



# Pre-Medicine Advising GUIDE

2021 - 2022

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Students interested in pursuing studies in medicine are required to take an array of courses while in college to properly prepare them for these programs. Typical course requirements are outlined below. However, it is critical that students who are interested in pursuing medical school explore the requirements of specific schools that they are considering applying to, since there can be notable variability between institutions. Students should anticipate taking the initiative to contact admissions offices at schools to which they are considering applying, to ensure that the courses they have taken, or will be taking, will fulfill their specific requirements. This guide will provide insight into three pathways to becoming a physician: Allopathic medicine (MD), Osteopathic medicine (DO), and Podiatric medicine (DPM).

## Typical Course Requirements

### BIOLOGY

Two general biology courses with labs are widely required by MD, DO & DPM medical schools.

#### Denison's Curriculum

- ▶ Molecular Biology & Unicellular Life (BIOL210)
- ▶ Multicellular Life (BIOL220)

#### NOTES

- ▶ BIO210 & 220 must be taken in numerical order. Both courses are offered each semester.
- ▶ Students may also need to take Ecology & Evolution (BIOL230); BIOL230 is not formally required for most health-related programs, but it is a prerequisite for 300-level biology courses for Biology Majors (and required for certain 300-level courses for non-majors; see the Biology page on MyDenison for specifics); it also fulfills a W ("writing intensive") overlay requirement for Denison general education requirements if taken in addition to BIO220.
- ▶ Some MD and DO medical schools require an advanced biology course:
  - ▷ Example: Baylor College of Medicine.
- ▶ Some MD and DO medical schools require genetics specifically:
  - ▷ Examples: University of Arkansas College of Medicine and the University of Missouri-Kansas City School of Medicine.

### CHEMISTRY & BIOCHEMISTRY

Two general chemistry courses with labs and two organic chemistry courses with labs are widely required by MD, DO & DPM medical schools. Biochemistry is commonly required for MD and DO programs, and always recommended.

#### Denison's Curriculum

- ▶ Atoms and Molecules: Structure and Dynamics (CHEM131)
  - ▷ Fall-only course. "General Chemistry" designation for medical schools
- ▶ Organic Structure and Reactivity (CHEM132)
  - ▷ Spring-only course. "Organic Chemistry I" designation for medical schools
- ▶ Intermediate Organic Chemistry (CHEM251)
  - ▷ Fall-only course. "Organic Chemistry II" designation for medical schools
- ▶ Intermediate Biochemistry (CHEM258)
  - ▷ Spring-only course. "Biochemistry" designation for medical schools; not required for all schools but is a pre-requisite for 300-level CHEM courses

**NOTES**

- ▶ CHEM 131/132/251/258 must be taken in numerical order.
- ▶ While Denison's four-course Chemistry sequence is acceptable to most medical programs, others specifically require the completion of five Chemistry courses.
  - ▷ Examples of DO programs that require five CHEM courses: Rocky Vista University College of Osteopathic Medicine and Liberty University College of Osteopathic Medicine.
  - ▷ Examples of MD programs that require five CHEM courses: Wright State University Boonshoft School of Medicine and University of Toledo College of Medicine and Life Sciences.
  - ▷ DPM programs only ask for four courses including inorganic and organic chemistry.
- ▶ If students are interested in programs requiring five chemistry courses, beyond the Denison Chemistry core described above, possible course options (taken during junior or senior year) include:
  - ▷ Intermediate Inorganic Chemistry (CHEM317).
  - ▷ Intermediate Polymer Chemistry (CHEM325).
  - ▷ Intermediate Analytical Chemistry (CHEM331).
  - ▷ Intermediate Physical Chemistry (CHEM343).

**MATHEMATICS**

Two courses of college mathematics are common requirements for MD programs but are rarely required specifically by DO programs and never required by DPM programs. Many institutions generally accept any college mathematics courses. However, some are more specific.

**Denison's Curriculum**

- ▶ Essentials of Calculus (MATH130) or Single Variable Calculus (MATH135; MATH130 or placement exam prerequisite). Please note that MATH130 or 135 is a pre- or co-requisite for PHYS121.
  - ▷ Example of a school with this requirement: The Washington University School of Medicine in St. Louis.
- ▶ Statistics (MATH120): occasionally required, always recommended for MD.
  - ▷ Examples of schools with this requirement: Medical College of Georgia at Augusta University and Creighton University School of Medicine.
- ▶ Calculus II (MATH145; MATH135 is a prerequisite): Rarely required or recommended.

**PHYSICS**

Two courses with labs are widely required by MD, DO & DPM medical programs.

**Denison's Curriculum**

- ▶ Physics I (PHYS121), offered Fall only.
- ▶ Physics II (PHYS122), offered Spring only.

**NOTES**

- ▶ Must be taken in numerical order.
- ▶ MATH130 or 135 is a pre- or co-requisite for PHYS121.

## ENGLISH/WRITING

Two courses commonly required for MD, DO & DPM programs. In general, medical programs will honor the structure of the undergraduate college and accept writing intensive coursework as designated by Denison's curriculum, although some schools do not accept writing intensive courses taken within the sciences.

### Denison's Curriculum

- ▶ W101 (must be taken during first year).
- ▶ One additional "English" or "Literature" course. "W overlay" courses or other humanities (U) courses may count toward this requirement, but students should explore this issue with the admissions offices of the schools that they anticipate applying to. Only a few medical schools provide strict requirements for English prerequisite courses.
  - ▷ Example: Weill Cornell Medicine requires two-writing intensive courses and specifies that one should be in the humanities/social science and one should be in English literature.

## PSYCHOLOGY/BEHAVIORAL SCIENCE

Widely recommended, but not widely required by medical programs. A few programs require six credit hours in behavioral sciences.

### Denison's Curriculum

- ▶ PSYC100: Introduction to Psychology.
- ▶ Choice of 200-300 level Psychology course.

### NOTES

- ▶ In general, medical programs are demonstrating an enhanced interest in student exposure to behavioral sciences. This shift in overall perception is demonstrated through the addition of psychological and sociology content on the new 2015 MCAT. However, it is still widely recommended and less widely required.
  - ▷ Examples of DO programs requiring psychology/behavioral science courses: Marian University College of Osteopathic Medicine and Lake Erie College of Osteopathic Medicine.
  - ▷ Examples of MD programs requiring a psychology/behavioral science course(s): University of Illinois College of Medicine and Health Sciences and Indiana University School of Medicine.
- ▶ DPM programs do not require behavioral science, but some recommend it.

## ADDITIONAL, LESS COMMON REQUIREMENTS

- ▶ Physiology: Widely suggested, rarely required. At Denison, two potential course options- HESS403: Exercise Physiology or BIO334: Comparative Physiology. When selecting the appropriate course, please speak with institution representatives directly in regard to whether exercise physiology or comparative physiology are acceptable for prerequisite requirements.
  - ▷ Example of school with this requirement: Creighton University School of Medicine.
- ▶ Humanities and social sciences: various courses in general education.
  - ▷ Example: Johns Hopkins University requires 24 credit hours in these areas.

## COMMONLY SUGGESTED, BUT RARELY REQUIRED, COURSES

- ▶ Genetics
- ▶ Physiology
- ▶ Anatomy
- ▶ Bioethics
- ▶ Microbiology
- ▶ Immunology

## Timeline for Undergraduate Studies

Students entering Denison with an interest in medical school have several options regarding the timing of beginning and completing prerequisite courses. These options depend upon the student's projected timeline for entering a medical program, and their level of preparation upon matriculating to Denison.

**NOTE:** These plans are only **examples** and are **NOT** meant to be used in isolation from factors such as major selection. Please consult your faculty advisor regarding how your goals can fit with pre-med requirements.

### PLAN A.

If a student intends to enroll in medical school immediately following graduation, the requirements listed above must be completed in the first six semesters, preparing the student to take the MCAT in the spring of the junior year. Students wishing to pursue this timeline should have a strong background in the sciences and should be prepared to undertake a rigorous schedule from the very beginning of their studies at Denison (typically at least two science courses per term). A typical schedule might look like this; however students should discuss other possibilities with your academic adviser:

FIRST YEAR	JUNIOR YEAR
<ul style="list-style-type: none"> <li>▶ <b>Fall:</b> BIOL210, CHEM131, and W101 (or in spring)</li> <li>▶ <b>Spring:</b> BIOL220 and CHEM132</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>Fall:</b> PHYS121, PSYC100 or SA100 potentially</li> <li>▶ <b>Spring:</b> BIOL300-level (if needed), PHYS122</li> </ul>
SOPHOMORE YEAR	SENIOR YEAR
<ul style="list-style-type: none"> <li>▶ <b>Fall:</b> CHEM251, MATH130 or MATH135</li> <li>▶ <b>Spring:</b> CHEM258, MATH120, and English, Literature or Writing</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>Fall:</b> Fifth CHEM of choice (if needed), other courses required for specific programs</li> </ul>

### PLAN B.

A student may elect to delay medical school entrance by a year, providing the opportunity to spread out the science/math courses across 7-8 semesters, with the MCAT taken in the spring of the senior year. This is recommended for students who anticipate needing a more gradual transition to taking multiple science courses in a given term during their undergraduate studies or who simply wish to have a “gap” year between college and medical studies.

FIRST YEAR	JUNIOR YEAR
<ul style="list-style-type: none"> <li>▶ <b>Fall:</b> CHEM131 and W101 (or in spring)</li> <li>▶ <b>Spring:</b> CHEM132</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>Fall:</b> MATH130 or MATH135, PSYC100 or SA100 potentially</li> <li>▶ <b>Spring:</b> English/Literature/Writing</li> </ul>
SOPHOMORE YEAR	SENIOR YEAR
<ul style="list-style-type: none"> <li>▶ <b>Fall:</b> CHEM251 and BIOL210</li> <li>▶ <b>Spring:</b> CHEM258, BIOL220, and MATH120</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>Fall:</b> PHYS121, and fifth CHEM of choice (if necessary)</li> <li>▶ <b>Spring:</b> PHYS122, English/Literature/Writing, BIO300-level (if needed)</li> </ul>

### PLAN C.

A student may opt to take the MCAT after graduating from Denison, and thus would complete most of the needed science/math courses across their Denison career, possibly taking some of the required classes after graduation. In this plan, the student can limit the number of science classes take to suit the pace at which they wish to complete the required courses.

## General Advice for Advising Pre-Med Students

- ▶ There are three types of medical schools: allopathic (resulting in an MD degree), osteopathic (resulting in a DO degree) and podiatry (resulting in a DPM). The accreditation system and residency placement process for MD and DO programs has been combined as of 2020. While MD and DO programs provide a generalized medical education before specialization occurs in residency, DPM programs are specialized from the start. A Doctor of Podiatric Medicine is a specialist in the prevention, diagnosis, and treatment of lower extremity disorders, diseases and injuries. Students should explore each type of medicine as early as possible. This allows them to make an informed choice about what programs they have interest in applying to, which is essential to ensure they complete all requirements.
- ▶ It is recommended that students begin compiling their list of interested medical schools as early as the end of their sophomore year. This allows for students to ensure they understand the required courses for their schools of interest in time to adapt scheduling if necessary. Students in the 2018-2019 admission cycle applied to an average of 16 MD medical schools, while applicants in the DO process applied to an average of 9 schools. Note that some students apply to both program types, which cannot be accounted for between the individual applicant services for MD and DO.
- ▶ The Medical School Admission Requirements (MSAR), is the best resource for students to use to explore prerequisites and other information for each MD program. The Choose DO Explorer is a similar resource for DO programs. MSAR is a yearly subscription and requires payment of a small fee. The DO resource is published for free yearly. The American Association of College of Podiatric Medicine provides information on each of the nine podiatry programs in the US for free on their website.
- ▶ Some medical programs are moving to a competency-based admission process and have removed all prerequisite course requirements. Examples include Albert Einstein College of Medicine and Duke University School of Medicine.
- ▶ The average age of matriculants to medical school, both MD and DO, is 24 years old, reflective of the increasing trend of taking gap years before entering medical school.

# Trends in Admissions: Data from AAMC, AACOM & AACPM

## ALLOPATHIC MEDICINE

- ▶ As of 2020, the acceptance rate to MD programs is 41%.
- ▶ 2020-2021 accepted MD applicants nationwide:
  - ▷ Average of a 3.66 science GPA and an average of a 3.73 cumulative GPA.
  - ▷ Average of a 511 MCAT Total Score.
- ▶ The proportion of women MD students has been rising over recent years, from 46.9% in 2015 to 49.5% in 2018. In 2020, women comprise 53.6% of all MD medical school students.

## OSTEOPATHIC MEDICINE

- ▶ As of 2019, the acceptance rate to DO programs is 36%.
- ▶ 2018-2019 accepted DO applicants nationwide:
  - ▷ Average of a 3.40 science GPA and an average of a 3.60 cumulative GPA.
  - ▷ Average of a 502 MCAT total score.
- ▶ Majors classified as life sciences made up 74.3% of the DO applicant pool in 2019.

## PODIATRIC MEDICINE

- ▶ For 2020, the acceptance rate to DPM programs is 67%.
- ▶ 2020-2021 accepted DPM applicants nationwide:
  - ▷ Average of a 3.2 science GPA and an average of a 3.4 cumulative GPA.
  - ▷ Average of a 494 MCAT total score.
- ▶ Women made up 50% of the applicants and 50% of matriculating students in 2020.

For more information about **Pre-Medicine Advising**, or other career-related topics, visit the Knowlton Center for Career Exploration.

# DENISON

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