MASTER OF STATISTICS PROGRAM
BIOSTATISTICS TRACK

DIVISION OF PUBLIC HEALTH
DEPARTMENT OF FAMILY AND PREVENTIVE MEDICINE
SCHOOL OF MEDICINE

POLICIES AND GUIDELINES

July 2019

There are academic and administrative steps involved in earning a degree from the interdepartmental, interdisciplinary Master of Statistics Program, Biostatistics Track. The Graduate School and the Master of Statistics Program have specific requirements. In addition, the Biostatistics Track is situated in the Department of Family and Preventive Medicine, Division of Public Health, and the Division has specific requirements. This document outlines the academic requirements and procedures. This document is subject to change without notice.

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Brief Introduction to MStat Program

History

The Master of Statistics program is an interdepartmental, interdisciplinary program at the University of Utah. Begun in 1976, this is arguably the oldest program of its kind still on campus. The program awards an MStat, which is a professional, non-thesis degree in statistics. It is administered by the University Statistics Committee, by agreement with the chairs of participating departments. Current tracks (participating departments) are Business (college-wide), Biostatistics (Family and Preventive Medicine), Econometrics (Economics); Educational Psychology, Mathematics, and Sociology.

Graduates of the Master of Statistics program have gone on to doctoral study and faculty roles at this and other universities; positions such as vice-presidents of health care corporations; and pharmaceutical company leadership; as well as roles as statistical analysts and consultants at this university and elsewhere.

Mission

The MStat program's primary goal is to prepare students for statistical consulting roles in industry. It is for those students whose primary interest lies in statistical methods in the specified disciplines. Graduates have grounding in the intermediate theory of statistics; track-specific applications; related software; team participation; communication/consulting skills; and the abilities to translate real-world problems into statistical models, to think through a statistical analysis that responds to the real-world problem, and to communicate the results to the appropriate audience.

Biostatistics Track

The MStat in Biostatistics is housed within the Division of Public Health at the Department of Family and Preventive Medicine, in the School of Medicine. The goal of this track is to provide the student with a good foundation in the basics of applied statistics, the fundamentals of numerous problems in the areas of health, an ability to apply statistical knowledge to health-related data, an ability to understand the problems and deal with the personalities of health care personnel, and an ability to use computers to good advantage. For well-prepared students, this is a two-year program. Students with less preparation will need to extend their time in the program. In addition, many MStat students are part-time, as they also have a full-time job or family responsibilities.

As a track in an interdepartmental program, the track leadership is rotated among track faculty, approximately annually. There is a Biostatistics Director in the Division of Public Health, who assists to coordinate between the Public Health programs and the Biostatistics track.

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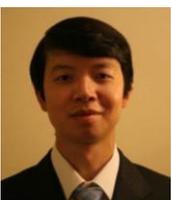**John VanBuren, Ph.D.**
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Admissions Criteria

MStat Program Admissions Criteria

Minimum requirements for admission:

1. Bachelor's degree from an accredited college or university with at least a cumulative 3.0 GPA

2. Two semesters of calculus, evidence of multivariate calculus, two semesters of biology, programming language, knowledge of matrix theory, and at least two semester courses in basic statistics.

Application for admission to the MStat Program is made through the Graduate School. Although the Track and the MStat Program can recommend admission, only the Graduate School can formally admit a candidate.

Two months in advance of the semester for which you are applying, submit the following through Apply Yourself (https://app.applyyourself.com/?id=utahgrad). (You may check your status at any time at the same web address).

International applicants must also include official TOEFL scores. The International Admissions Office requires at least iBT 80 or pBT 550, or an IELTS score of at least 6.5.

For admission to some tracks (but not Biostatistics), students must also take the GRE or GMAT prior to applying for the Master of Statistics Degree Program.

Additional Biostatistics Track Admissions Criteria

Admissions to the Biostatistics Program are highly competitive. Admissions decisions will be based on an evaluation of the individual's application.

1. Prerequisites for the Biostatistics Track: all the general MStat requirements, plus:
    a. Bachelor's degree from an accredited college or university- at least a cumulative 3.0 GPA
    b. 2 semesters of undergraduate statistics (applied or theoretical, e.g., Math 3070-3080, Math 1030, Math 1070)
    c. 2 semesters of undergraduate biology
    d. 2 semesters of undergraduate calculus
    e. Evidence of Multivariate Calculus
    f. Knowledge of a programming language (C++, Java, Python)
    g. Knowledge of matrix algebra (e.g., Math 2270)

    A letter grade of B- or better is required for all prerequisites to be accepted. For international students and/or institutions that grade based on a 100 point scale, a conversion chart must be provided. If no conversion chart or translation of the 100 point scale to a letter grade is submitted, the admissions committee will default to the grading scale set by the Office of Admissions. According to the grading scale anything lower than an 80 will not be accepted and the applicant will have to retake the prerequisite in question. Applicants can provide a conversion chart via transcripts, the institutions website or an official letter from the institution documenting the conversion scale. Any items taken from the institutions website must be translated and notarized for authenticity of translation.

    Students who have not completed all of the prerequisites may be rejected. Failure to meet these prerequisites will require explanation for the file to be considered further. See probationary admissions policy below.

    The programming language is to be a real programming language, not statistical software or a database. Please note that potential employers prefer Mstat–Biostatistics graduates to have experience in real programming languages such as Java, C++ and Python. However, the faculty will consider an application in which the student demonstrated that they can program macros in SAS, Stata or R, in lieu of the programming prerequisite. The prerequisite of 'knowledge of a programming language' requires documentation that goes beyond personal assertion. This could be a course documented in a transcript; a letter from a knowledgeable faculty member or reference person who knows that the candidate knows/has experience with a specific programming language; a copy of a certification or certificate of completion; or other concrete documentation of knowledge of that programming language. The prerequisite of knowledge of matrix algebra is similar.

2. The transcripts from all colleges and universities attended, submitted directly to the University of Utah Admissions Office

3. TOEFL scores for international students- at least iBT 61 or pBT 500, or an IELTS score of at least 6.5 submitted through Apply Yourself

4. Three letters of recommendation submitted through Apply Yourself

5. Personal statement of objectives and goals – not to exceed 1000 words; submitted through Apply Yourself.

6.   Potentially a personal interview after application is approved for interview, including international applicants. In order to accommodate applicants who come from a significant distance, personal interviews can be arranged at a mutually convenient time. Telephone interviews may be conducted and will be considered on a case-by-case basis. Any waiving of the personal interview is at the sole discretion of the Biostatistics Track Faculty.

The GRE is not required in the Biostatistics track at this time, but if you have the scores, you may submit them.

Only courses with a grade of B- or better may be transferred into the program. Students who took MStat in Biostatistics core courses prior to admission to this program and received a grade lower than a B- must repeat them.

The Biostatistics Program admits students for Fall semester and Spring semester each year. The 'priority' deadline for Fall admission is February 1. Complete applications received by the Biostatistics program by February 1 will be considered by February 15. The regular deadlines for Fall admission and Spring admission are **April 1** and **October 1,** respectively. Applications received by these timeframes will be considered if the class is not yet full. Applicants must complete their file prior to the deadline.

Probationary Admission Policy

This policy is experimental in 2012 and is subject to review in May of every year.

1.   Students are not eligible for probationary admission unless, as assessed by the admissions committee, they are otherwise strong candidates with a strong chance of MStat/Biostatistics program completion. This includes evidence that the student can do 1) calculus and 2) statistics. The admissions committee will make these decisions conservatively, on a case-by-case basis.

An applicant cannot be considered for probationary admission unless they have a bachelors from an accredited university(or will have it by the start of their first semester); a GPA of at least 3.0; and grades of B- or better in 2 semesters of calculus and 1 semester of statistics, or 1 semester of calculus and 2 semesters of statistics.

2.   Probationary admission must include a plan for completion of the missing prerequisites. The admissions letter will state these conditions and also that the student should expect to spend three years in the MStat program.

3.   Students may receive probationary admission in summer semester, fall semester, or spring semester, as recommended by the admissions committee.

4.   Students admitted on a probationary basis must focus on taking the missing prerequisites immediately. They may take required courses for the MStat program after they have completed all the prerequisites for that course with a grade of B- or better. For example: Math 5010 may be taken as soon as the person meets the Math department's prerequisites for this course. However, students must complete the matrix algebra and programming language requirements prior to taking FPMD 6106-6107.

5.   The student and advisor will work together to ensure that the requirements of probation are met in the specified timeframe. When all prerequisites are completed, the student will write a letter to the Biostatistics Faculty, signed by the advisor, reporting grades of all prerequisites and petitioning to be taken off probation.

6.   Students receiving less than a B- in any *single* prerequisite during this probationary admission period will be allowed to stay in the probationary program for one additional semester (counting summer), and to try to improve their grade in that prerequisite or take another course to apply to the prerequisite.

7.   Students receiving less than a B- in *two* of the (missing) prerequisites during this probationary admission period, or for the same prerequisite twice, will be reviewed for grounds for dismissal from the program.

8.   During the probationary admission period, the student may opt to take additional, non-required courses such as ESL, Calculus III, additional programming languages, database courses, other mathematics (non-statistics) courses, or additional biology, genetics, and medical terminology. Grades in such courses will not jeopardize their probationary status. They may choose to take courses at the community college, such as programming languages, but they must meet any minimum enrollment criteria (e.g., International Student criteria) according to UU rules.

9.   If at the end of the 12 month probationary admission period, the person has not met all of the MStat/Biostatistics prerequisites, they will be reviewed for grounds for dismissal from the program.

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Degree Requirements

1) General Requirements

Progress and Evaluation

Certain general policies with respect to advising and periodic evaluation of student progress apply to all students in the MStat-Biostatistics Program. For new students, an academic advisor is assigned to guide the student in their academic program. Students should meet with their academic advisor early in the beginning of the first semester, or prior to first semester when possible, to outline their coursework and review their academic goals. Furthermore, students should meet with their academic advisor each fall and spring semester to review progress and goals. It is the student's responsibility to meet with their academic advisor on a regular basis.

All students are assigned an initial faculty advisor. The initial faculty advisor will help the student with any questions they might have about the program; discuss possible elective courses; possibly help with practicum selection and potentially chair the student's supervisory committee (see below). Once the student has formed their committee, the chair of the committee is the new faculty advisor. The faculty advisor approves the student's academic program and all electives. If a graduate student's preliminary work is deficient, the faculty advisor may require supplementary undergraduate courses for which no graduate credit is granted. It is possible, though uncommon, to change initial faculty advisors, and this can be done with the approval of the Biostatistics Track faculty, as it requires them to shift workloads. The best time to change initial faculty advisors is at the time of formation of a formal supervisory committee. Also, students should feel free to discuss topics of interest with other faculty members, within and outside of the MStat-Biostatistics Program, who may be of help or who are interested in a particular applied area.

Supervisory Committee

A supervisory committee is a critical component of each student's graduate study. The supervisory committee is responsible for approving the MStat-Biostatistics project proposal, reading and approving the project report, and administering and judging the final oral examination. The final oral examination may be chaired by any member of the supervisory committee consistent with departmental policy. Decisions concerning examinations and project approval are made by majority vote of the supervisory committee.

For all students, three committee members are necessary. The committee chair must be from the MStat-Biostatistics Program Faculty. At least two of the members must be faculty of the MStat-Biostatistics Program.

It is the responsibility of the student to approach prospective committee members with a view to their willingness and availability to serve in such a capacity. The faculty has the right, for justifiable academic and/or administrative reasons, to decline to serve on a student's supervisory committee.

Supervisory committees are generally formed early in the third full semester. To establish a supervisory committee, the student is responsible for completing the Request for Supervisory Committee Form, having each member sign, having the Director of the MStat Program (all tracks) sign, and turning in a copy to the Biostatistics Track Academic Coordinator to be processed. After the supervisory committee form is filed, the student should file the Candidacy form as soon as possible (see below.) Deadlines are posted on the MStat website.

Please refer to the Graduate Handbook for further information on supervisory committees.

Faculty/Student Worksheet

After the supervisory committee form is filed, the student should complete the Faculty/Student Worksheet as soon as possible. The Faculty/Student Worksheet, signed by the supervisory committee chair, is required by the Division of Public Health and is used as the checklist of items which must be completed in order to allow a student to graduate. You can get the worksheet from the Biostatistics Track Academic Coordinator.

Once the form is signed and approved by the supervisory committee chair and the MStat program director, the student should give the original to the Biostatistics Track Academic Coordinator. This form constitutes a contract of graduation requirements.

Minimum Grades

Candidates for graduate degrees at the University of Utah are required to maintain a 3.0 or higher GPA in course work counted toward the degree. In addition, departments may set minimum grade requirements for a course to count towards a specific degree.

A failing grade for any course in the MStat-Biostatistics Program is a final grade below a B-. These courses will not be counted toward graduation in the MStat in Biostatistics program. This includes core courses taken in other departments, such as Math 5010-5080-5090 and elective courses.

Failure in a core course means the student has not demonstrated competence in a discipline necessary for success within the Program. For these reasons, the following action is recommended:
1. Students who receive a grade lower than a B- in a core course are on probation. The student will be notified in writing that he or she is on Departmental probation.
2. These students will be allowed to retake the core course one more time and they must pass the course with a grade of B- or better. A grade of B- or lower on the second attempt will be grounds for dismissal. The student will be permitted to take other Program courses for which the core course is not a prerequisite. However, students will not be permitted to count toward MStat graduation more than 15 hours after this failure occurred, before retaking the core course.
3. A student who fails two core courses will not be permitted to count any further courses toward MStat graduation until he or she has retaken both courses and received grades of B- or better. International students are cautioned that this may affect their status.
4. Two grades lower than a B- in elective courses will be grounds for dismissal.

Actions arising from this policy may be appealed by the student using the appeals process outlined by the University of Utah – Appeals of Grades and Other Academic Actions.

Math 5010, 5080, 5090 Undergraduate Credit

Students who have taken MATH 5010, 5080, and 5090 during their undergraduate degree from the University of Utah, and did not receive a B- or better in one or all of the courses, are required to retake those courses if admitted into the MSTAT, Biostatistics program. As a graduate student a B- is a passing score and MATH

5010, 5080 and 5080 are required courses for the MSTAT, Biostatistics degree. Given that courses taken as an undergraduate student that are applied towards the student's undergraduate degree cannot count as graduate credit, the student must retake these courses as an independent study section. Only if, the student received below a B-. It is up to the student to confirm with the Faculty teaching the course to set up an independent study section. The student will sit in on all class lectures and exams for the class in question, but grades will be submitted under the independent study section.

Students who have taken MATH 5010, 5080, and 5090 during their undergraduate degree from the University of Utah, but received above a B-, which is a passing grade in graduate school, will not have to retake these courses. Although, they will have to take an additional 9 credit hours as elective credit to fulfill the 38 credit hour requirement.

2) Policy on Courses and Registration

Course Numbers

Courses numbered 6000 and above are considered graduate-level. Courses numbered 5000 to 5999 can count toward graduate degrees. Courses numbered 3000 to 4999 are upper-division (junior and senior) courses. Those numbered 1000 to 2999 are lower-division (freshman and sophomore) courses.

Credit/No-Credit Policy

The intent of the *CR/NC* option is to free students to extend their studies to areas outside their major or specialty and to take classes they otherwise might not take if they had to compete with majors for a letter grade. The following applies to taking classes *CR/NC:*

1. During the first year in The Graduate School of the University of Utah, the student, if the department concurs, may register for one class each semester on a *CR/NC* basis.
2. Of the first year's work, courses taken for *CR/NC* grades may not exceed approximately 25 percent of the student's total credits and generally should be less than 25 percent. In some cases, especially if the student plans to do doctoral work, the director of graduate studies or advisor may determine it is desirable that all classes the first year be taken for letter grades. If so, the program should be outlined accordingly.

3. After the first year in The Graduate School, the student may request permission from the appropriate director of graduate studies to register for more than one class per semester on a *CR/NC* basis.
4. Students may not elect to register for *CR/NC* courses for core MStat-Biostatistics Program courses unless a course is offered *only* on a *CR/NC* basis.
5. All courses earning credit of one hour are graded on a *CR/NC* basis, unless use of regular letter grades is approved by the Graduate Council.
6. Students should earn a grade of *B-* or better to be entitled to credit. Students who do not wish to register for credit, either for a letter grade or *CR/NC,* should audit the course.
7. Students enrolled in a class for *CR/NC* may change to a letter grade any time before the Monday of the last week of classes. Graduate students are cautioned that it is important they receive letter grades in order to build a graduate GPA. This is especially important if students apply for fellowships or traineeships on a competitive basis or later transfer to another institution.

Petition for Graduate Credit

MStat-Biostatistics Program students may be allowed to designate certain graduate-level courses (5000 level and above) which they took while enrolled as an undergraduate student, to be counted for graduate credit. Such graduate credit is limited to six semester hours or two courses. Credit used to earn the undergraduate degree may not be counted toward a graduate degree. Students are required to seek advance approval of the student's supervisory committee and the Dean of the Graduate School on an **Undergraduate Petition for Graduate Credit** form, available in the Registrar's Office and on the Graduate School webpage under "Online Forms". However, if a student seeks retroactive graduate credit for courses taken as an undergraduate, permission may be granted only if a grade of B or better was earned in the specified courses and if the courses were taken no more than three years prior to the petition.

Transfer of Credit

Graduate credit may be transferred from other institutions. Similar core and required graduate-level courses taken at other colleges and universities will be reviewed on a course by course basis. The student's advisor will review the syllabus from the other institution to determine if the course is acceptable as a transfer course.

Credits transferred from another institution may be used for only one University of Utah degree. Up to six semester hours of transfer credit may be applied toward fulfillment of graduate degree requirements if they (1) are of high letter grade (*A, A-, B+ or B*; credit only grades are unacceptable), (2) are recommended by the student 's supervisory committee, and (3) are taken within the prescribed time limit.

Non-Matriculated Credit

The Graduate School allows up to nine semester credit hours from non-matriculated coursework at the University of Utah, which were not applied to another degree, to be applied towards a degree. It must be approved by the student's supervisory committee. Applying more than nine hours of non-matriculated work to the degree requires approval of the Dean of The Graduate School. Students should check with the International Office to determine if they are eligible for non-matriculated courses.

Furthermore, the Graduate School allows a maximum of six credit hours from relevant coursework outside of the University of Utah. From the Graduate Handbook:

"Graduate credit may be transferred from other institutions. Credits transferred from another institution may be used for only one University of Utah degree. Up to six semester hours of transfer credit may be applied toward fulfillment of graduate degree requirements if they (1) are of high letter grade (A or B; credit only grades are unacceptable), (2) are recommended by the student 's supervisory committee, and (3) are taken within the prescribed time limit."

However, these courses must be approved by the student's supervisory committee and cannot be credit hours that were counted toward another degree.

Scholarly Integrity

Work toward the MStat degree must be a student's own. The work of others must be properly cited and used with permission, within the boundaries set by the instructor of each class. Students must learn and abide by the University of Utah's policies concerning plagiarism.

Minimum Continuous Registration

All graduate students must maintain minimum registration from the time of formal admission through completion of all requirements for the degree they are seeking *unless granted an official leave of absence* (see Leaves of Absence, below). Students not on campus and not using University facilities are not expected to register for summer semester. If students do not comply with this continuous registration policy and do not obtain an official leave of absence, their supervisory committee is terminated and their records are inactivated. To reactivate a file at a later time, the student is required to reapply for admission to The Graduate School.

MStat-Biostatistics students maintain minimum registration by registering and paying applicable tuition and fees for at least three credit hours per semester during the academic year from the time they are admitted to The Graduate School until they have completed all requirements for the degree, including the submission of a final paper or project.

Minimum continuous registration requirements apply to MStat candidates until the final paper or project is submitted and approved by the department. Students who take their last examination after the final examination period and before the next semester begins are not required to register for the next semester. They will graduate the semester all Graduate School requirements are fulfilled. Master's degree students maintaining minimum continuous registration have library privileges, health insurance options, and access to athletic facilities.

Summer Term Registration

Continuous registration refers only to registration during the regular academic year and is not terminated or interrupted by non-registration during summer term. Students should, however, maintain registration status during summer term if they are taking examinations.

International Students Vacation Semester

In response to guidance from U.S. immigration authorities, the University is required to make a change to the vacation semester policy for F-1 visa holders. Beginning Fall 2017, vacation semesters will automatically be granted to all students during the summer semesters. Students will no longer be eligible for a vacation semester during the Fall or Spring semesters.

All students must enroll full time, unless they have an approved exception from ISSS. Vacation semesters will automatically be applied for all qualifying students in Summer 2018.

Please NOTE the following important changes to the Vacation Semester Policy:

- Students will no longer need to submit vacation requests to ISSS, but will instead be automatically granted vacation in the summer

- Students may still choose to take full time courses in the summer if they wish

- Students may no longer request to be below full time for the purpose of a vacation in the Spring or Fall semester

- Students may still choose to take courses at another university during their summer semester as long as they request a letter to attend another school from ISSS

- Students will NOT be allowed to participate in Full-time CPT or on campus work during Spring or Fall semesters (unless during official university breaks such as Spring break or Fall break). Students MAY participate in Full-time CPT or on campus work during their summer vacation semester

Please see the International Student & Scholar Services for more information.

Maximum Hours

No candidate for a graduate degree is permitted to register for more than 16 credit hours in any single semester. A schedule of nine credit hours is considered a full load for graduate degree candidates.

Candidates electing to register for 17 credit hours or more must file a formal petition to the Dean of Graduate Studies. This petition must include:
1. A completed petition form;
2. Two letters of support from their committee members; and
3. An approval letter from the MStat Program Director.

Leaves of Absence

Students who wish to discontinue their studies for one or more semesters (other than summer term) must file a *Request for Leave of Absence* form with the Chair of their supervisory committee.

Before being forwarded to the Graduate Records Office for approval by the Dean of The Graduate School, the form must be approved by the supervisory committee Chair and Department Chair.

Requests may be granted in the following circumstances:
1. Leaves of absence generally are granted and reviewed on a yearly basis for reasons relating to illness, military service, pregnancy and/or child care, residence outside the state of Utah, and work in process in which students are not in continual contact with their supervisory committee or other members of the faculty.
2. Leaves also may be granted on a yearly basis to students who, in the judgment of their department chair, are engaged in work considered beneficial to their academic goals, such as temporary teaching or professional employment that allows the student ultimately to complete the degree.
3. Leaves for other reasons may be granted and reviewed on a yearly basis when the student's chair believes the leave is in the best interest of both the student and the University.

Students must apply for leaves of absence for a current semester by the last day of classes of that semester. They also must *officially* withdraw from classes in any semester for which a leave is granted. Failure to withdraw formally results in the reporting of *E* or *EU* grades for all classes. For more information about official withdrawal, see Grading Policies in the Undergraduate Information section of this catalog.

The period during which a leave of absence is granted does not count toward the period allowed to complete the degree. Leaves are granted for a maximum of one academic year at a time, unless otherwise specified by the academic department. The leave of absence is void if a student registers for classes in a semester for which a leave was granted.

Full-time Status

Graduates considered full time if they:
1. are registered for 9 or more credit hours; and
2. after the residency requirement has been met (two consecutive semesters of nine hours or more), are registered for three credit hours of PBHLT 6970. *Option 2 does not fulfill state residency requirements*.

Tuition Differential

The Biostatistics track of the MStat program is situated within the Division of Public Health, and so, since 2008, the public health tuition differential applies to Biostatistics students as well.

Tuition fees for residents and non-residents can be found here. Public Health tuition includes a differential fee. IMPORTANT: Under the heading 'Graduate', please make sure you select 'Division of Public Health' not the regular Graduate tuition. Also see:
Resident - http://fbs.admin.utah.edu/download/income/Graduate/PHGraduateRes.pdf
Non-Resident - http://fbs.admin.utah.edu/download/income/Graduate/PHGraduateNRes.pdf

Tuition is subject to change without notice.

If a student works for pay on campus, the department in which they are paid can assist them to obtain a partial or full tuition waiver. For more information, students should contact the Public Health Office Manager.

3) Course Requirements

Coursework: Credit hours must total at least 38 credit hours.

Core courses: must total 30 credits.

Course #	Course Title	Credit Hours	Prerequisite
MATH 5010	Introduction to Probability	3	Math 2210 or 1260 (Calculus III)
MATH 5080	Statistical Inference I	3	Math 5010
MATH 5090	Statistical Inference II	3	Math 5080
PBHLT 6106	Categorical Data Analysis (offered fall semester)	3	MStat/Biostat prerequisites; Math 5080, Math 5090 (concurrent enrollment or instructor permission)
PBHLT 6107	Survival Analysis (offered spring semester)	3	MStat/Biostat prerequisites; Math 5080, Math 5090 (concurrent enrollment or instructor permission)
PBHLT 6300	Epidemiology	3	None
PBHLT 6307	Biostatistics Seminar I (must be taken first year)	1	Instructor Permission
PBHLT 6308	Biostatistics Seminar II (must be taken second year)	1	Instructor Permission
STAT 6869	Advanced Methods in Statistics (Capstone) (offered each spring)	3	Completion of all other coursework, particularly Math 5010-5080-5090
STAT 6969 or STAT 6003	Special Topics in Statistics	3	Varies
PBHLT 6970	Statistical Investigation and Reporting (MStat Project)	3	Instructor Permission
PBHLT 6971	Practicum	1	Instructor Permission

Additional Required Courses: must total 6 credits.

Option 1

Course #	Course Title	Credit Hours	Prerequisite
Math 6010	Linear Models	3	Math 5010, 5080, 5090 and 2270
Math 6020	Multivariate Models	3	Math 6010

Option 2

Course #	Course Title	Credit Hours	Prerequisite
PBHLT 7120	Linear and Logistic Regression Models	3	PBHLT 7100 or instructor permission
PBHLT 7130	Longitudinal Data Analysis	3	PBHLT 7120

Electives: Technical elective(s) approved by advisor, must total at least 2 credits.

Suggested Electives

There are many possible statistics-related courses in the Public Health Programs, departments housing other tracks of the MStat program, and elsewhere on campus. The MStat Program website has a list of such courses. Some examples are:

PBHLT 6101 (3):   SAS Programming
STAT 6969-091 (2): Nonstatistical Aspects of Clinical Trials for Statisticians
PBHLT 7300 (3):   Epidemiology II
PBHLT 6311 (3):   Public Health and Clinical Research Methods
MATH 5040 (3):   Stochastic Processes
MATH 6070 (3):   Mathematical Statistics
OIS 6450 (3):   Simulation of Business Processes
OIS 6425 (3):   Six Sigma for Managers
ED PS 7300 (3):   Psychometric Theory

Similar to PBHLT 6101 (3): SAS Programming, a student may select an elective focusing on Stata programming from the following courses, when they are taught with Stata:

MDCRC 6000 (2):   Intro Biostats
MDCRC 6210 (2):   Regression Models
MDCRC 6030 (1):   Computer Practicum (Stata)

Waivers and Substitutions: Waivers and substitutions must be approved by the student's advisor. If changes are made after the Candidacy form is filed, changes must be requested of the Graduate School by the advisor.

Comprehensive Examination: A Comprehensive Examination is not currently required in the MStat-Biostatistics Program.

4) IRB Requirements

The Institutional Review Board (IRB) is the committee which safeguards the ethics of all research on human subjects at the University of Utah, including MStat projects. The IRB does this by receiving and reviewing an

application by each project and making a determination, such as 'approved', 'exempt', or 'not human subjects research'.

All MStat in Biostatistics students must fill out a University of Utah IRB application for their MStat project, and sometimes the practicum (see below), even if the PI already has an IRB approval; even for students who work at the state and are authorized to use the data; even if it is data that the student is authorized to use at Intermountain or another corporate situation. Students using animal data must check on the requirements of the Institutional Animal Care and Use Committee (IACUC). Statisticians must often counsel their clients to make an IRB application, or to ensure that the statistician is authorized by the IRB to analyze the data. Therefore, the ability to articulate the ethics issues, as well as experience with an actual IRB application of one's own, are important foundations for the MStat graduate's career. The University of Utah tracks each MStat student project's IRB determination based on the student's IRB application (See http://irb.utah.edu/ for forms and deadlines.)

Related to the IRB application, all MStat students must take the IRB-required CITI course on ethics and human subjects concerns prior to any data analysis on human subjects. Each student must keep the certification current while a student here.

All MStat in Biostatistics students must submit copies of the completed CITI course certificate, IRB application and approvals to their advisor and the MSTAT-Biostatistics Track Academic Coordinator.

5) Biostatistics Practicum

Overview

The practicum is one of the culminating experiences in the MStat-Biostatistics program. The purpose is to allow students to obtain specialized, hands-on, real-world experience in routine statistical consulting, data management, and data analysis, comparable to that in a master's level career biostatistics position. It also allows the student, advisor and a practicing data analysis mentor to evaluate whether the student's statistics and consulting skills are mature enough to go out into the field as a statistics professional.

Description

- Students spend a minimum of one half day a week for one semester, or equivalent, in a direct work experience involving data management and statistical analysis, under the supervision of a mentor from the practicum site. This may be paid or unpaid, but it should not ordinarily be work done at a job the student held before beginning the MStat-Biostatistics program.
- A practicum is intended to assess and increase one's experience in routine data management and statistical data analysis. It is different from an MStat-Biostatistics project in that it involves routine data management and data analysis, whereas the MStat-Biostatistics Project involves learning a new statistical method, using it to think through the analysis of a data set, and writing a report to another statistician which summarizes the statistical and clinical issues, explains one's statistical logic and summarizes the statistical and clinical results.
- Students will generally participate in a current or ongoing data analysis project of the practicum site, or, if feasible, propose their own projects.
- A prior statement of objectives, a report by the student summarizing experiences and knowledge gained, an evaluation by the student, and an evaluation by the mentor with concurring advisor signature are required, using forms provided by the MStat-Biostatistics Program.

Criteria for Selecting Practicum Sites

- Site business should be closely related to the practice of biostatistics.
- The work experience available at the site must include hands-on experience with the regular biostatistical work of the site, such as direct contact with the patients, clients, or customers.
- The site mentor must be available to supervise and evaluate the student's experience.
- A practicum is generally distinct from a research opportunity, depending on the student's career goals.
- Experience at a practicum site might add to the student's resume.

Report and Evaluation

A student's practicum is evaluated by the student and the mentor, using forms developed by the MStat-Biostatistics Program, in addition to a 5 (or more)-page report by the student on the experience. The mentor shares their evaluation with the student and the advisor. Based on this information, the advisor assigns a credit (CR) or no credit (NC)for the experience. The quality of the practicum experience is also tracked by selected periodic site visits by the MStat-Biostatistics faculty. The MStat-Biostatistics Program is developing a mechanism with which to track the actual career placement of graduates.

Placement

The student is responsible to set up a practicum, in consultation with the advisor. The advisor will help choose a suitable practicum and find a statistics/statistics-related professional to serve as the mentor. The advisor and mentor will be the student's main sources of assistance and feedback during this time. Questions may be referred to the MStat in Biostatistics Track Representative as necessary.

Pre-Practicum Forms

Practicum Objectives Form

Once a practicum site is located, you must complete the Practicum Objectives form. This form will outline specific objectives of the practicum, how they will be addressed as well as include brief description of the experience. This form must be signed by the practicum mentor and approved by the student's faculty advisor. Once the form is completed with the appropriate signatures, please return the form to the academic advisor.

Register for Practicum Hours

Once the Practicum Objectives form has been completed and returned to the academic advisor a permission code will be distributed. The permission code will allow you to register for **PBHLT 6971 –Practicum.** Please be mindful of registration dates to ensure adequate time to obtain all of the needed forms and permission code for registration. Students must register for a total of 1 credit hour towards the practicum before graduation. Note: It doesn't matter when students are registered for the practicum credit, this can be during or after the student actually completes their approved practicum hours.

5 Page Paper

A student's practicum is evaluated by the student and the mentor, using forms developed by the MStat-Biostatistics Program, in addition to a 5 (or more)-page report by the student on the experience. The 5 page summary paper outlining the student's practicum experience should hit on the following points:
- Briefly describe the practicum in relation to how it increased your experience in routine data management and statistical data analysis.
- State the focus of the practicum: identify how the focus is relevant to the student's study; and, State the objectives that address both the student's and the mentor goals and expectations.
- Describe the key responsibilities and activities of the student as it relates to the objectives of the practicum.
- Outline the results of the practicum, such as what you learned and how this experience will benefit your career goals.

Student Evaluation Forms 1 & 2

At the completion of the practicum, submit the completed Student Evaluation Form 1 and Student Evaluation Form 2 to the student's faculty advisor and the academic advisor. The first form will be placed in your practicum records. The second form has no identifiers, and will not be placed with your practicum records, allowing for freedom to evaluate the practicum experience anonymously.

Mentor Evaluation Form

Finally, the student will have the practicum mentor submit a completed Mentor Evaluation Form report. It is the responsibility of the student to assure that the mentor submits the form. A copy of the form must be submitted to the academic advisor. Based on this information, the student's faculty advisor assigns a credit (CR) or no credit (NC) for the experience.

Receiving Credit for Your Practicum

Note that **PBHLT 6971 –Practicum** is a Credit/No Credit course. If all paperwork is completed and submitted to the Division of Public Health by the last day of class, a CR/NC grade will be assigned and submitted to the registrar's office for that semester. If paperwork is not received until after this deadline, the student will receive a T (In Progress) grade. ***Therefore, if the student wishes to graduate on a given semester, they must make sure all paperwork is submitted by the last day of class for that semester.***

6) MStat Project

Project Details

The Mstat, Biostatics project is one of the culminating experience of a student's degree, typically centered on statistical skills used for a career as a biostatistician. All MStat, Biostatistics students are required to complete and successfully defend a project prior to graduating. Students must:
1. choose a project that coincides with their research interests
2. create a supervisory committee which consists of MStat, Biostatistics faculty
3. complete three project credit hours (roughly 135 hours of effort)
4. write a paper of publishable quality
5. present the project at a public seminar
6. successfully defend the project

Overview

The MStat, Biostatistics projects objective is to challenge students to think through new statistical methods, using it towards the analysis of a data set, and writing a report to another statistician which summarizes the statistical and clinical issues, explains one's statistical logic and summarizes the statistical and clinical results. It is encouraged that the project includes, but is not limited to, mixed models, propensity score models, instrumental variables, methods of missing value imputation, a simulation study of Phase I study designs, or a special analysis for a crossover study. Students are not restricted to the above statistical model areas and should thoroughly discuss potential project topics with the student's supervisory committee.

Prior to beginning the research project a student should have taken Math 5010, 5080, and 5090; at least one of the PBHLT 6106 or 6107; and Math 6010 or PBHLT 7120. This will ensure they have enough theoretical basis to be successful in using an advanced statistical technique applied to data.

It is preferred that students have had completed a regression class, Math 6020 or PBHLT 7130, and the Biostatistics seminar. However, it depends on the project and the student. It is advised to start thinking of potential projects and compose the supervisory committee no later than two semesters out from the anticipated graduating semester. This will provide adequate time to gain rapport with faculty who will be on the supervisory committee; and develop research project ideas that align with the specific research interests of the student.

Form Your Supervisory Committee

To begin, the student will want to identify potential faculty to work with on their project. The supervisory committee form must be completed with the appropriate signatures to determine which faculty have agreed to act as a committee member. The supervisory committee form must be turned into the academic advisor before a permission code will be distributed for

registration of project hours. The essential role of the supervisory committee is to provide feedback, guidance and mentorship on the project while also approving the research subject and judging the final defense. Potential faculty members eligible to be on a student's supervisory committee can be found in the policies and guidelines on pages 5-7. Please see the academic advisor with any questions concerning the supervisory committee.

Register for MStat Project Hours

Before registration of project hours the student must set up their supervisory committee and turn in the supervisory committee from, with the appropriate signatures, to their academic advisor. At that time, a permission code will be provided to them allowing them access to register for PBHLT 6970 – Statistical Investigation and Reporting (MStat Project).

Please be mindful of registration dates to ensure adequate time to obtain all of the needed forms and permission code for registration. Students must register for a total of 3 credit hours towards the research project before graduation. Note, the student must be registered for at least 3 credit hours, whether that be project credits, or an actual class, during the semester they plan to defend their project.

MStat Project Proposal Approval

Prior to starting the MStat project, a student must prepare a concept proposal that requires approval by their committee. Guidelines on what the concept proposal should cover can be found here or on the website under MStat project forms where all other necessary forms can be found. A copy of the final proposal will be placed in the students file, thus submission of the proposal after approval must be submitted to the academic advisor. The Supervisory Committee will determine if the student is prepared to proceed to the formal project by written or verbal approval.

IRB Approval

After approval of the project proposal the student is now ready to develop their research. Any and all approval of the content of the MStat project is an academic matter between the student and their committee. Depending on the given project, IRB approval may be required in order to protect the rights and welfare of the research subjects involved. Once IRB approval is established, please complete the IRB research proposal form and return it to the academic advisor. Please note, if IRB approval is not needed, the completion of the IRB form is required.

Project Defense
Pre-Defense

Prior to scheduling the project defense it is strongly recommended to hold a pre-defense meeting with the supervisory committee. During the pre-defense, the student will present their progress, so that the committee can determine whether sufficient progress has been made in order to schedule the defense.

Publicize the Event

Once the committee agrees that the project is sufficient to move forward with the final defense, the student will work with their academic advisor to schedule the time, location, and public posting of the defense. Please note, the supervisory committee must approve the final defense arrangements before the announcement is publicized. The date and time of the final defense must be widely publicized to the entire department at least ten business days prior to the date of defense. Please use this defense announcement to publicize the event and return this announcement to the academic advisor for dispersal.

Final Defense

For the final defense the student must defend their project satisfactorily introducing their research topic, covering their methods, results, strengthens and limitations and concluding findings. The oral presentation ranges between 30-35 minutes with questions to follow. A PowerPoint presentation is the most common platform used for sharing research findings. Please note, the last day to defend in a given semester is the last

day of classes, and the student must be registered for at least three credit hours during the semester they defend.

Common misconceptions of defense requirements, include printing of a student's manuscript for their committee members; and/or serving of light refreshments. These are not requirements set by the Division of Public Health or the Graduate School and, thus, are not required during the final defense.

Final Approval

After the project defense, the Committee indicates on the Report of the Final Examination form whether the student has passed or failed. All committee members who are present at the examination should sign the form. In cases where the Supervisory Committee does not feel that the student has passed the defense, the committee will make appropriate recommendations for further courses, reading or research to address the deficiencies.

The final project must produce a publishable quality paper that is submitted to the supervisory committee with a copy given to the academic advisor in order to be deemed complete. A letter grade will then be assigned as set by the supervisory committee.

Projected Timeline
To assist students in anticipating how to navigate the completion of their MStat project, the following timeline is recommended.

Task	Rough timeline
Compose supervisory committee/ Address potential project topics	Two semesters out from the anticipated graduating semester (after the completion of Math 5010, 5080, and 5090; at least one of the PBHLT 6106 or 6107; and Math 6010 or PBHLT 7120.)
Prepare research proposal and submit to supervisory committee for approval	Two semesters out from anticipated graduating semester
Submit IRB application for IRB review	Two semesters out from anticipated graduating semester
Development of project and scheduling of committee meetings as necessary	Two semesters out from potential graduating semester and into final semester
Start written report and prepare for pre-defense of the oral presentation	Two semesters out from potential graduating semester and into final semester
Send draft of the written report to supervisory committee for review	Graduating semester
Present pre-defense with supervisory committee. Make any necessary edits and prepare for final defense	Graduating semester
Schedule time for final defense that is inclusive of the supervisory committees schedules and work with academic advisor for location and submit defense announcement	Submit defense announcement: 10 business days prior to date of defense
Final Defense	Last day of classes in the semester the student plans to graduate
Final edits to paper and final submission to supervisory committee and academic advisor	Last day of classes in the semester the student plans to graduate

7) Graduation

During the semester that a student intends to graduate, the student should check with the University of Utah Graduation office (http://www.sa.utah.edu/regist/graduation/graduation.htm) or in the Graduation portion of the Campus Information System (CIS) to ensure that all requirements are recorded as having been met and that the student is approved to graduate. It is advisable for students to keep copies of all signed forms, in case of any discrepancy.

The University of Utah's commencement is held annually at the close of spring semester. (http://www.sa.utah.edu/commencement/) However, individual colleges often have their own convocations. The MStat in Biostatistics degree is conferred by the University of Utah Department of Family and Preventive Medicine during the School of Medicine's Commencement.
(http://medicine.utah.edu/studentaffairs/student/studentlife/Commencement.htm)

8) Learning Outcomes

- Demonstrate familiarity with intermediate statistical theory and methods, Statistical Inference, Linear Regression, Categorical Data Analysis and Modern Causal Methods, Epidemiology, Longitudinal Data Analysis, and Survival Analysis.

- Demonstrate familiarity with core content of at least one area in health sciences: for example- genetics.

- Be able to:

    - Formulate and perform a descriptive and inferential analysis of a public health or other health sciences study using statistical software.

    - Reshape data for analysis using a programming or statistical language.

    - Interpret the findings from a moderately complex analysis.

- Understand and be able to address ethical, regulatory and practical aspects of human subjects research including human subjects protections and IRB requirements.

- Demonstrate competence in collaborative research in at least one area of public health or health sciences.

- Be capable of self directed learning of unfamiliar statistical methods and written and oral presentation of results/findings.

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Appendix A: Forms and Worksheets

PBHLT 6971 – Biostatistics Practicum Objectives Form

PBHLT 6971 Student Evaluation Part 1

PBHLT 6971 Student Evaluation Part 2

PBHLT 6971 Mentor Evaluation

MStat, Biostatistics Worksheet

All of the above forms plus the project forms can be found on our website.

Appendix B: Other Forms

IRB FORMS

All MStat in Biostatistics students must fill out a University of Utah IRB application for their MStat project, including a protocol summary and a web-based IRB application.

Forms and deadlines are at: http://irb.utah.edu/

GRADUATE SCHOOL FORMS FOR MASTERS DEGREES

Graduate School forms for various steps of the MStat program can be found at:
http://gradschool.utah.edu/current-students/forms/