MASTER OF SCIENCE FOR TEACHERS

MST PROGRAM HANDBOOK

SUMMER 2017
JUNE 22 – JULY 28
Master of Science for Teachers Program

Program Information

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MST in Mathematics Degree Program

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PROGRAM OVERVIEW

The University of New Hampshire's Master of Science for Teachers (MST) Program in Mathematics originated in the early 1960's as a National Science Foundation Summer Institute. It has since served hundreds of mathematics teachers from around the globe.

The MST degree program is typically completed in two to three years and is designed primarily for experienced teachers of secondary school mathematics. The program features a strong emphasis on mathematics content, while also providing opportunities for teachers to consider alternative approaches to pedagogy.

It is possible to enroll in MST courses without enrolling in the MST degree program. This option is particularly popular with individuals who are interested in obtaining certification to teach secondary school mathematics, since MST courses have traditionally satisfied the content area requirements in teacher certification programs. Please note that the MST Program does not grant teaching certification or licensure.

The program is designed to enable teachers to:

• deepen and broaden their mathematics background in core areas of geometry, algebra, and analysis;

• explore additional content areas of mathematics;

• interact with faculty and students in small classes;

• share ideas and teaching approaches with teachers from different areas of the country and around the world;

• consider perspectives which allow them to help their own students learn mathematics more effectively;

• and participate in workshops and seminars to extend their knowledge of mathematics and to promote innovative teaching.
ADMISSION REQUIREMENTS

Candidates for the MST Degree must have graduated from a college or university and usually possess a background equivalent to at least a minor in mathematics, including calculus. Candidates MUST possess an education background sufficient for certification, or three years of teaching experience, or a full-time teaching position at the present time.

*Note that the GRE is not required.*

DEGREE REQUIREMENTS

The MST degree requires:

1. **Thirty credits** approved by the Department of Mathematics. These will normally be taken from the courses numbered 900-929, and will usually include eight required courses numbered 900, 905, 906, 909, 913, 915, 918, and 925 (see course titles and descriptions starting on page 6).

2. Successful completion of the **concluding experience**. See next page and the MST web site for further information.

The MST Program has in-class summer components and on-line academic year components, allowing students to complete the degree within 2 to 3 years. Individuals seeking advice for a non-traditional course track can contact the MST Office at (603) 862-1943 or email mst.math@unh.edu.

All graduate work for any Master's degree must be **completed within six years** from the date of matriculation (admission/enrollment) in the program. Students admitted into the MST Degree Program who are not enrolled in courses in a particular year must register for GRAD 800 to retain active student status. The GRAD 800 fee is $200, and the remaining student fees are waived. The MST registration form can be used to register for GRAD 800.
CONCLUDING EXPERIENCE

In addition to successfully completing 30 graduate credits, MST degree candidates will be required to complete a concluding experience in which they:

- Develop a mathematical portfolio, with specific components due annually.
- Successfully complete a comprehensive problem set in conjunction with a problem-solving seminar.

For complete information about the MST degree requirements, and concluding experience, please call the MST office at (603) 862-1943, or visit the MST Web site: ceps.unh.edu/MST

ADMISSION PROCEDURE

Individuals interested in enrolling in the MST Degree program are encouraged to apply to the UNH Graduate School as soon as possible, preferably before May 1st of the first summer. It is possible to apply after the first summer, but this process must be complete before April 1st of the second summer in order to have the first summers’ credits applied toward the degree. Applications can be submitted electronically through the Graduate School website:

gradschool.unh.edu/apply.php

Transferring Credits: A maximum of three courses for up to 9 credits completed by a student in graduate courses at UNH may, upon recommendation of the program faculty and approval of the dean of the Graduate School, be applied to a student’s degree program. Courses must be taken at the Graduate level (800-900) and students must have earned a B- or better. The 9-credit limitation applies to all courses completed or in process on the date when the official letter of admission is written. This number will be reduced if transfer credits are also applied.
COURSE DESCRIPTIONS

A selected set from the following courses is offered each summer, in a sequence that allows all program participants to pursue in-depth study of the major areas of the mathematical sciences over a 2 or 3-year period. We suggest that students enroll in no more than 10 credits per summer. Please call the office for further course registration information and recommendations.

Required Courses

MATH 900: Bridges from the Classroom to Mathematics (1 credit)
An introduction to the goals of the MST program. Students have the opportunity to explore mathematical problems; to complete activities that make connections between several areas of mathematics, including the mathematical content in the MST degree program and the secondary school mathematics classroom; and to participate in readings/on-line discussion on the nature of mathematics. Permission required. Cr/F.

MATH 905: Euclidean and Non-Euclidean Geometries from a Synthetic Perspective
An axiomatic development of geometry, beginning with finite geometries; emphasis is given to the fundamental concepts of Euclidean and non-Euclidean geometries from a synthetic perspective.

MATH 906: Analytic and Transformational Geometry
Fundamental concepts of transformational, projective geometry, and inversive geometry, including the properties of conics and quadratic surfaces.
MATH 909: Probability and Statistics for Teachers
An introduction to the fundamental concepts of probability, including combinatorics, random variable, probability distribution, mean, standard deviation; normal distribution and binomial distribution; statistical applications, including sampling, statistical inference confidence intervals, significance tests; correlation; linear regression; and the Central Limit Theorem.

Permutations and combinations; finite sample spaces; random variables; binomial distributions; statistical applications.

MATH 913: Graph Theory and Discrete Mathematics
Key theoretical, and computational aspects of graph theory and related areas of discrete mathematics. Applications of graph theory as well as current “open” problems are explored.

MATH 915: Algebraic Structures
An exploration of the structural similarities between and among seemingly disparate number systems, beginning with counting numbers, and progressing to the integers, the rational numbers, the real numbers, and the complex numbers; and leading to a discussion of polynomials as an integer analogue and to fields as polynomial “quotients” through the basic concepts of splitting fields and Galois Theory.

MATH 918: Analysis – Real Numbers and Real Functions
An introduction to the fundamental concepts in real analysis that provide the mathematical foundation for calculus. Content focuses on properties of sequences and series; properties of functions, including continuity, the derivative and the Riemann integral.

MATH 925: Problem Solving Seminar (Pass/Fail)
A study of a variety of problem solving strategies and techniques in the context of solving mathematical problems. Problems will emphasize the connections between the core areas of Algebra, Geometry, and Analysis. Other mathematical topics may be included. Typically, taken in conjunction with Concluding Experience Problem Set.

Elective Courses

MATH 902: Classroom Practicum (1 credit)
A follow-up course to the six core mathematics content courses of the MST degree program. During the course, students choose a mathematical topic and/or set of concepts learned in one of the core MST courses and develop and teach a unit based on these concepts at the middle school or secondary school level.
MATH 910: Topics in Mathematics Education (1 credit)
Special topics in Mathematics Education that are not included in the regularly offered courses. Possible topics include: development of mathematical reasoning across the grades, action research in mathematics classrooms, algebraic thinking across the grades, formal and informal assessment strategies, cooperative learning strategies, and mathematical software in secondary teaching.

MATH 914: Topology for Teachers
An introduction to the foundational notions of general topology, including neighborhood, open set, closed set, limit point and closure; and to the topological properties of separation, connectedness and compactness. Emphasis is given to the usual topology for the real line.

MATH 916: Number Theory
An introduction to number theory, including divisibility theory, congruences, perfect and amicable numbers, Fermat’s Little Theorem, Euler’s phi-function and other number-theoretic functions, Diophantine equations, and cryptography.

MATH 917: Proof and Problem Solving
Introduction to abstract mathematics with an emphasis on problem solving and proof structure, methods, and techniques. Content includes logic, set theory, and basic number theory.

MATH 919: The Real Number System
A postulational approach to fundamental aspects of algebraic structure; limits, sequences, and continuity.

MATH 920: History of Mathematics
An examination of the historical development of number theory, geometry, probability, algebra, and analysis that notes the significant mathematical contributions to these topics by prominent mathematicians.

MATH 928: Topics in Mathematics (1 credit)
Special topics in Mathematics that are not included in the regularly offered courses. Possible topics include: knot theory, and spherical geometry.

MATH 929: Directed Reading (variable credit)
A directed reading project on a selected topic in mathematics or mathematics education, planned in collaboration with a faculty member.
SAMPLE 2-YEAR COURSE SCHEDULE

Below is a proposed schedule for matriculated MST students to follow; however, individuals are welcome to design their own schedule according to their needs in conjunction with their advisor. Please contact the MST office for assistance in creating a schedule that will work best for you. The following lists are subject to change depending on courses being offered.

**Spring Prior to Summer 1 (1 Credit)**

MATH 900 (on-line)

**Summer 1 (9 credit)**

MATH 905
MATH 909 OR MATH 913
MATH 918 MATH 915

**Academic Year 1 (6 credits)**

MATH 916, or other elective course (on-line)
MATH 920, or other elective course (on-line)

**Summer 2 (9 credits)**

MATH 905 MATH 906
MATH 909 OR MATH 913
MATH 918 MATH 915

**Academic Year 2 (5 credits)**

MATH 925 (on-line)
MATH 928, or other elective course (on-line)
SUMMER SCHEDULE

Classes for Summer 2017 will begin on Thursday, June 22nd. Orientation and Welcome Back for all students will take place from 11:30am to 12:00pm on the first day of classes. Feel free to bring your lunch! Please note that classes will NOT be held on July 4th this year.

INTERNATIONAL STUDENTS

International students who are interested in admission to the graduate school for the MST summer program must complete an International Applicant Financial Declaration Form and return it with their application for admission along with the supporting financial documentation as soon as possible. Upon admission to the program, the UNH Office of International Students & Scholars (OISS) will provide students with the appropriate Certificate of Eligibility (Form I-20 or DS-2019), that will allow them to apply for a student visa. Students who do not return the International Applicant Financial Declaration Form by the deadline may not receive their Certificate of Eligibility in time to secure a visa to attend the summer program. NOTE: A new Certificate of Eligibility must be issued each subsequent summer.

International Students must report to the OISS within 7 days of arrival on campus to satisfy US Department of Homeland Security requirements and to obtain important information about their immigration status and obligations. In addition, students are required to provide proof of health insurance coverage or purchase coverage through UNH Health Services.

More detailed information and answers to specific questions may be obtained by visiting the OISS Web site at unh.edu/global or sending questions via email to: oiss@unh.edu.
SETTING AND FACILITIES

The University of New Hampshire is located in Durham, New Hampshire. This New England town enjoys easy access to Boston, the beaches, and the White Mountains. The picturesque 188-acre campus is surrounded by more than 3,000 acres of fields, farms, and woodlands owned by the University.

Downtown Durham, next to UNH campus

The five university libraries offer an excellent collection of modern mathematics and mathematics education textbooks and journals. Library facilities are available to all MST participants. The Mathematics Department’s Mathematics Education Curriculum Library houses an extensive collection of K-12 curriculum materials, as does the UNH Leitzel Center, (603) 862-0718.

Quiet study room in the Dimond Library

Computer courses are typically taught in computer classrooms, and student computer clusters are available around campus. A selection of software may be available for participants' use. Participants who have their own laptop computers should bring them. There are various buildings on campus (including parts of Kingsbury Hall and various dorms) with wireless capabilities.

Tech classroom located in Kingsbury Hall
The Memorial Union Building (MUB) is known as UNH’s “heart of campus.” The facility holds many services such as a computer store, a copy center, and the MUB Bookstore, owned by Barnes & Noble. There are also many study areas, a computer cluster, a food court, and two movie theatres.

Several recreational and educational programs exist for MST students who decide to bring their families with them. The UNH Recreation Department, (603) 862-2031, sponsors a Day Camp, Camp Wildcat; the Education Department, 862-2310, sponsors summer school programs for children entitled Summer Learning.

The Music Department, 862-2404, hosts the Summer Youth Music School for middle school students; the Theatre & Dance Department, 862-2919, sponsors various children’s workshops. There is a Master of Science for Teachers degree offered through the English Department for elementary, secondary, and college level teachers. We can also provide assistance with locating an appropriate day care program.
UNH SUMMER HOUSING

Lodging in student residence halls is available to individuals who register for summer credit courses. Air-conditioned dorm rooms in are available upon request for an additional fee. If you would like to try to room near other MSTers, please note this on your application form and housing will do the best they can to accommodate you.

Application and payment for housing must be on file at least two weeks prior to class start date.

For housing application forms and more information, contact Summer School Housing

 unh.edu/housing/summer-school-housing

If you have questions call Sholanna Pemberton at (603) 862-1754.

OFF-CAMPUS APARTMENTS

The Commuter and Non-Traditional Student Services, part of the UNH Office of Student Involvement and Leadership Center, has resources available to assist students in finding and locating off-campus housing. The Off-Campus and Commuter Student Office is located in the MUB, Room 114. You can also reach them at (603) 862-0303, or at off-campus@unh.edu.

 unhmub.com/off-campus-housing

Other online resources for the seacoast:
• Foster’s Daily Democrat: www.fosters.com
• Seacoast On-Line: www.seacoastonline.com
UNH DINING SERVICES

University meal plans are available (but not required) for all summer session students who live on or off campus. For more information about the UNH Dining meal plans, visit their website at:

unh.edu/dining/summer-meal-plans

MST students have also enjoyed meals at the many inexpensive Durham eating establishments that are within walking distance of the residence hall as a supplement to the dining hall meals. A list of local restaurants will be available in the MST program office.

CAMPUS PARKING

Parking permits are required to park in non-metered parking lots and spaces. Summer parking permits are available to eligible students for $50 (commuter or campus resident). Sales of summer permits are sold online in advance of semester openings, or over-the-counter at other times of year. Information on permits and other parking policies is available by calling (603) 862-1010, or by visiting their website at: unh.edu/transportation/parking
PUBLIC TRANSPORTATION

Bus transportation is available from Boston's Logan Airport to Portsmouth via C&J Trailways (800) 258-7111, (603) 430-1100, or www.ridecj.com. Please note that C&J routes to Durham are typically not open during the summer, so please check the schedules to Portsmouth.

From Portsmouth, you can travel to Durham via the Coast Bus, www.coastbus.org, or via UNH Wildcat Transit (603) 862-2328. There is no Wildcat weekend service.

Amtrak www.amtrak.com offers the Downeaster train service, with a stop right on UNH campus! The Downeaster operates five daily round trips between Portland, ME and Boston, MA.

Ground transportation from Manchester NH airport www.flymanchester.com is offered by Flight Line Inc. (800) 245-2525 or www.flightlineinc.com.

Zipcars, www.zipcar.com/unh, are also available on campus for students. Simply reserve online, let yourself in with your Zipcard and drive.

Campus maps and driving directions to UNH can be obtained at unh.edu/main/map
ACTIVITIES

We occasionally have an afternoon seminar or workshop presented by MST or UNH faculty, guests, or MST students. They may be offered after classes and might involve sharing of student activities and classroom practice, historical topics, mathematical applications, or current issues in mathematics education. We encourage all students to take some time to attend these events.

Various recreational and social activities are typically planned for the participants and their families throughout the summer. We have ample information available regarding community programs for children, local attractions, and schedules of Seacoast events.

Facilities for tennis, swimming, racquetball, volleyball, and jogging are available at the University. You may bring your bike (please be sure to use a secure lock) as there are several trails around campus for mountain biking, running and hiking. Summer memberships and day passes to the Hamel Recreation Center are also available. Please contact UNH Campus Recreation for student prices (603) 862-2031.

Please be reminded that the MST Program is academically rigorous; however, participants have enjoyed the facilities at UNH and the recreational opportunities that the NH seacoast has to offer.

Past MST events have included Dairy Bar, cookouts, mountain hikes, kayaking, pizza parties, picnic outings, shopping, local tours, and various mid-term celebrations. If you have any suggestions for activities, please include them with your registration form!
TUITION, FEES AND REGISTRATION PROCEDURES

Course charges, fees, and regulations are subject to change without notice. We will keep you updated on changes as they occur. To confirm the latest tuition information please visit the UNH Business Services website: unh.edu/summersession/tuition.html

Educational expenses, including course charges, fees, books, and travel may be tax-deductible. Your school system may also have funds available for financial assistance. Federal financial aid is available for summer programs – please request forms from Financial Aid office: financialaid.unh.edu.

Course Charges:
- NH Resident (cost per graduate credit) $510
- Non-resident (cost per graduate credit) $560
- UNH Registration Fee: $20
- MUB Fee (non-degree students only): $15
- Student Services Fee (degree students only): $138
- UNH Tech Fee:
  - 1 to 4 credits $25.00
  - 5 to 8 credits $48.25
  - 9 to 16 credits $97.50

Individuals wishing to participate in the MST Program should complete the Course Registration Form with payment, before June 12, 2016 to:

MST Program
Department of Mathematics & Statistics
33 Academic Way - Kingsbury Hall
University of New Hampshire
Durham, NH 03824

Full payment is required before the first day of classes. Registration for courses is not complete until you have paid in full. Course sections will be filled on a first-come, first serve basis, with preference given to participants admitted to the MST degree program.
**ADDING & DROPPING COURSES**

Students are financially and academically responsible for all courses in which they enroll. Students wishing to withdraw from courses must complete official withdrawal procedures, otherwise automatic failing grades are assigned. Adding and dropping courses are administered through the MST office. Check with the MST office for the deadlines to add or drop courses.

Students who officially withdraw before a course is scheduled to begin are entitled to a full refund minus the registration fee. Consult the MST Program Coordinator at (603) 862-1943, for refund information pertaining to one-credit courses.

The University reserves the right to cancel or combine class sections, to limit registration, and to change instructors as necessary.

*Holloway Commons at night*
MST GRADUATES

The following people are graduates from the MST program. If you have any questions you would like to address to a participant, please feel free to call or write them. All have agreed to answer questions about being involved in the MST program.

Sam Critchlow  
(MST May '14)  
Lyndon Institute  
Lyndon Center, VT  
(413) 687-8736  
sam.critchlow@lyndoninstitute.org

Jesse Jost  
(MST September '09)  
Noble High School  
jdjost@gmail.com

Jeff Cohen  
(MST September '08)  
Mercersberg Academy  
(610) 513-9489  
jeffjiggy@gmail.com

Stacey Plummer  
(MST September ‘08)  
Hollis Brookline High School  
(603) 465-2269 x 317  
plummers@sau41.k12.nh.us