Honors Opportunities

The Honors Program at The Ohio State University is a unique opportunity to live and learn in a small community of dedicated scholars and students, while at the same time enjoying the advantages of being part of a major research university. Training in mathematics is at the core of any outstanding honors program in engineering, physical, biological or social sciences. With this in mind, the Ohio State Department of Mathematics has developed a unified four-year program of honors courses in mathematics serving the needs of a wide spectrum of honors undergraduate students. *Both* honors and non-honors students are eligible to enroll in honors math courses.

The foundation of the program is a one-year sequence in the calculus of one and several variables. The Department's appreciation of the varying levels and abilities of entering students is reflected in the availability of two honors sequences at this level. For those who are ready and eager to explore the deeper theoretical underpinnings of the calculus, the department offers the sequence **Math 4181H-4182H**. This enriched sequence, which is the most rigorous of the calculus options, is intended to stimulate the development of mathematical thinking. It is designed to challenge **talented, highly motivated** students who enter the University already familiar with differential and integral calculus, regardless of their chosen major area of study. The typical student has Advanced Placement Credit and has a Math ACT score ≥ 32, or a Math SAT score ≥ 700.

For those who have demonstrated technical mastery of calculus and who would like deeper insights into some of the theory that makes it all work, the department offers the sequence Math **1181H-2182H**. Students in this sequence will be exposed to proofs and held to higher standards of mathematical rigor than those in non-honors versions. Although not as rigorous as 4181H, both of these options assume mastery of differentiation of polynomial and trigonometric functions, and compress the typical three-semester calculus sequence into two semesters.

Students successfully completing either 2182H (3345 or 3345H recommended to be taken concurrently with it; permission is necessary) or 4182H and interested in an in-depth study of the mathematics which forms the mathematical heart-and-soul of chemistry, physics and engineering will want to enroll in the second year: **Math 5520H,** linear algebra and differential equations and **Math 5522H** complex analysis. While these courses are theory-and-proof oriented, they do not neglect the fundamental skills needed in scientific applications.

Math 2182H or 4182H also prepares students to take a one-semester course in Combinatorics (**Math 5529H)**. In addition, Math 5529H prepares students to take a one-semester course in Rigorous Probability (**Math 5530H)**.

Successful completion of 5520H qualifies a student for either a semester course in differential geometry **Math 5540H** or a course in number theory **Math 5576H**. Math 5540H is a course on the geometry and topology of n-dimensional spaces and manifolds. This material is key to understanding the world of modern physics and is valuable for students pursuing advanced degrees in mathematics, physics and engineering. The other course, **5576H**, presents the Queen of Mathematics - Number Theory - in its historical development stressing the mutually perpetuating bridges between number theory and algebra, geometry and analysis**. *Math 5529H and 5530H alternate with Math 5576H and 5540H every academic year*.

Finally, 5520H prepares students for a two-semester sequence in abstract algebra **Math 5590H-5591H.** This is a sequence in algebraic theory covering the major structures of groups, rings and fields. This background is a prerequisite to advanced study in mathematics and also provides an understanding of the mathematical language of symmetry and invariants essential to chemistry, quantum physics and electrical engineering. It also provides the context for exploring coding theory, modern electrical engineering and the world of computer and information science.

For students who love the challenge of brain-teasing mathematical problems, we offer an honors problems course: **1187H** (Problem Solving). This course also serves as a training ground for the national Putnam Exam in Mathematics, with the course instructor coaching the Putnam team. They also help prepare students for the in-house Rasor-Bareis-Gordon Math Competition, which is held each February.

All honors courses are taught in small classes (25 or fewer students) with faculty instructors who are committed to the needs of each student. Classmates will be among the best students at The Ohio State University, all eager to learn and explore new ideas. Recent honors students have received national recognition for their scholarship by being awarded Barry M. Goldwater Scholarships and/or National Science Foundation Graduate Fellowships. Within this University, our honors majors have been routinely elected to Phi Beta Kappa and earned "Excellence in Scholarship Award," "President's Salute to Undergraduate Achievement," and other distinctions. Honors math courses prepare one for any type of graduate program, not necessarily just math. Our students are admitted to graduate programs in statistics, physics, law, medical programs, etc.

Graduation "With Distinction in Mathematics" may be accomplished by taking the math 4181H & 4182H sequence, and all the 5000H level math courses: 5520H, 5522H, 5529H, 5530H, 5540H, 5576H, 5590H & 5591H. Recent graduates who pursued this option have gone on to successful doctoral studies in mathematics at Harvard, Stanford, University of Chicago, Berkeley, New York University, Michigan, and other leading universities.

Undergraduate students can also engage in research activities by participating in one of the Working Groups. These Working Groups are small groups of faculty and students who are interested in a common research venture. Undergraduate students work directly with professors and graduate students on interesting, open-ended problems. By exploring their projects together with other students and faculty, students will not only delve into an active research area but also learn how to work and communicate with others. In addition, opportunities exist for students to present research papers at various conferences around the country.

During the summer, selected Honors Math Majors are chosen to participate in Knot Theory Research with Dr. Chmutov. To best explain what Knot Theory is begins with imagining a rope tied somehow and have ends glued together afterward, forming a circular tied rope. Having two such ropes, can you move one of them around to get the other one? In particular, can you untie it and get a perfect circle? One example of a Knot would be the Olympic rings.

Another research opportunity exists within the Mathematical Biosciences Institute (MBI). The MBI fosters interactions between the biological, medical, and mathematical sciences and offers opportunities for undergraduates to participate in a research project each summer. MBI receives major funding from the National Science Foundation (NSF). Further information on this program can be found at this website: **http://mbi.osu.edu**.

This is the cornucopia of possibilities available in the Honors Program in Mathematics at The Ohio State University. **We hope you will join us and share the honors experience!**

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