

DISTINGUISHED MAJOR PROGRAM

Distinguished Major Program (DMP) is a special option within the math major that provides advanced training in mathematics by combining extensive course work (at the level of the Graduate Preparatory Track and beyond) with active involvement in various aspects of mathematical research. Successful completion of the DMP is required to receive high/highest honors. The centerpiece of the program that sets it apart from any track of the math major is the requirement/opportunity for a participating student to work on the Distinguished Major Thesis under the supervision of a faculty member (typically) in the 4th year of his/her undergraduate studies and then present the findings in a public defense of this work.

Students apply for admission to the DMP in the Spring semester of their third year, and should have completed at least two of the required courses (see below) by that time. Criteria for acceptance into the program are based on letters of recommendation from mathematics instructors, the GPA in mathematics, and the cumulative College GPA (which should be near 3.400 or higher). Because of the importance of the research component in the program, the individual programs of studies of the students interested in the DMP should include the completion of Math 4840 *Introduction to Mathematical Research* at an early stage - typically, by the time of application and certainly no later than the Fall semester of the fourth year.

A complete application will include a letter of application addressed to the DUP, a copy of the transcript, **and two letters of recommendation. One of these letters should be from the prospective thesis advisor confirming their readiness to supervise the project and outlining the general topic of the latter.** While the applicant could choose another UVa math faculty member as letter-writer, a possible choice might be, for example, the supervisor of an REU (Research Experiences for Undergraduates) taken outside UVA. The precise topic of the thesis can be determined after the application, in the beginning of the fourth year, after the student has done some preliminary reading over the summer. The decision on the application for the DMP is made by the DUP in consultation with the prospective thesis advisor; a letter from a Math 4840 instructor (if this course either has already been completed or is being taken by the student at the time of application) can be helpful in the decision-making process (in addition to or as one of the two letters required for application).

To satisfy the course requirements, students are expect to complete the following courses with a GPA of at least 3.4:

Math 3340 *Complex Variables with Applications*

Math 4310 *Introduction to Real Analysis*

Math 4651 *Advanced Linear Algebra*

Math 4652 *Introduction to Abstract Algebra*

Math 4770 *General Topology*

Math 4330 *Advanced Multivariable Calculus*, or Math 4720 *Introduction to Differential Geometry*

In addition, students must complete at least two math electives of level 4000 and above. Furthermore, Math 4840 *Introduction to Mathematical Research*, and two semesters of Math 4900 *Distinguished Major Thesis* (see below) are required. Certain substitutions such as the graduate

level versions of the courses listed above are possible at the discretion of the DUP. **Students majoring in math are all required to choose a concentration. This goes as well for Distinguished Majors. The course Math 3250 (or higher level versions) is required in all concentrations so this will be an additional required course added to those mentioned above. The total then for Distinguished Majors is ten required courses not counting the thesis courses.**

All these courses assume the ability to understand and write proofs. So, students potentially interested in the DMP but having insufficient prior exposure to the proof-based mathematical instruction, should discuss their situation with the DUP in order to determine the best way of acquiring the necessary skills before taking the courses required for the DMP (this can be accomplished, for example, by taking Advanced Calculus sequence Math 2315-3315 and/or some of the following courses: Math 3000, Math 3310 and Math 3354, but other ways are also possible).

Distinguished Major Thesis is an original essay containing an exposition of results in advanced mathematics. It is written by a student under the supervision of a faculty advisor who guides the student through all stages of the process, from formulating the topic and determining the scope of the project to putting the finishing touches to the final product and presenting it at the public defense. For the bookkeeping purposes, all these activities will be framed as taking Math 4900 *Distinguished Major Thesis* in both semesters of the 4th year; each semester will carry 2 credits. In preparation for the work on the thesis, students are expected to acquire some initial skills of mathematical research through taking Math 4840, which is the reason why students interested in the DMP should consider taking this class early on.

The work on the thesis is a multi-stage process, which should begin no later than the end of the third year, soon after the application for the DMP has been approved. At the initial stage the faculty advisor discusses with the student the general topic of the project, determines its parameters and recommends the materials for the student to work over the summer to get introduced to the chosen area. The precise topic of the thesis can be formulated in the beginning of the fourth year based on the student's report on the work done in the summer. Depending on the availability of funds, the department will try to help the DMP students to stay in residence at UVA for several weeks during the summer to facilitate an early start on the work on the thesis through frequent consultations with the advisor. As the project takes shape, the department may also help the DMP students to travel to suitable venues to present the results of their work if recommended by the faculty advisor.

The almost year-long process of preparation of the thesis culminates in a public defense of the work. The defense includes a presentation of the main findings in front of the audience consisting of undergraduate and graduate students, faculty and guests, open discussion of the results in the Q&A format, and a closed to the public examination with the defense committee (thesis advisor and two more faculty members). The results of the defense are then publicly announced, and in case of a successful defense, the student is awarded a special departmental certificate containing a letter grade determined by the committee. This grade (in conjunction with the GPA in the required math classes) will be a major factor in nominating the student for high/highest honors.

While the Distinguished Major Thesis is a significant investment of time and effort, it has several important benefits for a student in addition to qualifying him/her for the high/highest honors. First and foremost, it creates a unique opportunity for a student to work one-on-one with a faculty advisor for a period of about one calendar year on a topic in advanced mathematics of mutual interest. This work will help to develop the student's analytical, research and expository skills, and

can be expected to boost his/her application for graduate admission as well as for jobs in industry. It can also be a basis for the student's presentations at various venues and can sometimes lead to publications.