

Vision Science Graduate Program Handbook

Version 2.5

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The Ohio State University
College of Optometry

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1. Purpose of the Handbook

The purpose of this handbook is to describe the policies, rules, and procedures of the Graduate Program in Vision Science, and particularly to define distinctions between the information relating to this program and the general information already described in the *Graduate School Handbook*.

2. Goals of the Program

The goals of the Graduate Program in Vision Science are:

- a) To train researchers in the latest and most effective approaches for solving vision science problems;
- b) To train educators for programs that train eye care providers; and
- c) To produce scientists for the conduct of vision science in academia, military, government, industrial, and other professional settings.

3. Relationship between the Graduate School and the Research and Graduate Studies Committee

The Graduate School of The Ohio State University includes faculty members authorized to provide graduate instruction, the graduate faculty, the Graduate Council, and the administration. The Graduate Council is the principal legislative body of the Graduate School and initiates policies and rules governing Graduate Programs. The policies, rules, procedures and general information concerning graduate education and research at The Ohio State University are embodied in the *Graduate School Handbook*.

The Research and Graduate Studies Committee administers the Graduate Program in Vision Science. This committee oversees and administers the Graduate Program and serves as the liaison between the Graduate School and the graduate faculty members. The responsibilities of the Research and Graduate Studies Committee are described in detail in the *Graduate School Handbook*. They include but are not limited to monitoring courses proposed for graduate credit; establishing procedures for assigning advisors; appointing graduate faculty; reviewing graduate faculty membership; making recommendations on student admissions; monitoring student progress; and establishing rules and procedures for the conduct of Master's Examinations, Candidacy Examinations, and Final Oral Examinations. The Research and Graduate Studies Committee is appointed by the College of Optometry Dean from the Category P, tenured graduate faculty in Vision Science.

The Committee publishes this *Graduate Program Handbook* embodying the policies, rules, and procedures of the program.

4. Admission

The admission criteria that are outlined in the *Graduate School Handbook* apply to the Graduate Program in Vision Science. The admission of students to the Graduate School is the joint responsibility of the College of Optometry's Research and Graduate Studies Committee and the Graduate School. The Research and Graduate Studies Committee evaluates the applicant's credentials and recommends admission of graduate students to the Graduate Program in Vision Science by a simple majority vote of the Committee; however, the Graduate School has the final authority for making admission decisions.

The admission procedure is a competitive process that examines the applicant's overall undergraduate and/or professional grade point average (GPA) from official transcripts, Graduate Record Examination (GRE) results (required of all applicants, except combined OD/MS applicants, who have not already earned or will earn a doctoral degree from a US or Canadian program prior to matriculation), letters of recommendation, a personal statement, and other qualifications such as publications, scores on the National Board of Examiners in Optometry examinations (for applicants being considered to serve as a clinical attending in the college clinics), and professional and research experience.

The Research and Graduate Studies Committee may elect to conduct an interview with the applicant.

Applicants are normally expected to have completed an appropriate baccalaureate or more advanced degree or a Doctor of Optometry degree at an institution accredited by the Association of Schools and Colleges of Optometry, to be considered for the program. Other potential applicants should make inquiry directly to the chair of the Research and Graduate Studies Committee to determine their potential eligibility.

5. Funding

A limited number of Graduate Teaching Associate (GTA) positions are available in the College of Optometry. Students will be notified at the time of the offer of admission whether they will receive a GTA position, the amount of the stipend, and the duration of the GTA award. The conditions of the GTA position are more thoroughly described in Section 14 of this manual and in the University's *Graduate Program Handbook*.

Likewise, Graduate Research Associate (GRA) positions are sometimes available in the College of Optometry, typically funded through the college and/or an individual faculty members' extramural funding. Students will be notified at the time of the offer of admission whether they will receive a GRA position, the amount of the stipend, and the duration of the GRA award. The conditions of the GRA position are more thoroughly described in Section 14 of this manual and in the University's *Graduate Program Handbook*.

6. Advisors

Advisors are selected by the graduate student with consent of the selected advisor. An advisor for a PhD student must have been granted 'P-level' status by the Graduate School. An advisor for an MS student can have either 'M-level' or 'P-level' status. The Research and Graduate Studies Committee Chair serves as the interim advisor for all graduate students prior to selection of a regular advisor. The advisor must be selected prior to beginning thesis/dissertation research, which for MS students should occur during the first semester in the program.

The student and advisor are responsible for constructing the student's schedule. The advisor is responsible for proposing the composition of examination committees and chairs all such committees.

A student is expected to participate actively in the ongoing research program of the laboratory of their selected advisor.

The student is expected to monitor their own progress and adherence with all Graduate School and Graduate Program in Vision Science requirements and timelines for admission, course enrollment, course requirements, credit hour requirements, examinations, and graduation.

A student enrolled in any degree-seeking capacity in the Graduate Program in Vision Science may, without prejudice, request a change of advisor by writing to the Research and Graduate Studies Committee. The Research and Graduate Studies Committee and the student must concur on the particular choice of the new advisor. A change of advisor does not reset time limits defining adequate "academic progress" except at the discretion of the Research and Graduate Studies Committee.

7. Registration

To maintain full-time status, students must be enrolled in at least eight credit hours. Optometry credit hours count toward those eight credit hours for Combined OD/MS students. PhD students with Clinical Instructor Practice appointments may not take more than 10 credit hours, which is the limit placed by the university for the faculty and staff Tuition Assistance Program. During the semester of graduation, all students must register for at least three graduate credit hours. To maintain a 50% or greater graduate associate (GA) appointment students must take a minimum of 8 credit hours in Autumn or Spring semesters, and 4 credit hours in summer term; however, it should be noted that 8 credit hours are still required in the summer term to maintain full-time status.

8. Graduate Student Travel Support

Travel funds for meetings are not guaranteed, but associations, student organizations, the university, and the college all provide means for students to apply for travel funds. Below is a list of possible sources, but it should not be considered comprehensive. Details about specific travel funds and the application process can be obtained by asking the sponsoring individual, visiting the sponsor website, or inquiring with the Research and Graduate Studies Chair. Graduate students should communicate with the Research and Graduate Studies office prior to booking any travel to confirm that internal university/college policies regarding requests for funds and booking of travel are followed.

- American Academy of Optometry Travel Fellowship
- ARVO Travel Fellowship
- Graduate Student Research Fund (GSRF) from OSU Vision Science Program
- Ray Travel Awards from the OSU Council of Graduate Students
- Inter-Professional Council for OSU Optometry Students
- OSU Research Advisor Funds

9. Description of Fields of Study

Vision Science is the science concerned with the study of all aspects of the eye or the visual system. Active research programs within The Ohio State University's Graduate Program in Vision Science include but are not limited to:

- **geometrical and physical optics:** fundamental optical principles applied to the optics of the eye and vision, and vision correction technologies;
- **ocular development:** etiology of refractive error, growth of the ocular components, and prenatal ocular development;
- **visual psychophysics:** color vision, visual processes, and measurement of visual performance;
- **infant vision:** development of visual acuity and stereopsis;
- **binocular vision and space perception:** correspondence, fixation disparity and spatial localization, vergence/accommodation therapy, vision therapy
- **ocular motility:** accommodative-convergence, sports vision, eye movements, and binocular rivalry;
- **ocular physiology:** metabolism of the ocular structures;
- **environmental vision:** vision standards and quality of life issues;
- **epidemiology of vision:** progression of keratoconus, natural history of eye growth;
- **pediatric vision:** amblyopia, vision screening, convergence insufficiency, binocular vision disorders, refractive error;
- **contact lenses:** myopia control, wear and care, comfort;
- **neurobiology of vision:** neuroanatomy and neurophysiology of retina and ascending visual pathway;
- **high resolution imaging of the eye:** Cellular level in vivo imaging of the retina to study both healthy and diseased eyes; allows early detection of ocular disease and monitoring of its progression;
- **pathology of vision:** assessment and prevention of eye disease;
- **vision rehabilitation:** assessment and rehabilitation of individuals with impaired vision; and
- **molecular and cellular biology:** localization and quantification of DNA, RNA, and proteins in healthy and diseased ocular structures

10. Vision Science Graduate Program Code of Student Conduct

Graduate students and Graduate Faculty aspire to professional behavior that is consistent with the highest ethical and moral standards. The Graduate School at The Ohio State University expects that graduate students will demonstrate responsibility and integrity in pursuing their creative and scholarly interests. The academic enterprise is dependent upon such behavior. Graduate students are responsible for learning about appropriate standards for ethical research and scholarly conduct and for following all university policies related to ethical research and scholarly conduct.

When graduate students join the Ohio State community, they become members of disciplinary, scholarly, and professional communities that extend beyond the university. Graduate students are expected to learn, respect, and abide by the professional codes of ethics and responsibilities that are commonly accepted in their field of study or area of research. These codes include but are not limited to the following: a responsibility to contribute an original body of work to one's chosen discipline and the recognition that one's work is based on the work of others which must be respected and properly acknowledged. Graduate students also have the responsibility to treat university faculty, staff, and other students respectfully and professionally.

Graduate Faculty, advisors, and graduate programs should actively encourage their students to participate as members of their chosen disciplinary, scholarly, and professional communities. Graduate students should be encouraged to seek and share knowledge wherever and whenever possible. Academic advisors and other faculty members should educate graduate students through example and discussion, addressing such issues as academic honesty, research, publication, recruitment, and hiring practices, and applicable fellowship and graduate associateship responsibilities. Disciplinary codes of ethics and norms should be discussed among graduate students and faculty. Such communication is a means of setting high standards of behavior in graduate study and beyond.

In accordance with the *Graduate Program Handbook*, allegations of graduate student violations will be investigated following the procedures outlined in either the *University Code of Student Conduct* or the *Code of Research and Scholarly Misconduct*, dependent upon the nature of the alleged violation. For OD/MS students jointly enrolled in the professional program of the College of Optometry and the graduate program in Vision Science, allegations of misconduct affiliated with a course that is part of the optometric curriculum for the OD degree will be investigated by the Honor Council of the College of Optometry. Allegations of misconduct affiliated with a course that is not part of the optometric curriculum for the OD degree will be investigated by the University Committee on Academic Misconduct (COAM). For instances where an OD/MS student is investigated by COAM and aspects of the professionalism code of the College of Optometry are not addressed by COAM, a student may additionally be investigated by the Honor Council of the College of Optometry, but only as it pertains to aspects of the case that were not already adjudicated by COAM. Allegations of research misconduct by graduate students will be adjudicated according to the university Policy on Research Misconduct, irrespective of joint enrollment in the professional optometric program and graduate program in Vision Science. If the proposed sanction for any violation of the conduct code rises to the level of suspension or dismissal from the Graduate Program in Vision Science, that recommendation will be referred to the Graduate School.

11. Master's Degree Programs

The Graduate Program in Vision Science offers three master's degree pathways: Combined OD/MS, Residency/MS, and traditional Master's degree. The current policies of the Graduate School apply with regard to academic performance requirements, transfer of credit, residence, and time limits, except as specified in this document. The admission and completion requirements vary, depending on the course of study.

11.a. Combined OD/MS

11.a.1. Description

The Combined OD/MS program is only available to outstanding students enrolled in The Ohio State University College of Optometry who wish to simultaneously pursue the OD degree and the Master's in Vision Science. Only the Plan A (thesis) program is offered. The Plan B (non-thesis) program is not offered.

11.a.2. Eligibility

A minimum GPA of 3.00 in The Ohio State University College of Optometry program is required. Optometry students typically apply for this program through submission of an internal application to the College of Optometry's Research and Graduate Studies Committee during the spring semester of their first year in the optometry program. Admission of the applicant is based on the student's academic performance and the Research and Graduate Studies Committee's assessment of their motivation and ability to complete a program of independent research in combination with the regular optometry curriculum. Acceptance is offered contingent upon maintenance of a minimum cumulative GPA of 3.0 in the optometry program following completion of the spring semester. Applicants will then formally apply to the Graduate School in the summer following completion of the first year in the optometry program; the final decision of admission rests with the Graduate School.

11.a.3. Course Requirements

- Must complete 30 graduate credit hours
 - Required courses:
 - Vision Science 7960 (Ethics in Biomedical Research)
 - Vision Science 7980 (Statistics in Clinical Research)
 - Vision Science 7101 (Basics of Graduate Work)
 - Vision Science 7950 (Vision Science Seminar)
 - Every semester through spring semester of the third year.
 - Students *must make every attempt* to attend VS 7950 lectures during their fourth year of optometry school, but should not take the course for credit.
 - At least two of the following four courses:
 - VS 8001 (Anatomy and Physiology of the Eye)
 - VS 8002 (Ocular Motility and Binocular Vision)
 - VS 8003 (Visual Sensory Processes)
 - VS 8004 (Optics of the Eye and Specification of the Visual Stimulus)
 - Up to 10 credit hours of VS 7999 (research credits) may be counted toward the 30 graduate credit hours required for the Master's degree, but a student may take more than 10 credit hours total. For example, students are required to take at least three graduate credit hours during the semester they plan to graduate. If a graduating student already received 10 credit hours of VS 7999, three credit hours of VS 7999 can be taken during the last semester to satisfy the need for three credit hours during the graduation semester, but they will not count toward the 30 graduate credit hours.
 - Vision Science 6300 and 6320 taken in the optometry curriculum may contribute up to 10 of the 30 credit hours required for graduation
- Remaining coursework is selected according to the student's interests, as recommended by the student's advisor

11.a.4. Thesis and Master's Examination

Prior to commencing research, the student and the advisor must obtain the appropriate Institutional Review Board (IRB) or Institutional Animal Care and Use Committee (IACUC) approval, if applicable. The topic of the thesis work and the members of the Master's Examination Committee (see 11.a.5) are determined by close communication and mutual agreement between the student and their advisor. Upon completion of two semesters in the program, the student, in consultation with the advisor, must complete a written research plan for submission to the Research and Graduate Studies office, to include a list of Master's Examination Committee members appointed. The Research and Graduate Studies office will circulate the plan for committee signatures and retain the plan as documentation of the requirements to progress to the thesis examination. Changes to the plan are permitted upon request and mutual agreement of the student and committee.

The thesis examination occurs in two steps: an oral examination followed by approval of the written thesis document. The thesis oral examination is a two-hour examination with emphasis on the thesis material. Students may not bring written materials to the oral examination. A presentation of the research by the student should not last more than 45 minutes, and the remaining time must be allotted to discussion of the research and to questions of and answers by the student. The examination is scheduled by the student in close consultation with their advisor. The exam must take place during announced university business hours, Monday through Friday. Preference is for all exams to be held on site with all committee members present. However, if circumstances dictate, the university allows for exams to be conducted on-campus, remotely, or in a hybrid format. Remote and hybrid exams should follow the guidelines for video-conferencing as outlined in Appendix B of the *Graduate School Handbook*. All exam participants must be able to see and hear each other during the entire exam. The written thesis is approved by the Master's Examination Committee after successful completion of the oral examination.

11.a.5. Master's Examination Committee

- Chosen by the student and advisor
- Approval by Research and Graduate Studies Committee is not required, except for non-graduate faculty, as noted below
- Three members are required
 - Advisor and at least one other committee member must be Vision Science Graduate Faculty
 - A non-Graduate Faculty member may be appointed to the Master's Examination Committee by approval of the Research and Graduate Studies Committee and petition to the Graduate School. This member may be from another OSU department or outside the university and will be asked to submit a curriculum vitae as part of the approval process.

11.a.6. Progress in the Graduate Program

The Master's degree should be completed by spring semester of the final year in optometry school for students enrolled in the Combined OD/MS program. A student may be considered lacking in academic progress after this period. To be considered in good standing, a student must maintain a graduate cumulative grade point average of 3.00 or better in all graduate credit courses taken after enrollment in the program, to include those credit hours that serve as dual credit between the professional program in Optometry and the MS in Vision Science. Students who are not in good standing, or fail to make reasonable academic progress, will be notified by the Graduate School and are at risk for denial of further registration, as outlined in the *Graduate School Handbook* and sections 12g and 12h below.

11.a.7. Progress in the Professional Program Clinical Rotations

In the case of an I/E grade in the (OD) professional program clinical rotation(s) for a Combined OD/MS student, the student’s advisor will be notified of the poor clinical performance and the need to schedule Remediation Committee meetings. The advisor will be invited to Remediation Committee meetings, after which they will discuss the option of postponement of the student’s participation in the Master’s program during clinical remediation with the Research and Graduate Studies Committee. For students wishing to continue pursuit of their MS, inadequate clinical or academic performance in the professional program will not impact student standing in the graduate program. Decisions to dismiss a student from the MS program are based upon performance in the graduate program and ultimately rest with the Graduate School upon recommendation from the Research and Graduate Studies Committee.

11.b. Residency/MS

11.b.1. Description

The Residency/MS program is a two-year program involving completion of a Master’s degree in Vision Science combined with clinical experience (direct patient care and clinical attending). Its purpose is to provide advanced optometric and research training with particular emphasis on the chosen specialty:

- 1) Cornea and Contact Lenses;
- 2) Binocular Vision and Pediatrics;
- 3) Vision Rehabilitation; or
- 4) Community Eye Care.

Residency/MS students will be admitted for the summer semester. During the first summer of the program, students will register for four research credit hours (VS 7999), either with their research advisor, or with the Research and Graduate Studies Chair if an advisor has not yet been selected. They will provide direct patient care 75% time (30 hours) in the clinical setting of their specialization and possibly other clinical settings, as follows:

Cornea and Contact Lenses:	Contact Lens Clinic
Binocular Vision and Pediatrics:	Binocular Vision and Pediatrics Clinic
Vision Rehabilitation:	Vision Rehabilitation, Advanced Ocular Care, and Primary Care
Community Eye Care:	Vision care settings in the community

The remaining five semesters are devoted to 50% effort in clinical teaching (20 hours), serving as a Graduate Teaching Associate in appropriate laboratories, and patient care from routine to the most complex phases of optometric practice. Individual sequences will be established by consultation among the resident, their advisor, their clinical mentor, the Associate Dean for Clinical Services, and the individual Service Chief, and may be influenced by thesis project requirements. Residency/MS students must also complete a research project and Master’s thesis; only the Plan A (thesis) program is offered. The Plan B (non-thesis) program is not offered.

11.b.2. Eligibility

A minimum cumulative GPA of 3.00 in the student’s optometry program is required. Applicants to this program must be eligible for licensure to practice optometry in the state of Ohio. Admission of the applicant is based on the student’s academic performance, passing NBEO scores, input to the Research and Graduate Studies Committee from the relevant clinical faculty / administrators regarding the applicant’s ability to complete the clinical component of the program, and the Research and Graduate Studies Committee’s assessment of their motivation and ability to complete a program of independent research. Upon recommendation of admission by the Research and Graduate Studies Committee, the ultimate decision to admit rests with the Graduate School.

11.b.3. Course Requirements

- Must complete 30 graduate credit hours
 - Required courses:
 - Vision Science 7960 (Ethics in Biomedical Research)
 - Vision Science 7980 (Statistics in Clinical Research)
 - Vision Science 7101 (Basics of Graduate Work)
 - Vision Science 7950 (Vision Science Seminar) every semester
 - At least two of the following four courses:
 - VS 8001 (Anatomy and Physiology of the Eye)
 - VS 8002 (Ocular Motility and Binocular Vision)
 - VS 8003 (Visual Sensory Processes)
 - VS 8004 (Optics of the Eye and Specification of the Visual Stimulus)
 - Each of the areas of specialization has further requirements:
 - **Cornea and Contact Lenses:** Must take VS 8001
 - **Binocular Vision and Pediatrics:** Must take VS 8002
 - **Vision Rehabilitation:** Must take VS 8004
 - **Community Eye Care:** Must take one of the following:
 - VS 5500 Global Issues in Eye Care (1 credit)
 - PUBHHBP 7544 Health Behavior & Health Promotion: Fundamental Determinants of Population Health and Implications for Public Health (3 credit hours)
 - PUBHHMP 7617 Health Management & Policy: Leadership in Health Care (3 credit hours)*
 - PUBHHBP 7520 Health Behavior & Health Promotion: Community Health Assessment (3 credit hours)*
 - PUBHHBP 7542 Health Behavior & Health Promotion: Settings and Special Populations in Health Promotion (3 credit hours)*
 - Up to 10 credit hours of VS 7999 (research credits) may be counted toward the 30 graduate credit hours required for the Master's degree, but a student may take more than 10 credit hours total. For example, students are required to take at least three graduate credit hours during the semester they plan to graduate. If a graduating student already received 10 credit hours of VS 7999, three credit hours of VS 7999 can be taken during the last semester to satisfy the need for three credit hours during the graduation semester, but they will not count toward the 30 graduate credit hours.
- Remaining coursework is selected according to the student's interests, as recommended by the student's advisor

11.b.4. Thesis and Master's Examination

Prior to commencing research, the student and the advisor must obtain the appropriate Institutional Review Board (IRB) or Institutional Animal Care and Use Committee (IACUC) approval, if applicable. The topic of the thesis work and the members of the Master's Examination Committee (see 11.a.5) are determined by close communication and mutual agreement between the student and their advisor. Upon completion of two semesters in the program, the student, in consultation with the advisor, must complete a written research plan for submission to the Research and Graduate Studies office, to include a list of Master's Examination Committee members appointed. The Research and Graduate Studies office will circulate the plan for committee signatures and retain the plan as documentation of the requirements to progress to the thesis

examination. Changes to the plan are permitted upon request and mutual agreement of the student and committee.

The thesis examination occurs in two steps: an oral examination followed by approval of the written thesis document. The thesis oral examination is a two-hour examination with emphasis on the thesis material. Students may not bring written materials to the oral examination. A presentation of the research by the student should not last more than 45 minutes, and the remaining time must be allotted to discussion of the research and to questions of and answers by the student. The examination is scheduled by the student in close consultation with their advisor. The exam must take place during announced university business hours, Monday through Friday. Preference is for all exams to be held on site with all committee members present. However, if circumstances dictate, the university allows for exams to be conducted on-campus, remotely, or in a hybrid format. Remote and hybrid exams should follow the guidelines for video-conferencing as outlined in Appendix B of the *Graduate School Handbook*. All exam participants must be able to see and hear each other during the entire exam. The written thesis is approved by the Master's Examination Committee after successful completion of the oral examination.

11.b.5. Master's Examination Committee

- Chosen by the student and advisor
- Approval by Research and Graduate Studies Committee is not required, except for non-graduate faculty as noted below
- Three members are required
 - Advisor and at least one other committee member must be Vision Science Graduate Faculty
 - A non-Graduate Faculty member may be appointed to the Master's Examination Committee by approval of the Research and Graduate Studies Committee and petition to the Graduate School. This member may be from another Ohio State department or outside the university and will be asked to submit a curriculum vitae as part of the approval process.

11.b.6. Progress in the Graduate Program

The Master's degree normally is completed in two years for students enrolled in the Residency/MS. A student may be considered lacking in academic progress after this period. To be considered in good standing, a student must maintain a graduate cumulative grade point average of 3.0 or better in all graduate credit courses. Students who are not in good standing, or fail to have reasonable academic progress, will be notified by the graduate school and are at risk for denial of further registration, as outlined in the *Graduate School Handbook* and sections 12g and 12h below.

11.c. Traditional Master's Degree Program

11.c.1 Description

The College of Optometry offers a traditional Master's in Vision Science. This is a two-year program that provides vision science research training and experience. Only the Plan A (thesis) program is offered. The Plan B (non-thesis) program is not offered.

11.c.2. Eligibility

A minimum undergraduate GPA of 3.00 is required. Applicants to this program must have a Bachelor's degree or equivalent. Part-time students are permitted, but first priority is given to full-time students. If

permitted, the time limit for part-time attendance is determined by the Research and Graduate Studies Committee prior to the admission of the student. If a full-time student wishes to change to part-time status, a petition must be made to the Research and Graduate Studies Committee who will then provide written terms for continuation on part-time status.

The minimum academic criteria for admission include:

- credentials documenting prerequisite academic work that gives evidence of ability to pursue a graduate program in your chosen area,
- a baccalaureate or higher degree from an accredited college or university prior to beginning graduate studies, and
- a cumulative grade point average equivalent to at least 3.0 on a 4.0 scale (B grade) in the last degree of study.

Applicants who have earned, or will earn, a doctoral degree from a US or Canadian program prior to matriculation are waived from submitting Graduate Record Examination (GRE) scores. All other applicants are required to submit GRE scores that were completed within the past five years. If an applicant is from a country where the first language is not English and the applicant has not earned a bachelor's degree or higher in a primarily English-speaking country, the applicant must submit an official Test of English as a Foreign Language (TOEFL) score, DUOLINGO score, or an International English Language Testing Service (IELTS) score that was completed within the past two years. A list of those countries exempted from the English proficiency requirement can be found on the Graduate School website. Minimum English Proficiency Requirements are as follows:

- minimum score of 550 on the old or a minimum score of 19 on each section of the new paper-based TOEFL,
- at least 79 on the internet-based TOEFL,
- at least 120 on the DUOLINGO, or
- at least a 7.0 on the IELTS.

11.c.3. Course Requirements

- Must complete 30 graduate credit hours
 - Required courses:
 - Vision Science 7960 (Ethics in Biomedical Research)
 - Vision Science 7980 (Statistics in Clinical Research)
 - Vision Science 7101 (Basics of Graduate Work)
 - Vision Science 7950 (Vision Science Seminar) every semester
 - At least two of the following four courses:
 - VS 8001 (Anatomy and Physiology of the Eye)
 - VS 8002 (Ocular Motility and Binocular Vision)
 - VS 8003 (Visual Sensory Processes)
 - VS 8004 (Optics of the Eye and Specification of the Visual Stimulus)
 - Up to 10 credit hours of VS 7999 (research credits) may be counted toward the 30 graduate credit hours required for the Master's degree, but a student may take more than 10 credit hours total. For example, students are required to take at least three graduate credit hours during the semester they plan to graduate. If a graduating student already received 10 credit hours of VS 7999, three credit hours of VS 7999 can be taken during the last semester to satisfy the need for three credit hours during the graduation semester, but they will not count toward the 30 graduate credit hours.
- Remaining coursework is selected according to the student's interests, as recommended by the student's advisor

11.c.4. Thesis and Master's Examination

Prior to commencing research, the student and the advisor must obtain the appropriate Institutional Review Board (IRB) or Institutional Animal Care and Use Committee (IACUC) approval, if applicable. The topic of the thesis work and the members of the Master's Examination Committee (see 11.a.5) are determined by close communication and mutual agreement between the student and their advisor. Upon completion of two semesters in the program, the student, in consultation with the advisor, must complete a written research plan for submission to the Research and Graduate Studies office, to include a list of Master's Examination Committee members appointed. The Research and Graduate Studies office will circulate the plan for committee signatures and retain the plan as documentation of the requirements to progress to the thesis examination. Changes to the plan are permitted upon request and mutual agreement of the student and committee.

The thesis examination occurs in two steps: an oral examination followed by approval of the written thesis document. The thesis oral examination is a two-hour examination with emphasis on the thesis material. Students may not bring written materials to the oral examination. A presentation of the research by the student should not last more than 45 minutes, and the remaining time must be allotted to discussion of the research and to questions of and answers by the student. The examination is scheduled by the student in close consultation with their advisor. The exam must take place during announced university business hours, Monday through Friday. Preference is for all exams to be held on site with all committee members present. However, if circumstances dictate, the university allows for exams to be conducted on-campus, remotely, or in a hybrid format. Remote and hybrid exams should follow the guidelines for video-conferencing as outlined in Appendix B of the *Graduate School Handbook*. All exam participants must be able to see and hear each other during the entire exam. The written thesis is approved by the Master's Examination Committee after successful completion of the oral examination.

11.c.5. Master's Examination Committee

- Chosen by the student and advisor
- Approval by Research and Graduate Studies Committee is not required, except for non-graduate faculty as noted below
- Three members are required
 - Advisor and at least one other committee member must be Vision Science Graduate Faculty
 - A non-Graduate Faculty member may be appointed to the Master's Examination Committee by approval of the Research and Graduate Studies Committee and petition to the Graduate School. This member may be from another Ohio State department or outside the university and will be asked to submit a curriculum vitae as part of the approval process.

11.c.6. Progress in the Graduate Program

The Master's degree normally is completed in two years for students enrolled in the traditional Master's degree program. A student may be considered lacking in academic progress after this period. To be considered in good standing, a student must maintain a graduate cumulative grade point average of 3.00 or better in all graduate credit courses. Students who are not in good standing, or fail to have reasonable academic progress, will be notified by the Graduate School and are at risk for denial of further registration, as outlined in the *Graduate School Handbook* and sections 12g and 12h below.

12. Doctoral Degree Program

12.a. Description

The College of Optometry offers a Doctoral (PhD) degree in Vision Science. This is typically a five-year program that provides vision science research training and experience.

12.b. Eligibility

Applicants to this program must have a Bachelor's degree. If a student wishes to change academic advisors when switching from the Master's program to the Doctoral program, they may do so. Students who transfer to the PhD program without completing a Master's thesis will not be awarded a Master's degree.

Part-time students are permitted, but first priority is given to full-time students. If permitted, the time limit for part-time attendance is determined by the Research and Graduate Studies Committee prior to the admission of the student. If a full-time student wishes to change to part-time status, they must petition the Research and Graduate Studies Committee who will provide written terms for continuation on part-time status.

The minimum academic criteria for admission include:

- credentials documenting prerequisite academic work that gives evidence of ability to pursue a graduate program in the chosen area,
- a Baccalaureate or higher degree from an accredited college or university prior to beginning graduate studies, and
- a cumulative grade point average equivalent to at least 3.00 on a 4.00 scale (B grade) in the last degree of study.

Applicants who have earned, or will earn, a doctoral degree from a US or Canadian program prior to matriculation are waived from submitting Graduate Record Examination (GRE) scores. All other applicants are required to submit GRE scores that were completed within the past five years. If an applicant is from a country where the first language is not English and the applicant has not earned a Bachelor's degree or higher in a primarily English-speaking country, the applicant must submit an official Test of English as a Foreign Language (TOEFL) score, DUOLINGO score, or an International English Language Testing Service (IELTS) score that was completed within the past two years. A list of those countries exempted from the English proficiency requirement can be found on the Graduate School website. Minimum English Proficiency Requirements are as follows:

- minimum score of 550 on the old or a minimum score of 19 on each section of the new paper-based TOEFL,
- at least 79 on the internet-based TOEFL,
- at least 120 on the DUOLINGO, or
- at least a 7.0 on the IELTS.

Students who are currently enrolled in The Ohio State University Vision Science Graduate Program (Combined OD/MS, Residency/MS, or traditional Master's students) who wish to apply to the PhD program must submit a curriculum vitae, a one-page letter of intent, and a letter of recommendation from their advisor to the Research and Graduate Studies Chair. Acceptance in the PhD program will be determined by recommendation from the Research and Graduate Studies Committee.

12.c. Program Requirements

- Must complete 80 graduate credit hours or 50 graduate credit hours beyond the Master's degree if the Master's degree was previously completed at The Ohio State University. For applicants who earned a Master's degree from a different institution, requests to transfer 30 previously earned credit hours to be

applied toward the PhD requirements must be made through Gradforms for review and approval by both the Graduate Program in Vision Science and the Graduate School.

- Required courses:
 - VS 7960 (Ethics in Biomedical Research)
 - VS 7980 (Statistics in Clinical Research)
 - VS 7101 (Basics of Graduate Work)
 - VS 7950 (Vision Science Seminar) every semester
 - VS 8001 (Anatomy and Physiology of the Eye)
 - VS 8002 (Ocular Motility and Binocular Vision)
 - VS 8003 (Visual Sensory Processes)
 - VS 8004 (Optics of the Eye and Specification of the Visual Stimulus)
 - VS 7970 (Grantsmanship)
 - VS 7940 (Oral Presentation of Scientific Research) annually, beginning 12 months after matriculation into the PhD program and culminating with the open dissertation defense. Students present a research symposium talk in the VS 7950 series based on research interests. Failure to do so could provide evidence of insufficient academic progress.
- Up to 40 credit hours combined of VS 8998 and 8999 (pre and post candidacy research credits) may be counted toward the credit hours required for the Doctoral degree, but a student may take more than 40 credit hours total. For example, students are required to take at least 3 graduate credit hours during the semester they plan to graduate. If that student already received 40 combined credit hours of VS 8998 and 8999, 3 credit hours of VS 8999 can be taken during the last semester to satisfy the need for 3 credit hours during the graduation semester, but they will not count toward the total required graduate credit hours. For students applying credits from a previously earned Master's degree, previously earned research credit hours (VS 7999) count toward the 40 credit hour maximum for the Doctoral degree.
- Remaining coursework is selected according to the student's interests, as recommended by the student's advisor
- One year after matriculation, every PhD student must submit an American Optometric Foundation Ezell Fellowship and an Ohio Lions Eye Research Foundation (OLERF) Fellowship application annually, until receiving that award the maximum number of times allowable. Exceptions to this requirement must be approved by the Research and Graduate Studies Chair.
- Each student must perform at least two semester of teaching, although it can be on a part-time basis. At least one of these semesters must encompass teaching in a laboratory course. In the event that the student is funded through a source outside the college (e.g. a training grant) the student will not receive additional compensation for teaching. Teaching experience may include working with optometry students in providing care to patients examined in the professional program or instructing optometry students in selected laboratories.

12.d. Progress Committee

Within 12 months of matriculation, each PhD student must, in consultation with their advisor, select a Progress Committee. The Progress Committee will be expected to follow the student's progress throughout their training and to help mentor the student in their research. It is expected that the Progress Committee will meet with the student at least annually as a group for the duration of the student's time in the program.

- Chosen by the student and advisor
- The initial Progress Committee members and any changes to the Progress Committee must be approved by the Research and Graduate Studies Committee
- Three members are required
 - Advisor serves as the Chair
 - At least two additional P-level graduate faculty must be on the committee

- A student may, without prejudice, request a change in the Progress Committee, and a member of the Progress Committee may resign. A change in Progress Committee membership must be approved by the Research and Graduate Studies Committee.
- A change of Progress Committee membership does not reset time limits defining adequate “academic progress” except at the discretion of the Research and Graduate Studies Committee.

12.e. Candidacy Examination

Doctoral students are considered pre-candidacy until successful completion of the Candidacy Examination. To be eligible for the Candidacy Examination, students must complete all required coursework and a minimum of 40 credit hours (exclusive of Vision Science 8999 and 8998). The timing of the Candidacy Examination should ordinarily occur following completion of the second year in the program; failure to complete the exam by the end of 8 semesters in the program may be considered failing to make adequate academic progress. The student must be in good standing in the Graduate School and registered for at least three graduate credit hours each semester or term in which any part of the candidacy examination is taken. The Candidacy Examination has both written and oral portions and successful completion is judged by the approved Candidacy Examination Committee (see 12.e.1). Candidacy Examinations are arranged by the graduate student’s advisor and exceptions to the ordinary timeline should be discussed with the Research and Graduate Studies Chair.

Satisfactory completion of the Candidacy Examination is achieved by unanimous affirmative vote of the Candidacy Examination Committee. Satisfactory completion of the Candidacy Examination admits the student to Candidacy for the Doctoral degree.

If the examination is judged unsatisfactory, a second examination may be permitted on the recommendation of the Candidacy Examination Committee, according to the guidelines in the *Graduate School Handbook*. Students who fail their Candidacy Examinations and are permitted to retake the examination must retake the Candidacy Examination within two semesters of their initial failure and follow the rules outlined in the *Graduate School Handbook* for re-examination.

The Candidacy Examination Committee can unanimously designate an “Honors” (non-transcript) level for exceptional performance on the Candidacy Examination. It is expected that the Honors designation will be used rarely.

12.e.1. Candidacy Examination Committee

- Chosen by the advisor and candidate
- The initial Candidacy Examination Committee members and any changes to the Candidacy Examination Committee must be approved by the Research and Graduate Studies Committee
- At least four members of the current graduate faculty are required
 - Advisor serves as Chair of the Candidacy Examination Committee
 - At least one member of the Progress Committee, in addition to the Advisor, must serve on the Candidacy Examination Committee
 - At least two additional members of the graduate faculty of the Graduate Program in Vision Science must serve on the Candidacy Examination Committee. The two additional members may include the third Progress Committee member and may include one M-level faculty member.
 - Non-Graduate Faculty members may be appointed to the Candidacy Examination committee by approval of the Research and Graduate Studies Committee and by petition to the Graduate School. Non-Graduate Faculty are in addition to the required four, current Ohio State Graduate Faculty members and will be asked to submit a curriculum vitae as part of the approval process. Once

approved, membership of the Candidacy Examination Committee cannot be changed without the approval of the Research and Graduate Studies Committee.

12.e.2. Written Candidacy Examination

The written portion of the Candidacy Examination consists of a 13-page NIH-R01 type application (one page specific aims plus 12-page application) plus a critical review article on the same topic (20 double-spaced pages, suitable for publication). These page limits do not include references. The written portion must be completed no fewer than two and no more than three months after the approval of the Candidacy Examination topic.

The topic of the Candidacy Examination proposal must be distinct from the candidate's proposed dissertation topic but may be in a related area. The grant proposal cannot be one that has been created for any other purpose previously. Writing on the grant proposal cannot begin until the topic has been approved by unanimous vote of the Candidacy Examination Committee. After the topic has been finalized and approved by the Candidacy Examination Committee, candidates are not permitted to seek advice regarding the proposal from anyone other than the Candidacy Examination Committee. The entire proposal will be evaluated by the Candidacy Examination Committee.

12.e.3. Oral Candidacy Examination

The oral portion of the candidacy examination is held between two weeks and one month after completion of the written portion. To schedule the oral examination, the student must submit an Application for Candidacy on Gradforms and have this approved by their program and advisor at least two weeks before the oral examination's proposed date. The oral examination must take place during announced university business hours, Monday through Friday. Preference is for all candidacy exams to be held on site with all committee members present. However, if circumstances dictate, the university allows for exams to be conducted on-campus, remotely, or in a hybrid format. Remote and hybrid exams should follow the guidelines for video-conferencing as outlined in Appendix B of the *Graduate School Handbook*. All exam participants must be able to see and hear each other during the entire exam. Extensions must be approved by simple majority vote of the Research and Graduate Studies Committee.

The oral examination is two hours in length and consists solely of questions posed by the Candidacy Examination Committee; the candidate does not make a formal presentation. Each Candidacy Examination Committee member is expected to participate fully in the oral questioning of the student. Questions must relate to the written materials but can draw from related areas in vision science and other related disciplines. Students may not bring written materials to the oral examination. Questions at the oral examination will require the candidate to understand important and classic papers in vision science. The candidate should also be prepared to discuss strengths and limitations of various study designs and methods, potential threats to validity, and other pitfalls in the area of research interest.

12.f. Dissertation

12.f.1. Research Plan

The PhD student, in consultation with their advisor, selects the dissertation topic. Within one semester of successful completion of their Candidacy Examination, the student must prepare a comprehensive research plan for the Dissertation Committee (see 12.f.2). This plan should include proposed methodologies, analyses and expected outcomes, and must be approved by each internal member of the Dissertation Committee. The completed research plan will be submitted to the Research and Graduate Studies office. The Research and Graduate Studies office will circulate the plan for committee signatures and retain the plan as documentation

of the requirements to progress to the dissertation examination. Changes to the plan are permitted upon request and mutual agreement of the student and Dissertation Committee. Where human subjects, animals, or chemical or biological agents are involved in the dissertation research it is the responsibility of the student to assure that the appropriate institutional review is obtained.

12.f.2. Dissertation Committee

- Chosen by the advisor and candidate
- The initial Dissertation Committee members must be approved by the Research and Graduate Studies Committee, and any changes to the Dissertation Committee after the research plan is approved must be approved by the Research and Graduate Studies Committee.
- At least three Vision Science graduate faculty members and a non-Vision Science graduate faculty member are required
 - Advisor (must be P-level) serves as Chair of the Dissertation Committee
 - In addition to the Advisor, two committee members must be P-level Ohio State graduate faculty members, at least one of whom is a member of the Progress Committee
 - One faculty member who is not a member of the Graduate Faculty in Vision Science, either from Ohio State or from another academic institution, is required. This member is typically assigned specifically for the Dissertation Examination only, but may be included earlier if desired. At minimum, the external faculty member should be determined the semester prior to graduation and the Research and Graduate Studies Chair notified. Any non-Ohio State graduate faculty must also be approved by the Ohio State University Graduate School and will be asked to provide a curriculum vitae as part of the approval process. It is expected that this member will be chosen based on their expertise in the area of the dissertation research topic. If travel is permitted by the University Travel Policy and an expert is flown in from another institution, airline, hotel, airport parking (as applicable), ground transportation (as applicable) and per diem will be provided by the Research and Graduate Studies office.

While visiting the college a non-Ohio State committee member will be asked to provide a talk in the VS 7950 seminar course when scheduling permits.

- Once the final oral examination is scheduled, the Dean of the Graduate School appoints the Graduate Faculty Representative. The Graduate Faculty Representative is a Category P Graduate Faculty member who is neither a Graduate Faculty member in the student's graduate program nor a member of the dissertation committee. The Graduate Faculty Representative is a full voting member of the final oral examination committee.

12.f.3. Dissertation Examination

The oral portion of the Dissertation Examination takes the form of verbal questioning by the Dissertation Committee and the graduate school representative. The final oral examination lasts approximately two hours. Students may not bring written materials to the oral examination. The oral examination begins with a public presentation of the dissertation research by the student, which should not last more than 45 minutes; the remaining time must be allotted to discussion of the research and questioning of the student by the Dissertation Committee. This portion of the Dissertation Examination is not open to the public. Questioning is focused on the dissertation material, although it also may be comprehensive of the major field. The examination is scheduled by the student and their advisor. The written dissertation is subsequently approved by the entire Dissertation Committee following successful completion of the oral portion of the Dissertation Examination. The dissertation exam must take place during announced university business hours, Monday through Friday. Preference is for all exams to be held on site with all committee members present. However, if

circumstances dictate, the university allows for exams to be conducted on-campus, remotely, or in a hybrid format. Remote and hybrid exams should follow the guidelines for video-conferencing as outlined in Appendix B of the *Graduate School Handbook*. All exam participants must be able to see and hear each other during the entire exam.

12.g. Academic Progress

Graduate students who fail to make adequate academic progress, as identified by the research advisor and/or Research and Graduate Studies Chair, will receive a warning from the Graduate School that further registration may be denied. This warning will include a request that the student contact their advisor and the Research and Graduate Studies Committee Chair for details regarding why they are not deemed to be making sufficient progress and to determine what is needed to comply (as determined by the advisor and the Research and Graduate Studies Committee). A student who has received a warning and then satisfies the specified conditions will be placed back in good standing. A student who has received a warning, but does not satisfy the specified conditions will be denied further registration in that graduate program by the Graduate School, unless a petition by the Research and Graduate Studies Committee is approved by the Graduate School.

A doctoral student who fails to schedule and take their Candidacy Examination within 8 semesters of matriculation into the program may be considered failing to make adequate academic progress.

Doctoral students who fail their Candidacy Examinations and are permitted to retake the examination may be considered failing to make adequate academic progress if they do not retake the Candidacy Examinations within two semesters of their initial Candidacy Examination failure.

Doctoral candidates who do not complete their dissertation within five years (i.e. 15 semesters) of matriculation into the doctoral program may be considered to be failing to make adequate academic progress.

12.h. Good Standing

To be considered in good standing, a student must maintain a graduate cumulative GPA of 3.0 or better in all graduate credit courses. A student whose cumulative GPA falls below 3.0 will be placed on remediation for one semester/term. The remediation plan is developed in close consultation with the advisor, Graduate Studies Committee and the Graduate School with the aim of increasing the student's cumulative GPA to 3.0 or better. If the student's cumulative GPA does not improve after remediation has been attempted, the student will be placed on academic probation for one semester. A student who is on probation may not be appointed or reappointed as a graduate associate, or a graduate fellow or trainee. A student who then raises their cumulative GPA to 3.0 or better is removed from probation. Course work used in raising the GPA must be a part of the normal degree requirements and approved by the Research and Graduate Studies Committee. A student who is on probation and who does not raise their cumulative GPA to 3.0 or better at the end of the probation period may be dismissed from the university at the discretion of the Graduate School following consultation with the Research and Graduate Studies Committee Chair. If there are extenuating circumstances, the Research and Graduate Studies Committee may petition the Graduate School for an exception to this policy.

A doctoral student who has had two unsatisfactory attempts at the Candidacy Examination or the final oral examination is not in good standing, will not be afforded another opportunity to complete the examination, and will be dismissed from the Graduate School and university, as per the *Graduate School Handbook*.

13. Departmental Research Facilities

In addition to providing access to clinical and basic facilities for research, the graduate faculty members in Vision Science maintain specialized laboratories that offer a varied research environment for graduate

students in the Graduate Program in Vision Science. All applicable university and college policies should be reviewed and adhered to prior to commencing use of these facilities.

14. Departmental Graduate Associate Policies

The rules and procedures relating to Graduate Associate (GA: both Graduate Teaching Associates [GTA] and Graduate Research Associate [GRA]) responsibilities, appointments, and benefits, as described in the *Graduate School Handbook*, apply to the Graduate Program in Vision Science. The Graduate Program in Vision Science maintains its own specific *Graduate Associate Leave Policy* which is available through the Research and Graduate Studies Chair and posted in the college policy repository.

Graduate Associate positions are normally awarded by the Chair of the Research and Graduate Studies Committee on an annual or academic year basis and may be terminated by providing a one-semester notice. GA appointments may be terminated on the basis of unsatisfactory evaluations or failure to make adequate academic progress (defined in section 12g).

Graduate Teaching Associates are normally evaluated annually on the basis of their teaching performance; however, evaluations may be conducted each semester if deemed warranted by the Research and Graduate Studies Committee. Evaluations are conducted by the Chair of the Research and Graduate Studies Committee and are based on information provided by the instructors of the courses in which the GTA has had involvement, research job performance, faculty reviews, and/or teaching evaluations.

Graduate Associates should only undertake employment outside the College after consultation with their advisor.

Appendix A: Graduate Curriculum in Vision Science

Core Courses in Vision Science

Core courses present a comprehensive background in vision science and are not intended as introductory. Graduates of other institutions should have the graduate program evaluate the suitability of similar courses at their institution as substitutions. Open to graduate students only.

VIS SCI 8001 Anatomy and Physiology of the Eye

- 2 credit hours
- ½ semester
- Autumn semester, every year
- 2 hours per day, 2 days per week
- Advanced gross anatomy and normal and pathologic physiology of the eye

VIS SCI 8002 Ocular Motility and Binocular Vision

- 2 credit hours
- ½ semester
- Autumn semester, every year
- 2 hours per day, 2 days per week
- Advanced topics on eye movements, ocular motility, and sensorimotor aspects of visual perception and binocular vision
- Prerequisites include VS 6300 (Spring of 2nd year OD curriculum) and VS 6320 (Summer of 3rd year OD curriculum), or permission of instructor

VIS SCI 8003 Visual Sensory Processes

- 2 credit hours
- ½ semester
- Spring semester, every year
- 2 hours per day, 2 days per week
- Neurophysiology of the retina, the ascending visual pathway, and the brain, and their functional significance
- Prerequisite is VS 6300 (Spring of 2nd year OD curriculum), or equivalent with permission of instructor

VIS SCI 8004 Optics of the Eye and Specification of the Visual Stimulus

- 2 credit hours
- ½ semester
- Spring semester, every year
- 2 hours per day, 2 days per week
- Contemporary issues in visual and clinical optics and imaging

Courses in Vision Science

VIS SCI 5500 Global Issues in Eye Care

- On-line course with both synchronous and asynchronous components
- 1 credit hour
- Spring semester, even years

- Provides an overview of the common causes of vision impairment and eye disease, including means to eliminate avoidable blindness

VIS SCI 5998 Credit for Non-Thesis or -Dissertation Research

- 1 to 5 credit hours
- Student receives course credit for conducting research not related to a thesis or dissertation
- Cannot be concurrently taken with VIS SCI 7999, 8998, or 8999

VIS SCI 7101 Basics of Graduate Work

- Required for all students admitted SU 2024 or later
- 1 credit hour
- Designed for first-semester graduate students
- Autumn semester, every year
- Students will learn the basics of graduate work, from data management to writing abstracts

VIS SCI 7940 Oral Presentation of Scientific Research

- 1 credit hour
- PhD students present in VS 7950 based on their research or scholarship to improve presentation skills

VIS SCI 7950 Seminar in Vision Science

- 1 credit hour
- Series of seminars dealing with new developments in various areas of vision science
- Required every semester except 4th year Combined OD/MS students

VIS SCI 7960 Ethics in Biomedical Research

- 2 credit hours
- Autumn semester, every year
- Provides a general understanding of the issues surrounding the ethical conduct of science including issues related to research involving human subjects, scientific misconduct, and authorship of scientific papers. Real-life case studies will be used.

VIS SCI 7970 Grantsmanship

- 2 credit hours
- Spring semester, every year
- The structure of the National Institutes of Health, the principles of good grantsmanship, and description of the grant review process. Emphasis focused on Mentored Clinical Scientist Development Award (K08/K23) and Research Project Grant (R01).

VIS SCI 7980 Statistics for Clinical Research

- 2 credit hours
- Spring semester, every year
- Introduction to the basic concepts and methods of statistical analysis of clinical research data. Statistical software packages will be demonstrated along with interpretation of output.

VIS SCI 7990 Assessing the Literature

- 1 credit hour; repeatable up to 8 completions
- Autumn and summer semesters only
- Provides a framework to develop skills to critically evaluate the literature, improve data presentation skills, summarize information efficiently, and improve statistical knowledge by critically reviewing published literature

VIS SCI 7999 Credit for Master's Thesis Research

- 1 to 5 credit hours
- Student receives course credit for conducting research related to a Master's thesis

VIS SCI 8101 Designing Clinical Studies

- 1 credit hour
- Summer semester, even years
- Teaches various aspects of designing clinical studies, from specific aims to data management

VIS SCI 8103 Circadian Rhythms and the Eye

- 2 credit hours
- Autumn semester, even years
- Advanced topics in chronobiology with emphasis on the role of the eye in synchronizing circadian rhythms to the external environment

VIS SCI 8104 High Resolution Imaging of the Eye

- 2 credit hours
- Autumn semester, even years
- Design, construction, interpretation, and use of adaptive optics in normal and diseased eyes

VIS SCI 8105 Advanced Ocular Motility

- 1 credit hour
- Autumn semester, odd years
- Methods to monitor eye movements including eyetracker selection, calibration, and data interpretation
- Prerequisite is VS 8002 (offered each Autumn)

VIS SCI 8106 Refractive Error Development

- 2 credit hours
- Spring semester, odd years
- Students learn about ocular changes that lead to the development of refractive error in children

VIS SCI 8107 Basic Science Experimental Design

- 2 credit hours
- Summer semester, odd years
- Teaches various aspects of designing basic science experiments, from choosing controls to data analysis

VIS SCI 8108 Quantitative and Computational Methods for Vision Science

- 2 credit hours
- Summer semester, odd years
- An introduction to Matlab and its applications in research

VIS SCI 8111 Advanced Topics in Low Vision

- 1 credit hour
- Autumn semester, odd years
- Advanced topics in models for rehabilitation, patient-reported outcomes measurement, and psychophysical testing of people with permanent vision impairment

VIS SCI 8112 Advanced Binocular Vision and Visual Plasticity

- 1 credit hour
- ½ semester
- Spring semester, even years
- Structural, molecular and functional considerations of mechanisms underlying visual plasticity
- Prerequisite is VS 8002 (offered each Autumn), or permission of instructor

VIS SCI 8113 Clinical Trials in Binocular Vision and Pediatrics

- 0.5 credit hour
- Spring semester, even years
- Review of recent clinical trials in binocular vision and pediatrics

VIS SCI 8114 Advanced Contact Lens Topics

- 2 credit hours
- Autumn semester, odd years
- Advanced topics related to contact lens materials and care, lens modalities, advanced fitting techniques, adverse events and regulations

VIS SCI 8115 Effective Scientific Presentation Skills

- 2 credit hours
- Summer semester, even years
- Develop skills to communicate scientific findings using a variety of presentation formats

VIS SCI 8116 Scientific Writing

- 2 credit hours
- Summer semester, odd years
- Developing effective scientific writing skills
- Prerequisite is enrollment in the Vision Science PhD program, or permission of the instructor.

VIS SCI 8998 Credit for Pre-Candidacy Dissertation Research

- 1 to 5 credit hours
- Student receives course credit for conducting research related to a dissertation

VIS SCI 8999 Credit for Post-Candidacy Dissertation Research

- 1 to 5 credit hours
- Student receives course credit for conducting research related to a dissertation