal hearing and ruling by the Dean of Graduate Studies and the Committee on Student Grievances. Please note that allegations of scientific misconduct, violations of the academic honor principle, and certain issues of professional and personal conduct (sexual harassment, discrimination, and others described in the graduate handbook under code of conduct - non-academic regulations) must be reported to and handled by the Graduate Office. Additional information about Guarini Policies and Procedures can be found here (<https://graduate.dartmouth.edu/policies>).

### **III. ATTENDANCE**

The QBS Program follows the established Dartmouth academic calendar with regards to holidays and institutional breaks. Refer to Dartmouth Calendar:

(<https://www.dartmouth.edu/reg/calendar/academic/21-22.html>)

The QBS MS in Health Data Science or Epidemiology Programs are designed to be completed in 15 contiguous months, starting the Fall of the academic year of matriculation and ending the Fall of the following academic year.

It is the expectation that students will complete the program within 15 months, however, in cases where a student needs to take a medical or personal leave of absence, they should seek approval

from the QBS administration. Students seeking a leave should adhere to term check-in guidelines as established by the Registrar of the Guarini School of Graduate & Advanced Studies. Leaves of absence will follow the refund policies set forth by the Financial Aid Office and Student Financial Services.

In cases of financial hardship or approved leaves of absence, students will have three years from the date of matriculation to complete the MS Degree requirements for either concentration.

#### **IV. 4+1 PROGRAM**

QBS offers a 4+1 option to Dartmouth Undergraduates allowing students to successfully complete a maximum of *three* graduate level courses which count toward the QBS Masters in Epidemiology or Health Data Science. The 4+1 option is designed for completion in 12 months (1 year) post Dartmouth undergrad graduation (4 years). Graduate level courses in the Basic/Life sciences, Math, Computer Science, Engineering, Psychological & Brain Sciences, and Physics & Astronomy qualify for the 4+1 Program.

Successful completion of three Graduate level courses must occur by the end of the Spring term of senior year. Grades for each course must be submitted to the Graduate School Registrar by the first day of the Fall term of matriculation.

4+1 Students must satisfy a total of 18 units of coursework inclusive of the 3 units completed as an undergrad. Core and elective requirements must be satisfied as detailed in section I.

#### **V. INTERNAL QBS MASTER'S PROGRAM**

The internal QBS Masters degree option is initially offered to 1.) Ph.D. students at Dartmouth who are enrolled in a program separate from QBS who have permission from their advisor and program and 2.) QBS Ph.D. students in good standing who do not successfully advance to Ph.D. candidacy or wish to leave the program under reviewed circumstances.

Interested students will need to submit to the QBS Director and Administration a signed letter of approval from their advisor indicating they acknowledge the course load and grant permission to pursue the degree. They also need to ensure that approval from their Ph.D. program is communicated to QBS Administration either by their program director or administration. Applications are submitted online through the Dartmouth application system, however students

are not required to resubmit transcripts from other institutes or test scores. Students must apply to the MS according to the QBS application cycle deadline.

### **Degree Requirements**

Students applying to the QBS Masters program may begin to fulfill degree requirements prior to being accepted and will also receive credit for any required course that they have received a Pass or higher in. They must notify the QBS Administration, their program, and advisor that they intend to pursue the internal MS should they wish to take more than 3 QBS courses.

The requirements for the internal MS degree, in Quantitative Biomedical Sciences are as follows:

Satisfactory completion of the six core course requirements: Foundations of Epidemiology I & II (QBS 130 & 131), Applied Biostatistics I (QBS 119) or Foundations of Foundations of Biostatistics I (QBS 120) & Foundations of Biostatistics II (QBS 121), Foundations of Bioinformatics I (QBS 146) and a choice of either Foundations of Bioinformatics II (QBS 175), Machine Learning (QBS 108), Advanced Methods in Health Services Research (QBS 139), or Decision and Cost Effective Analysis (QBS 140). One additional approved QBS elective is also required that will not count towards their PhD elective requirements.