

HMC Advising Handbook

(Updated August 2011)

Welcome!

Advising is a central responsibility of all faculty members at Harvey Mudd College. Each of us guides students through our major or departmental requirements, serves as academic advisors to students in their first two years, and are called upon to answer questions about the broad set of general college academic regulations. This handbook offers a quick reference for questions commonly asked by students and provides basic information about the core program, graduation requirements, and advising expectations. The handbook can provide a convenient complement to collegial sources of information about advising including the Department Chairs, the Academic Affairs Committee, the Dean of Faculty, the Core Curriculum Director, and the Associate Dean for Academic Affairs. The handbook is revised annually – please let your departmental Academic Affairs Committee member know of any desirable additions or corrections.

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Advising FAQ's

I. Advising Program and Responsibilities

What is the structure of the formal advising program at HMC?

Each entering student is assigned a First-Year Faculty Advisor (FYA) who assists him or her in selecting courses and adjusting to life at HMC during their first two years. The FYA will advise the student on registration matters associated with their second and third semesters, and possibly their fourth semester if the student has not yet declared a major. In the second semester of their first year each student is assigned a Humanities, Social Sciences, and the Arts (HSA) advisor who, aside from time on sabbatical or leave, will serve the student through graduation. Once a student declares a major their first-year advisor steps aside and the Registrar, in consultation with the department chairs, assigns a technical or major advisor. That advisor will usually stay with the student through graduation, aside from time on sabbatical or leave.

Who serves as a First-Year Faculty Advisor?

All tenured and tenure-track faculty in their second year or beyond are expected to serve as FYAs. Faculty scheduled to have a sabbatical leave that interferes with the two year advising window will generally not be asked to serve for that time frame.

What are the primary responsibilities of a first-year advisor?

The primary responsibility is to provide one-on-one advising for your advisees on academic matters. It is expected that most advisors will spend at most three hours with an advisee during the course of a year. Some specific activities include:

1. Initiate contact with the advisee over email before their arrival on campus. By the time students learn of their advisor, they will have already submitted their elective preferences, so the purpose of this email is to serve as an introduction as well as to open a line of communication for general advisee questions.
2. Meet one-on-one with each advisee during the fall semester (before pre-registration). This meeting is an important aspect of the advising process and will allow the FYA to provide individualized advice appropriate for each advisee. The advisor can discuss the student's progress to date as well as help the student continue to refine their goals.

3. FYAs are expected to continue to meet with their advisees as needed, including during the week before pre-registration (when the advisor's signature will be required) for the student's second and third semester enrollments, and possibly the fourth if the student has not yet declared a major.

How are advisor-advisee assignments made?

The Office of Academic Affairs makes all First-Year Faculty Advisor pairings. HSA advisors are established by HSA 10 (Critical Inquiry), which all first-year students take in their spring semester. HSA instructors take on all of their current students as advisees and keep them, barring sabbaticals, through graduation. The Registrar, working in consultation with the department chairs, assigns major advisors.

What are the responsibilities of major and HSA advisors?

Guidelines for major and HSA advisors can be obtained from department chairs.

Can a student switch advisors?

A student may make a switch in advisors – first-year, HSA, or major – at any time provided that they have the permission of the advisor they wish to adopt. Forms are available from the Registrar's Office. A change of first-year advisor should be made in consultation with the Associate Dean for Academic Affairs.

What are Academic Advisories? When and how should they be used?

Academic Advisories are email-based notifications that should be sent to warn a student of the failure to meet any expectations of a class – including attendance, homework submission or participation – as well as in cases where a student's major assignments suggest the likelihood of a poor final grade. Copies of academic advisories go by email to a student's advisors, the Dean of Students, the Registrar and the Associate Dean for Academic Affairs. The appearance of Academic Advisories offers good occasion for conversations between students and advisors and can often forestall widespread academic difficulties. The Associate Dean for Academic Affairs sends out email each semester with directions on how to use the system.

II. Common Misconceptions about Advising

This section on common misconceptions about academic advising is adapted from Williams College's website on advising.

Some Misconceptions of Students

My advisor is going to set goals.

Most of our students come from high schools where guidance counselors worked closely with them as college-bound students. Their immediate goal was thus clear and has been achieved. What comes after college is not as clear, and ultimately it is up to the student to set their goals both for college and beyond.

My advisor is going to meet all my advising needs.

Making academic decisions in college is a complex process. No single advisor will meet all a student's needs. Students should be encouraged to seek advice from many sources in addition to their advisor, especially professors, deans, department chairs, and their dorm mentors. Good advising relationships depend on many factors, including personalities and the student's evolving goals and interests. Urge your advisees to be aware of these factors; feel free to guide them elsewhere if they have questions you can't answer, or seem unreceptive to your ideas.

My advisor will always be available.

A student who sends an email at 2:00 am or drops by their advisor's office at 4:30 pm on Friday the last day of the add/drop period, should not expect an immediate response. Students should allow sufficient time for any matter that requires their advisor's attention.

Some Misconceptions of Advisors

I need to know everything about the curriculum to be an effective advisor.

By this standard no one could be an advisor, for we all know only certain aspects of the curriculum. Few of us know the college well enough to have a full grasp of the curriculum. The important thing is to know what we don't know and to consult our colleagues and the Office of

Academic Affairs to find out what we need to know. A number of useful resources exist for HMC advisors. A good first place to look for information on academic regulations is the college catalogue, which is carefully reviewed and updated each year in order to provide up to date and accurate information. The Registrar, Core Curriculum Director, and Associate Dean for Academic Affairs are also good sources for information about general academic matters. Department chairs offer information about departmental programs and majors as well as disciplinary offerings in the core. The Dean of Students and Associate Dean for Academic Affairs can be helpful if student questions extend beyond the academic program to residential, social, or health considerations.

I will need to be a personal counselor to my advisees.

This is often an unspoken expectation of both students and advisors. It may happen in a few cases, but usually does not and should not be expected. After all, most advisors spend at most about three hours with an advisee during the course of the year. In addition we usually do not have the opportunity to see our advisees' minds in operation either in class or in writing. This sometimes means that there is a bit of impersonality to the relation between advisors and advisees, but there is absolutely nothing wrong with this. If you sense your advisee is in need of or is looking for more personal counseling than you are comfortable giving, suggest that they consider talking with the Associate Dean for Academic Affairs.

I will be responsible for enforcing all college rules and regulations.

Neither in the area of discipline nor in that of academic regulations does the advisor play a role. Students may ask for your support in various exceptions to the rules and regulations, usually through a petition to the Scholarly Standing Committee (SSC), but such requests are ruled on by the SSC. Disciplinary matters are ruled on by the student-led Disciplinary and Judicial Boards, which are responsible for ruling on disciplinary (e.g., alcohol policy violations) and judicial (e.g., cheating) matters.

III. General Advising

How can I find out who all of my advisees are?

You can find all your advisees on the Advising section of the portal. Under the “Faculty” tab, click Advisee Roster and select “Active Advisees” under the Advisee Status tab. This will list all your active advisees. First year students will be listed as “1st time, 1st semester”.

As an advisor, how do I obtain access to my advisees’ transcripts?

You can obtain access to your advisees’ transcripts using the portal.

If a student appears to be having difficulty coping while at HMC, what should I do?

If you feel comfortable doing so, the first thing to do is to ask the student how they are doing. Alternatively, if you do not feel comfortable approaching the student directly you should contact the Dean of Students or the Associate Dean for Academic Affairs.

How should I react if a student fails to attend my class, but continues to appear on the roster?

While students may choose not to attend class, this can be a signal of a problem. Frequently the problem is that a student thought they dropped a class but have not. An email to the student will generally clear this up. If, however, you do not receive a response in a reasonable time, this may be a signal of more significant problems, and you should contact the Dean of Students or the Associate Dean for Academic Affairs.

What considerations should govern a first year student’s choice of an elective in the spring semester?

The typical HMC student will have 14.5 units of work in the Core scheduled for the spring term, leaving the option of one three-unit elective course (without overloading). Since all departments are required to provide majors that can be completed in two years, there are no absolutely right or wrong choices regarding this elective. Nevertheless, certain considerations may make particular choices more advisable. A student who is actively conflicted about a choice of major (rather than simply still exploring) might use the elective to probe further. For example, a student who imagines him or herself undecided about majoring in math or engineering might take Math 55 or Eng 4/8 (students enrolling in E4 will usually postpone Chem 23D to their sophomore Fall to avoid an overload). A student who is feeling very pressured in the core

curriculum might take a course in an area of strength (an extra math course, or a history course). A student who seems completely undecided might be advised to take a course that will further their work in the core or the Humanities, Social Sciences and Arts curriculum.

How and when may students exercise the option to take a course Pass/Fail? What issues should an advisor raise with a student considering that option?

After the first semester of the first year, a student may elect to take one course each semester on a Pass/Fail basis. No more than one course may be taken from each department each academic year on a pass/fail basis and departments may have additional regulations which exclude certain courses from the Pass/Fail option. No core courses after the first semester may be taken Pass/Fail without departmental approval.

A student who wants a Pass/Fail option for a course must declare that intent on a form available from the Registrar's Office, obtain the signatures of his or her advisors and the relevant instructor, and submit the form to the Registrar no later than the last date to withdraw from the class. Students should be reminded that a grade of "P" requires a minimum letter grade of "C-" in a course – a higher standard for 'passing' than in a letter grade scheme, where a grade of "D" is "barely passing". Students should also be advised that while "P" grades do not register in the GPA, "F" grades always do.

III. Academic Regulations

What is considered an overload? What is the process for obtaining overload permission?

Are there different kinds of overloads?

At HMC, any units taken above 18 will constitute an overload. College policy, embodied in the catalog and re-endorsed by the faculty in 2002, requires that any student who wishes to overload 1) possess strong academic credentials and 2) have a compelling reason to undertake an extraordinary load. In order to keep these two criteria distinct, a student's ability to "handle" large numbers of units is specifically excluded as a compelling rationale.

In practice, every sophomore, junior or senior wishing to overload must write and submit a petition form (available from the Registrar or in the Office of Academic Affairs) to all of his or her academic advisors and to the Associate Dean for Academic Affairs. A short petition is required for a "small" overload of fewer than 20 units. More extensive commentary is required to secure a "large" overload of 20 – 21 units. Loads of more than 21 units are not typically granted unless a student requires those units to graduate on time – and even then conditions may be

attached to overload permission. First year students who wish to overload must obtain the permission of the Associate Dean for Academic Affairs regarding the process.

The decision of the Associate Dean is final in the case of overloads. It is worth reminding students that full-time student status at HMC requires only 12 units per semester; and that a degree can be obtained with an average of 16 units per semester (+1 in one semester for Engineers).

Under what circumstances are grades of Incomplete awarded at HMC? Who grants permission for Incompletes?

The College catalog indicates that grades of Incomplete can only be granted at HMC when serious personal or family situations preclude a student's ability to finish work prior to the end of term. An abundance of work, in and of itself, does not merit the granting of an Incomplete.

At HMC Incompletes can only be granted by the Associate Dean for Academic Affairs or, in cases where Disciplinary or Judicial Board matters are involved, by the Dean of Students. Students secure Incomplete forms from the Associate Dean for Academic Affairs if permission for an extension of work is granted. Faculty are typically responsible for negotiating a completion date and any other terms.

Under what circumstances may a student be excused from coursework or obligations during the course of the semester? By whom is such permission granted and how is it communicated to instructors?

Faculty may, of course, excuse students from work at their discretion. But faculty are not obliged to offer extensions or special accommodations unless a student has secured an excuse from the Dean of Students or the Associate Dean for Academic Affairs. Students with medical or personal or family emergencies should contact an appropriate administrator as soon as possible. Medical excuses typically require supporting documentation from a healthcare provider.

Once the Dean of Students or Associate Dean for Academic Affairs has established that academic accommodations are appropriate, all of a student's current faculty and advisors will be notified by email.

What does it mean when a student is on Academic Warning? Academic Probation? Under what circumstances is it likely that a student will become Ineligible to Re-Register (ITR)?

The Scholarly Standing Committee renders decisions about academic status in their review of all student grades at the end of each term. Students placed “On Warning” remain in good standing, but are notified that improved performance will be necessary in order to remain at the college. Typically, students with Warning status have registered cumulative or semester GPAs in the 1.8 to 2.0 range. Academic Probation is a formal change of status, indicating a need for substantial improvement. Typically, students on Academic Probation have registered semester GPAs below 1.8.

If a student on Probation or Warning fails to improve, they may be declared “Ineligible to Re-Register” and be required to either leave the college or to move for one final semester into the Program for Transfer Studies. ITR status may also be established if a student fails to complete 8 or more units with passing grades during any term or if a student’s cumulative or (for juniors and seniors) major GPA falls below 2.0.

Advisors are formally notified regarding changes in status of all advisees. Specific questions about a student’s standing may be directed to the Chair of the Scholarly Standing Committee or to the Associate Dean for Academic Affairs.

How does a student secure permission for the transfer of credits from summer work?

The appropriate department must approve all transfer credit, including work a student wishes to bring in as purely elective units. In the case of the technical departments, permission must be secured from chairs. In Humanities, Social Sciences, and the Arts summer transfer credits must be approved by the chair. It is worth noting that nearly every department has restrictions governing the amount of summer transfer credit that can substitute for required units in the degree. Transfer credit may substitute for units in the core only in rare circumstances – e.g., after multiple failures of a core course.

If a student tells me that he or she has a learning disability that needs to be accommodated, how should I respond?

Students with previously documented learning disabilities should place relevant paperwork (previous tests, professional directives regarding accommodations, high school accommodation practices) on file with the Dean of Students Office and that office can provide direction concerning appropriate accommodations. Occasionally our students have a learning issue that is ‘informally’ diagnosed by a family doctor, or diagnosed and documented during

childhood, but never accommodated. In such a case, a student should be advised to consider retesting – the Dean of Students typically will not act on the basis of testing carried out prior to a student’s high school career unless the student can demonstrate high school accommodation. Ordinarily, faculty should look to the Dean of Students for guidance concerning any provision of accommodations.

For students who suspect a learning disability, but who have never been evaluated, you might suggest a conversation with the Dean of Students or with the current learning issues specialist at Monsour.

What is the “Five Semester Rule” and under what circumstances (and by whom) might it be waived?

The Five Semester Rule states that a student must have completed his/her core requirements by the end of the 5th semester (Fall semester of the junior year). The Scholarly Standing Committee can grant a waiver of the Five Semester Rule, but generally only does so when fulfilling the Five Semester Rule causes a serious course conflict with required courses in the major.

When are Add and Drop days and what are their implications?

It may be simplest to consult the college’s academic calendar on this one, but....

For semester-long courses the last day to add a course is the 10th day of the semester, while a course may be dropped anytime before the final three weeks of the semester. If a course is dropped before this deadline it will not appear on the transcript. Late drops can be requested through the Scholarly Standing Committee, but if granted they will appear as a W (Withdraw) on the student’s transcript.

Half courses can be added up to and including the 10th day of the given half semester. In the first half of the semester a course may be dropped anytime before the final two weeks of the half-semester, whereas in the second half of the semester the course must be dropped anytime before the final three weeks of the semester.

Under what circumstances may a first year student drop a core course? What signatures are required?

When it becomes abundantly clear that a student will be unable to complete a course with a passing grade, the student may be permitted to drop a core course. The only required signature

is that of the Associate Dean for Academic Affairs, but this is granted only after consultation with the student's advisor and the faculty member for the class in question.

What are the GPA implications of a grade in a course that is repeated following an initial failure?

With respect to cumulative GPA, an original F contributes to a student's GPA even after the course is retaken and passed. However, for the Major GPA the F no longer contributes once the course is retaken and passed.

What is the Program of Transfer Studies (PTS) and how does a student obtain access to it?

By electing the Program of Transfer Studies a student is allowed to select a set of courses that is significantly different from that which would be typical for any of the existing majors at HMC. However, by election of the PTS a student agrees that the semester in which the PTS is undertaken is their last at HMC, and they may not re-enroll at the college in the future. PTS is normally elected in response to an Ineligible to Re-Register (ITR) decision (by appeal to the Scholarly Standing Committee) or when a student determines that HMC will not meet their long-term academic goals.

When should a student consider taking five years to complete the HMC degree? With whom should a student discuss that option? To whom should a final decision be communicated? What are the implications for a student's financial aid?

Some small number of our students clearly benefit from the opportunity to progress through the curriculum at a 12 or 13 units per semester pace – and often that benefit becomes apparent within the first two or three semesters of work, while a student is immersed in the Core. Discussion of the benefits and costs of a five-year program will ideally occur early in a student's academic career and should involve a student's academic advisor(s), the Associate Dean for Academic Affairs, the student's parents and the Financial Aid Office.

The decision to take an additional year for the completion of the degree clearly brings additional financial costs to all students. Financial aid students will find that certain elements of their financial aid packages can only extend over eight semesters, though some federal aid and loan options can be exercised through the fifth year. A student may also feel some social or collegial costs as he or she moves through the curriculum at a different pace than any existing class. Campus housing is not guaranteed for any student during the fifth year.

Once a student makes the decision to pursue a five-year program, the Registrar's Office, Dean of Students, and Associate Dean for Academic Affairs should be notified and all student advisors should be notified.

How would an HMC student pursue an Off Campus Major? What are the implications for a student's technical work should he or she choose that option?

Any HMC student may elect to undertake a major through a department at another of the Claremont Colleges, provided that the discipline is not represented as a major at HMC (for example, an HMC student could major in History at Pomona, but not in Physics). Applications for participation in the Off Campus Major (OCM) should be made in consultation with the Associate Dean for Academic Affairs and with the guidance of the chair of the intended major department. The OCM must consist of no fewer than 10 course equivalents, regardless of the typical requirements of the major granting department, and must include a senior thesis or approved capstone experience. All participants in the OCM program must also complete the HMC technical core, the HSA requirements and a minor with one of the HMC major departments. Specific details regarding technical minors can be obtained from HMC department chairs or the Registrar.

Is it possible for HMC students to pursue a minor in any discipline?

With the exception of technical minors granted in conjunction with the Off Campus Majors program, no minors are recognized at HMC. This exclusion includes coursework that would lead to recognized minors at one of our consortium partners.

What is the Independent Program of Study option and how might a student choose to pursue it?

The Independent Program of Studies (IPS) is an option students can elect that allows the design of a major (frequently at the intersection of two or more disciplines) that is not already offered at the college. Generally students elect an IPS when it becomes clear that their academic interests cannot be addressed in meaningful ways by any of the existing majors offered on campus. The major is designed in connection with the Associate Dean for Academic Affairs and possibly one or more advisors in the academic departments.

While the IPS can be an exciting and novel educational experience it has the disadvantage of having no formal "home" within a department, which can contribute to a sense of diminished connection to life at the college. This is not to suggest that an IPS should not be

pursued, but it is to indicate that there are drawbacks that accompany the flexibility of this course of study.

IV. Miscellaneous

What is the Leonard Fund?

HMC possesses a modest fund earmarked to allow interaction between small groups of faculty members and students over breakfast, lunch or dinner. The Leonard fund can be accessed by students or faculty as long as the ‘event’ involves no more than a total of eight students and faculty. Reimbursement rates are presently as following: \$13.50/person for dinner; \$10.50/person for lunch; \$7.50/person for breakfast or brunch. Requests for reimbursement should be forwarded to the Administrative Assistant for the Office of Academic Affairs and must include original receipts as well as a list of all attendees. Because the Leonard Fund is often fully expended before the end of the academic year, you may wish to confirm its availability prior to any spring term events.

What is Summer Math?

Over the last several years, the Mathematics Department has made its sophomore math sequence available through an intensive three-week summer program for rising sophomores. Details about the program, its timing and its cost are distributed to the first year class early in the second semester. The program may have strong benefits for students who have fallen behind in their core work during the first year or who have particular needs to create flexibility in their sophomore schedules. Contact the Math Department chair for more information.

Career Services

Can someone from Career Services come to my classroom to give a career-related presentation?

Yes. Classroom presentations can be tailored to meet your needs. Past presentations have included Resume Writing for Chemistry Majors, Job Search Tips for Physics Majors, Career Options for Math Majors and Job Search Tips for Computer Science Majors.

How do I arrange a career-related classroom presentation?

You may arrange a classroom presentation by contacting Judy Fisher, Director, Office of Career Services, at ext.18091 or via email at Judy_Fisher@hmc.edu

Can I post employment opportunities for students with Career Services and, if so, how are the positions advertised to students?

Yes! We advertise your positions two ways – 1) Through our web-based system called MUDDlink, we have created a one-stop shop which makes it easy for students looking for on-campus employment opportunities at all The Claremont Colleges. It requires that you or your administrative assistant set up an account on MUDDlink, our web-based career management system. We will be happy to assist you in setting up an account. Simply email Vannessa_Janovick@hmc.edu; 2) we often post these openings in our weekly newsletter MUDDMines during the beginning of each semester.

Please Note: Work-study job listings still need to be directed to the HMC Financial Aid Office.

Why are faculty members encouraged to attend the HMC Career Fair?

The Career Fair provides a great opportunity for faculty to talk to recruiters about their organizations and to see alumni who return to campus to represent their employers. It provides an opportunity to talk with employers about the technology they are using in their specific industry. Additionally, company representatives frequently have questions about the HMC curriculum. They are always appreciative to have the chance to meet faculty.

If you would like to know more about the services we provide, please stop by the Office of Career Services, Platt Campus Center, or email Judy Fisher at Judy_Fisher@hmc.edu. Our website is located at www.career.hmc.edu.

Graduation Requirements and Core Curriculum

Graduation Requirements

In order to be recommended by the faculty for the Bachelor of Science degree, students are required to complete satisfactorily a minimum of 128 credit hours of courses (including approved transfer credits for courses taken at other colleges). These credit hours are divided among four broad categories. (Credit hours in parentheses.)

The Core Program (37.5)

Single and Multivariable Calculus, Linear Algebra, Probability & Statistics, And Differential Equations.....	(9)
Introduction to Computer Science.....	(3)
General Chemistry (Structure, Energetics, Dynamics); Chemistry Laboratory	(5.5)
Special Relativity, Mechanics and Wave Motion; Electromagnetic Theory & Optics; Physics Laboratory	(8.5)
Introduction to Biology"	(3)
Introduction to Engineering Systems.....	(3)
Choice Laboratory.....	(1)
Introduction to Academic Writing.....	(1.5)
Critical Inquiry (HSA 10)	(3)
Total	37.5 hours

Physical Education (3)

Three courses	(3)
Total	3 hours

Humanities, Social Sciences, and the Arts (30)

Ten additional full semester courses satisfying distributive and concentration requirements.....	(30)
Total	30 hours

Major Requirements and Electives (57.5)

A student must complete the requirements for one of the eight departmental majors, for an approved Individual Program of Study, or for an Off Campus Major with approval from that faculty committee (see Off Campus Major). The majors are: biology, chemistry, chemistry and biology, computer science, engineering, mathematics, physics, computer science and mathematics, and mathematical biology.

The Common Core

The Common Core presents a coordinated, common foundation essential to the education of all students. It includes three semesters of mathematics, two and one-half semesters of physics and an associated laboratory, one and one-half semesters of chemistry and an associated laboratory, an interdisciplinary or disciplinary "choice lab" selected from a changing set of offerings, a half-semester of college writing, a course in critical inquiry offered by the Department of Humanities, Social Sciences, and the Arts, and one course each in biology, computer science and engineering.

Core courses address three objectives: (1) acquisition of disciplinary knowledge and experience with disciplinary-related techniques, (2) skill development in the areas of oral and written communication, critical thinking, teamwork and collaboration, project management and/or leadership, and (3) explorations of either the interrelationship of technical work and society or the understanding of one's own culture or other contemporary cultures.

All core courses must be attempted by the end of the fifth semester.

The 2010-2011 academic year marked the debut of a substantial revision of the Core. All students who enter the college in the fall of 2011 will be governed by the set of requirements that appear below, rather than those appearing in previous catalogues. It is the case that students have the option of graduating under any catalogue (that is, fulfilling the set of requirements represented by any catalogue) that is in effect during their continuous enrollment at the college. Students who entered the college in the fall of 2009, for example, will be able to graduate under the 2009-2010 catalogue.

Core courses, except the Choice Labs, are listed below with a brief description. Choice Lab topics will change from year to year and will be communicated to rising sophomores and their advisors during preregistration.

BIOLOGY 52. Introduction to Biology (3) Topics in cell biology, molecular biology, genetics, and evolution. Prerequisites: one semester of general chemistry and one semester of calculus.

CHEMISTRY 23S Structure (1.5) Molecular and electronic structure, intermolecular forces, condensed phases, organic structure and properties, and biopolymers.

CHEMISTRY 23E Energetics (1.5) Phase behavior, equations of state, intermolecular forces, thermodynamics, and electrochemistry.

CHEMISTRY 23D Dynamics (1.5) Kinetics, equilibria, acid/base chemistry, and electrochemistry.

CHEMISTRY 24 Chemistry Laboratory (1) Applications of thermodynamics, equilibria, electrochemistry, structure/property relationships, synthesis, spectroscopy, and chemistry in the service of society.

COMPUTER SCIENCE 5. Introduction to Computer Science (3) Introduction to elements of computer science. Students learn general computational problem-solving techniques and gain experience with the design, implementation, testing and documentation of programs in a high-level language. In addition, students learn to design digital devices, understand how computers work, and learn to program a computer in its own machine language. Finally, students are exposed to ideas in computability theory. The course includes discussions of societal and ethical issues related to computer science.

ENGINEERING 59. Introduction to Engineering Systems (3) An introduction to the concepts of modern engineering emphasizing modeling, analysis, synthesis and design. Applications to chemical, mechanical and electrical systems. Prerequisites: sophomore standing and concurrent registration in Physics 51.

HUMANITIES, SOCIAL SCIENCES, AND THE ARTS (HSA) 10. Critical Inquiry (3) This course introduces students to inquiry, writing, and research in HSA, through focused exploration of a particular topic selected by the instructor in each section. To encourage reflection on the place of HSA within the HMC curriculum, the course begins with a brief unit on the history and aims of liberal arts education.

MATHEMATICS 30B/30G. Calculus (1.5) A comprehensive view of the theory and techniques of differential and integral calculus of a single variable; infinite series, including

Taylor series and convergence tests. Focus on mathematical reasoning, rigor and proof, including continuity, limits, induction. Introduction to multivariable calculus, including partial derivatives, double and triple integrals. Placement into Math 30B is by exam and assumes a more thorough background than Math 30G; it allows for a deeper study of selected topics in calculus.

MATHEMATICS 35. Probability and Statistics (1.5) Sample spaces, events, axioms for probabilities; conditional probabilities and Bayes' theorem; random variables and their distributions, discrete and continuous; expected values, means and variances; covariance and correlation; law of large numbers and central limit theorem; point and interval estimation; hypothesis testing; simple linear regression; applications to analyzing real data sets.

MATHEMATICS 40. Introduction to Linear Algebra (1.5) Theory and applications of linearity, including: vectors, matrices, systems of linear equations, dot and cross products, determinants, linear transformations in Euclidean space, linear independence, bases, eigenvalues, eigenvectors, and diagonalization.

MATHEMATICS 45. Introduction to Differential Equations (1.5) Modeling physical systems, first-order ordinary differential equations, existence, uniqueness, and long-term behavior of solutions; bifurcations; approximate solutions; second-order ordinary differential equations and their properties, applications; first-order systems of ordinary differential equations.

MATHEMATICS 60. Multivariable Calculus (1.5) Linear approximations, the gradient, directional derivatives and the Jacobian; optimization and the second derivative test; higher-order derivatives and Taylor approximations; line integrals; vector fields, curl, and divergence; Green's theorem, divergence theorem and Stokes' theorem, outline of proof and applications.

MATHEMATICS 65. Differential Equations/Linear Algebra II (1.5) General vector spaces and linear transformations; change of basis and similarity. Applications to linear systems of ordinary differential equations, matrix exponential; nonlinear systems of differential equations; equilibrium points and their stability.

PHYSICS 22. Physics Laboratory (1) This course emphasizes the evidence-based approach to understanding the physical world; students design, conduct, and interpret experiments to give quantitative answers to physical questions. Topics are drawn from a broad range of physics subjects, with applications to other technical fields.

PHYSICS 23. Special Relativity (1.5) An introduction to special relativity covering kinematics, energy, momentum, conservation laws, and applications to cosmology.

PHYSICS 24. Mechanics and Wave Motion (3) Kinematics, dynamics, linear and angular momentum, work and energy, harmonic motion, waves and sound.

PHYSICS 51. Electromagnetic Theory and Optics (3) An introduction to electricity and magnetism leading to Maxwell's electromagnetic equations in differential and integral form. Selected topics in physical optics. Prerequisites: Physics 23-24; corequisite, Mathematics 60.

CHOICE LABORATORY Lab (1) Laboratory course emphasizing experiential learning (starting 2011-12).

WRITING 1. Introduction to Academic Writing (1.5) A seminar devoted to effective writing strategies and conventions that apply across academic disciplines. The course emphasizes clarity, concision, and coherence in sentences, paragraphs, and arguments.

Completing the Common Core. For many students the academic program in the first two years consists of the Common Core, two additional courses in the humanities, social sciences, or arts, two courses in the major and two to three electives. Usually it is possible for students to delay their choice of a major until midway through the sophomore year or even to the beginning of the junior year. Students should consult their first-year academic advisors early in their program in order to ensure that their options will remain open. After the first year, students must register for all deficient first-year courses each time they are offered. All such courses must be passed before the beginning of the junior year. Sample programs for the first two years appear below.

Sample First-Year Program

	Fall	Spring
Biology 52		
Introduction to Biology		3
Chem. 23S, 23E, 23D, 24		
Structure	1.5	
Energetics	1.5	
Dynamics		1.5
Chemistry Lab	1	
Computer Science 5		
Introduction to CS	3	
HSA 10		
Critical Inquiry		3
Mathematics 30B/G, 35, 40, 45		
Calculus	1.5	
Probability and Statistics	1.5	
Introduction to Linear Algebra		1.5
Introduction to Differential Equations		1.5
Physics 22, 23, 24		
Physics Lab		1
Special Relativity	1.5	
Mechanics and Wave Motion		3
Writing 1		
Introduction to Academic Writing	1.5	
Elective	3	3
Physical Education	1	
Total Credit Hours	17	17.5

Sample Sophomore Fall Program

Engineering 59	
Introduction to Engineering Systems	3
Mathematics 60, 65	
Multivariable Calculus	1.5
Differential Equations and Linear Algebra II	1.5
Physics 51	
Electromagnetic Theory and Optics	3
Choice Lab	1
Elective	3
HSA course	3
Physical Education	1
Total Credit Hours	17

A Guide to Advising Students about the Biology Core and Preparing for one of the Biology Majors

The Biology Core

What are the Biology requirements in the Core?

There is one Biology course in the Core: Biology 52, Introduction to Biology. It is a one-semester lecture course (without a laboratory), offered in the spring semester. Bio 52 is team-taught, and emphasizes the fundamental principles of molecular biology, genetics, and evolution. It is offered in two time slots to give students some scheduling flexibility.

Students who completed the integrated year-long computer science & biology (CS 6 and Biology 7) course during 2009-10 have fulfilled both the Biology 52 and CS 5 core requirements. Students who completed CS 5 Green during Fall 2010 have the option of taking either a 3-unit CS course or a 3-unit Biology course to complete both their CS and Biology core requirements (for questions, they may ask either Prof. Bush or Prof. Libeskind-Hadas). Students who enroll in CS 5 Green during Fall 2011 will need to take Bio 52 during Spring 2012, unless they place out of Bio 52 (see below).

Is it possible to place out of Biology 52? Is it advisable to place out if a student has a strong background?

Yes, it is possible to place out of Bio 52. However, because Bio 52 is the foundation course for Biology majors, students planning to major in Biology, Mathematical and Computational Biology, or Chemistry-Biology are not advised to skip the course.

A student with an exceptionally strong background in molecular biology, genetics and evolution may take a placement exam on the topics that are covered in Bio 52. For example, a student who earned a 5 on the AP Biology exam or who completed the International Baccalaureate biology program would have an appropriate background for taking the placement exam. Students who are interested in taking the exam should contact Prof. Steve Adolph in the Biology Department. The exam takes 3 hours and is administered during the first week of fall semester for newly arrived first-year students. It is evaluated by several Biology faculty members, with 3 possible outcomes:

- (1) A student does so well on all parts of the exam that they are awarded credit for Bio 52, and do not need to take a biology course at HMC to complete the core requirement. (This is rare!)
- (2) A student does very well on the exam, but does not ace all the questions. A student with this outcome on the placement exam will be given the option of completing the HMC Biology core requirement with a higher-level 3-unit Biology course at Harvey Mudd, but could also simply take Bio 52.
- (3) A student does not do well enough on the exam to earn placement out of Bio 52. This doesn't hinder progress towards a degree in Biology, Mathematical and Computational Biology, or Chemistry & Biology. In fact, we encourage all biology majors to take Bio 52

because future success in many of the upper-level courses depends on a strong foundation in the material covered in Bio 52.

What Biology courses do students take if they perform well enough on the placement exam?

Any 3-unit Harvey Mudd Biology course would satisfy the Bio 52 core requirement. In practice, students most commonly take Bio 101 (Comparative Physiology), Bio 108 (Ecology and Environmental Biology), or Bio 109 (Evolutionary Biology) as their replacement course. Students should discuss these options with a Biology professor.

Preparing for the Biology, Mathematical and Computational Biology, or Joint Chemistry & Biology major

What courses should a first-year student take if she or he is interested in pursuing a biology major?

All Harvey Mudd students will normally take Biology 52, Introduction to Biology, during the spring semester of their first year. If a student has placed out of Bio 52, then another Biology course could be taken during the spring semester. In particular, a student may wish to take Bio 101 (Comparative Physiology), Bio 108 (Ecology and Environmental Biology), or Bio 54 (Introductory Laboratory) during spring semester; these are required courses for Biology majors, and also count towards the two hybrid majors. If a student has placed out of Bio 52 and opts to skip Bio 52, then s/he should talk with a Biology professor to find out more about biology courses and research opportunities, whether or not they are planning to major in Biology. Students from all majors commonly take elective courses and/or do research in biology.

A Guide to Advising Students about Chemistry Core Courses and Preparing for the Chemistry Major

Chemistry Courses in the Core Curriculum

What are the Chemistry requirements in the Core?

A three half-course sequence and one semester of laboratory are part of the College's Core Curriculum. The courses provide an in-depth examination of several central areas in chemistry including organic and inorganic synthesis and analysis, macroscopic phase behavior and supramolecular chemistry, chemical equilibria, thermodynamics of chemical reactions including electrochemical processes, kinetic analysis of chemical reactions, correlation of quantum chemical principles to structure and bonding, transition metal chemistry, and basic principles of materials chemistry and biochemistry. While many of these topics may be familiar from high school chemistry courses (and the College does require a year of high school chemistry upon entrance), we explore these chemical principles in greater depth and particularly make use of the calculus and physics foundation that first-year students are gaining from their concurrent enrollment in these courses.

What Chemistry courses do students take to fulfill the Core requirements?

For most students the required sequence of courses is Chemistry 23S *Structure*, Chemistry 23E *Energetics*, Chemistry 23D *Dynamics*, and Chemistry 24 *Chemistry Laboratory*, all taken in the first year. All three Chemistry 23 courses meet three times a week for 50 minutes. The laboratory course meets once a week for a four-hour laboratory period.

An optional companion course for the Chemistry 23 sequence, Chemistry 19 *General Chemistry Intensive*, is available for students who are uncertain of their ability to do college-level chemistry. See the section [Additional Support](#) below for more details.

What is the typical sequence for Core Chemistry courses?

Students should take both Chemistry 23S *Structure* and Chemistry 23E *Energetics* in their first semester. While either course can be taken first, students with less strong backgrounds in chemistry should take Chemistry 23S first.

Chemistry 23D *Dynamics* should be taken in the second semester. In extraordinary circumstances Chemistry 23D can be taken in the third semester.

Chemistry 24 *Chemistry Laboratory* can be taken in either the first or second semester.

Is it possible to “place out” of Chemistry courses in the Core? Is it advisable to place out if a student has a strong background?

It is possible to receive credit for Chemistry 23S, 23E, or 23D based on satisfactory completion of a college-level Chemistry course. Students with an exceptional high school background can receive credit by completing placement exams. Students should discuss their situation with the Chair of the Chemistry Department as soon as possible before the start of the first semester. Placement exams are offered prior to the first week of the Fall semester for those seeking credit for Chemistry 23S or Chemistry 23E, and during the first week of the Spring semester for those

seeking credit for Chemistry 23D. A high standard of performance is required to receive credit. After taking the placement exam, the student will discuss his/her performance with the Chemistry Department Chair. Students who exhibit a strong command of the material in Chemistry 23 may elect to receive credit for the course and use the time to either enroll in another course at the College or take a reduced load to allow for more time on other classes.

Less frequently, credit is also awarded for the accompanying laboratory course, Chemistry 24. Students wishing to explore this option should meet with the Chair of the Chemistry Department to discuss placement options. Both the laboratory manual and the laboratory notebook from previous chemistry laboratory courses should be submitted to the department chair at this meeting.

What is the “next” Chemistry course if credit is awarded for all Core courses?

First-year students with credit for Chemistry 23S, 23E, 23D, and 24 who wish to continue in Chemistry might enroll in Chemistry 51 *Physical Chemistry* in the Fall semester if they have the necessary mathematical background. (Math 60 *Multivariable Calculus* is a co-requisite.) Alternatively, in the Spring semester, students might enroll in Chemistry 56 Carbon Compounds.

How should a first-year student prepare for Chemistry 23?

Every person enrolled in Chemistry 23 has a varied background in high school chemistry. The only prerequisite for this course is a firm understanding of the fundamental chemical principles presented in a standard high school chemistry program. What exactly do we expect students to recall from their previous chemistry course(s)? They should know:

- the relationship among atomic number, mass number, and the numbers of protons, electrons, and neutrons for a particular atom
- the interconversion among the mass, number of molecules, and number of moles of a substance
- how to balance simple chemical equations
- the relationship between the empirical formula of a compound and the percentages by mass of the elements in a compound
- how to determine the theoretical yield of a reaction given the starting amounts of reactants and how to determine the percentage yield of a reaction given the measured actual yield
- the quantitative relationships among the masses of reactants consumed and products formed in a given chemical reaction
- how to determine the limiting reagent (*i.e.*, reactant) given a set of initial amounts of reactants and a balanced chemical equation and how to determine the amount of product produced and the amount of reactants unconsumed from the amount of limiting reagent
- how to assign oxidation numbers and balance redox chemical equations

What if a student withdraws from or does not pass Chemistry 23/24?

- A student who withdraws from or who does not pass Chemistry 23S *Structure* in the first half of the first semester should immediately re-enroll in Chemistry 23S in the second half of the first semester.

- A student who withdraws from or who does not pass Chemistry 23E *Energetics* in the first half of the first semester should enroll in Chemistry 23S *Structure* in the second half of the first semester and re-enroll in Chemistry 23E *Energetics* in the first half of the second semester.
- A student who withdraws from or who does not pass Chemistry 23S *Structure* in the second half of the first semester should enroll in Chemistry 23D *Dynamics* in the second semester and re-enroll in Chemistry 23S in the third semester.
- A student who withdraws from or who does not pass Chemistry 23E *Energetics* in the second half of the first semester should enroll in both Chemistry 23E *Energetics* and Chemistry 23D *Dynamics* in the second semester.
- A student who withdraws from or who does not pass Chemistry 23D *Dynamics* in the second semester should immediately re-enroll in Chemistry 23D in the third semester.
- A student who withdraws from or who does not pass Chemistry 24 *Chemistry Laboratory* should re-enroll in the course the next semester.

It may be possible for a student who withdraws from or does not pass Chemistry 23/24 to take an equivalent course over the summer at another institution. This option must be approved in advance by the Chair of the Chemistry Department.

First-year students MUST receive approval from BOTH their faculty advisor and the Associate Dean of Academic Affairs in order to withdraw from a Core course.

Additional Support

What additional support is available during fall semester for students uncertain of their ability to do college-level chemistry?

Chemistry 19 *General Chemistry Intensive* (GCI for short) is a half-semester, 0.5 unit companion course to Chemistry 23S and Chemistry 23E emphasizing chemistry fundamentals and problem-solving in a group setting. Chemistry 19 can be taken twice in the same semester to provide support to both Chemistry 23S and Chemistry 23E without putting a student in an overload position. Recent experience shows that students electing Chemistry 19 perform significantly better across the core chemistry curriculum than peers with similar backgrounds who do not take this course.

Preparing for the Chemistry Major

What additional courses should a first-year student take if she or he is interested in pursuing a chemistry major?

All of the subsequent chemistry courses for a chemistry major require Chemistry 23/24 as prerequisites. Generally, students interested in pursuing a chemistry major enroll in Chemistry 51 *Physical Chemistry* and Chemistry 53 *Physical Chemistry Laboratory* during the Fall semester of their sophomore year. In the Spring semester of the sophomore year, chemistry majors enroll in Chemistry 52 *Group Theory, Quantum Chemistry, & Spectroscopy*, Chemistry 56 *Carbon Compounds*, and Chemistry 58 *Carbon Compounds Laboratory*.

A Guide to Advising Students about the Computer Science Core and Preparing for the Computer Science Major

The Computer Science Core

What are the CS requirements in the Core?

The Computer Science portion of Harvey Mudd's core curriculum is fulfilled by one of three courses: CS 5, *Introduction to Computer Science*, CS 5 "Green", or CS 42, *Principles and Practice of Computer Science*.

CS 5 assumes no prior computer science experience and presents fundamental computer science ideas and skills. In particular, students learn general computational problem-solving techniques and gain experience with the design, implementation, testing and documentation of programs in a high-level language (currently Python). In addition, students learn to design digital devices, understand how computers work, and learn to program a computer in its own machine language.

There are two "versions" of CS 5, one called "Gold" for students with little or no prior experience and one called "Black" for students with some prior programming experience (e.g. self-taught programming or a high school programming course). It is possible to switch within the two sections for a limited time in the beginning of the semester.

CS 5 "Green" (CS 5GR) is another version of CS 5 for students interested in the connections between computer science and biology. Computation is now an integral part of modern biology and is used in applications ranging from identifying genetic predictors of disease to helping fundamental questions in evolution, ecology, and other fields. This course covers the foundational material in CS 5 but all of the examples and problems are motivated by biological applications. The course is typically co-taught by a computer scientist and a computational biologist.

CS 42 is an accelerated breadth-first introduction to computer science as a discipline for incoming students who have a particularly strong computer science background, e.g., students who have completed a high-school AP computer science course and possibly even more experience. Successful completion of this course satisfies the Computer Science 5 core requirement and Computer Science 60 coursework. Topics include functions as first-class objects, parsing, logic programming, models of computation, and uncomputability, among others. Students in CS 42 write programs in Scheme, Java, Prolog, Python, and special-purpose languages.

Is it possible to "place out" of the CS Core?

Short Answer, NO.

Incoming students will be placed in one of the three courses described above (it is important that incoming students complete the survey that asks about previous computer science experience).

What is the "next" Computer Science course after completing the CS Core?

Students who complete CS5 or CS5GR should take the follow-up course, CS 60: *Principles of Computer Science*. CS 60 is an intensive introduction to computer science. It is an excellent

barometer by which potential majors can gauge their interest in the broad field of computing. In addition, it develops facility with several different types of programming languages and paradigms. Students who complete CS 42 would next take CS 70.

While students almost never pass out of CS 60, some students do pass out of the third course in the major sequence, CS 70: *Program Development and Data Structures*. Students with a strong background in C++ and data structures can complete a few substantial programs and take a test to receive credit and placement for CS 70.

Preparing for the CS and Joint Majors

What additional courses should a first-year student take if interested in the CS major CS/Math Joint Major or the Mathematical and Computational Biology Major?

If a student takes CS 5 or CS 5GR in the fall term and would like to consider CS or one of the joint majors involving CS, there are two natural options for the spring term: CS 60 (Principles of CS) or Math 55 (Discrete Mathematics). CS 60 is a particularly good option if one is “on the fence” about a computing-related major, as it provides an overview of much of the field. It is also required for both the CS and the Math/CS Joint Major. Often students find that taking CS 60 helps them decide whether they are interested in computing. Math 55 is also a requirement for the CS, Math/CS Joint Major, and the Mathematical and Computational Biology Major. It is also a good choice as a spring course. It is also possible to take an elective unrelated to the major, as students taking CS 60 in the fall of their sophomore year are not at all behind in completing a CS-related major.

Students who take CS 42 in the fall term and are considering a CS-related major may consider taking either CS 70 or Math 55 in the Spring.

A Guide to Advising Students about the Engineering Core and Preparing for the Engineering Major

The Engineering Core

There is one Engineering course in the Core, Engineering 59: Introduction to Engineering Systems. It is a one-semester lecture course, that is offered during both fall and spring semesters. The course focuses on the properties of signals and systems, the relationship between the inputs and outputs of physical systems, and the analysis, design and simulation of signals and systems. All students, regardless of intended major, should be strongly encouraged to enroll in the fall offering.

Is it possible to place out of Engineering 59? Is it advisable to place out if a student has a strong background?

No (to both).

How should a first-year student prepare for Engineering 59?

The student should complete the scheduled Core Mathematics and Physics courses.

What if a student withdraws from Engineering 59 or does not pass Engineering 59?

If an Engineering major fails or withdraws from E59, he or she should retake E59 in the next, immediately-following semester. Other majors must complete E59 by the end of the fall semester of their third year.

Preparing for the Engineering Major

A student should take E4 prior to or concurrently with E59. Students are also advised to consult with an Engineering faculty member in order to begin planning for subsequent courses.

A Guide to Advising Students About Humanities, Social Sciences, and the Arts

Program Overview

Detailed information about HSA advising may be found at:

<http://www.hmc.edu/academicsclinicresearch/academicdepartments/humanitiesandsocialsciences1/Advising-Resources.html>

What are the humanities, social sciences, and the arts (HSA) requirements in the Core?

The core curriculum includes a one-semester course, HSA 10, “Critical Inquiry,” taken during a student’s first spring semester. The course meets in sections of 18-20 students twice a week for 75 minutes.

The format of HSA 10 involves roundtable discussion of assigned readings, peer review of writing, writing workshops, student presentations of research and other material, library workdays, and a relatively small amount of lecturing. Reading topics are chosen individually by each instructor (and students are asked to express topic preferences), whereas workloads and writing assignments are coordinated by the entire teaching staff of each course. Each section requires the same number of papers (and paper revisions) due on the same dates, as well as the same end-of-semester research presentation (and paper).

What are the HSA requirements beyond the core?

Beyond HSA 10, students must take at least ten additional courses in HSA. These ten (or more) further courses must together satisfy the distribution, concentration, writing, and departmental requirements. A given course may be used to satisfy one or more of these requirements; e.g., the same course might count toward a student’s concentration and satisfy the writing requirement. The distribution requirement is satisfied by taking at least one course in each of five different HSA disciplines. The concentration requirement is satisfied by taking at least four courses in a single HSA discipline or interdisciplinary field chosen from the distinct areas of liberal arts study offered at The Claremont Colleges (see the list of approved concentrations on the HSA Department website, under “Advising Resources”). The writing requirement is satisfied by taking at least one HSA course in addition to HSA 10 that involves significant writing. (In general, a course satisfies this requirement if it assigns at least 5,000 words of formal graded writing, excluding exams, short response papers, e-mail or online discussion contributions, and in-class writing.) At least five of the HSA courses taken in addition to HSA 10 must be from departmental faculty (to ensure opportunities for exploring questions in the humanities, the social sciences, and the arts with a critical mass of fellow HMC-students).

For further elaboration of the Department’s program requirements, and other relevant information and documents, please consult the Advising Resources section of the HSA website at

<http://www.hmc.edu/academicsclinicresearch/academicdepartments/humanitiesandsocialsciences1/Advising-Resources.html>

HSA Advising in the First Year

Is it possible to place out of HSA 10?

Transfer students aside, it is not possible to place out of this course. The Department does not award placement for high scores on the Advanced Placement Test in English.

What happens if a student withdraws from, or is unable to pass, HSA 10?

A student should not withdraw from this course without the consent of the Associate Dean for Academic Affairs. A student who does not pass HSA 10 in the first year must re-take the course during the second year.

Can a student who has not passed WRIT 001 in the fall take HSA 10 in the spring?

A student in this position may enroll concurrently in HSA 10 and the spring make-up section of WRIT 001. HSA 10 requires WRIT 001 as either a prerequisite or co-requisite.

When and how are HSA advisors assigned?

The department assigns each student an HSA advisor in the spring of the first year. Normally, a student's HSA 10 instructor fills this role.

What should a student do who wants to take an HSA course over the summer at another institution?

Summer courses require the advance approval of a student's HSA advisor. The best time to raise this issue with one's advisor would be during the spring advising period.

Advising Beyond the First Year

Beginning in the spring of the first year, HSA advising is handled by a student's HSA advisor, so there is relatively little for advisors in other departments to bear in mind. But the following points may be helpful.

-- The department encourages students to make steady progress toward satisfying its program requirements. Students who leave five or more HSA courses for the senior year will almost certainly be over-extended.

-- The department encourages interested students to pursue study abroad opportunities. Students should consult with their HSA advisors concerning the HSA portion of their study abroad programs before leaving campus. It is the department's policy to reduce the required number of departmental courses from five to four when a student spends a semester in an approved study abroad program.

-- The department allows a total of two summer courses in HSA to count toward a student's program. (See above for approval procedures.) Study abroad courses are *not* counted in this total.

A Guide to Advising Students about the Mathematics Core and Preparing for the Math Major

The Math Core

What are the Math requirements in the core?

There are three semesters of core mathematics:

- Math 30G or Math 30B: Calculus (1.5 units, fall first-half)
- Math 35: Probability and Statistics (1.5 units, fall second-half)
- Math 40: Introduction to Linear Algebra (1.5 units, spring first-half)
- Math 45: Introduction to Differential Equations (1.5 units, spring second-half)
- Math 60: Multivariable Calculus (1.5 units, fall first-half)
- Math 65: Differential Equations and Linear Algebra II (1.5 units, fall second-half)

Most students will take Math 30G or Math 30B and Math 35 in their first semester, then Math 40/45 their second semester. Incoming students will be placed in either Math 30B or Math 30G based on their score on the Mathematics Diagnostic Exam which is administered during orientation. Students who qualify to take Math 30B may elect to take Math 30G instead. Both courses will prepare you equally well for the rest of the math core. Based on past experience, about 70% of students take Math 30G, 25% to take Math 30B, and 5% place out of both.

For detailed descriptions of the core math courses please visit the Math Core Curriculum website: <http://www.math.hmc.edu/program/core/>

Is it possible to place out of any of these core math courses? Is it advisable to place out if a student has a strong background?

Placing out of any math course is possible, but requires a meeting with the department's Placement Director and/or Chair, and usually necessitates taking a suitable placement examination. Students should contact the department Placement Director at placement@math.hmc.edu if they are interested in placing out of any math course. We advise neither for nor against; each situation is unique.

Preparing for the Math, Mathematical Biology, or Joint Computer Science-Math Major

What courses should a first-year student take if she or he is interested in pursuing a math major?

A prospective Math, Mathematical Biology, or Joint Computer Science-Math Major should take Math 55 (Discrete Mathematics) as soon as possible (typically during the spring semester of their first year or fall semester of their second year). Math Majors are also required to take Math 70 (Intermediate Linear Algebra) and Math 80 (Intermediate Differential Equations), typically in the spring semester of their sophomore year.

A Guide to Advising Students about Physics Core Courses and Preparing for the Physics Major

What are the physics requirements in the Core?

Physics core courses include

Ph 22 (1 unit, fall or spring semester)	<i>Physics Laboratory</i>
Ph 23 (1.5 units, fall semester)	<i>Special Relativity</i>
Ph 24 (3 units, spring semester)	<i>Classical Mechanics</i>
Ph 51 (3 units, fall semester)	<i>Electromagnetic Theory and Optics</i>

Some of the core topics are typically part of high-school physics courses; they are covered at Harvey Mudd College in considerably greater depth than most and use more mathematics than is possible in the great majority of high-school courses.

In what order are the core physics courses taken?

For most students the required sequence of courses is Ph 22 in the first or second semester, Ph 23 in the first semester, Ph 24 in the second semester, and Ph 51 in the third semester. Ph 23 has one lecture and two problem sections each week for the first half or the second half of the first semester; Ph 24 and Ph 51 each have two lectures and two problem sections each week; Ph 22 meets every week for two hours.

Is it possible to “place out” of physics courses in the Core? Is it advisable to place out if a student has a strong background?

All students take a 90-minute placement exam during orientation. The exam covers some basic mathematics and classical mechanics. We also ask students to describe their physics background: the courses they have taken, books used, grades earned, and AP physics scores, if available.

A student who demonstrates a high level of mastery of both classical mechanics *and* special relativity should speak to the physics department chair immediately following the placement exam during orientation. Few students will have taken a course in special relativity before coming to Harvey Mudd College, at least in the depth covered in Ph 23. Students who nevertheless believe that they have a strong background in special relativity *and* in classical mechanics should arrange with the physics department chair to take further examinations during orientation to demonstrate their readiness to be advance placed in Ph 51. They are then eligible to take Ph 52 (Quantum Physics) in the spring semester.

A larger number of students may be well prepared in classical mechanics but not in special relativity. They have the opportunity to try to place out of Ph 24. To determine whether students qualify for advance placement out of Physics 24, an optional 3-hour placement exam will be offered, typically on the first Saturday of the fall semester. Students who take this second exam will then confer with the department chair to determine whether they should take Ph 24, Ph 24A (an advance placed section of Ph 24 that covers similar material to Ph 24 but with less lecture and with somewhat more challenging problems), or simply place out of Ph 24.

With the results of placement exams and previous test-scores, the physics department endeavors to place each first-year student in an appropriate course that is close to being right for that student. We want each student to be challenged, but not overly challenged. Students with placement questions are encouraged to speak with the physics department chair during orientation.

How should an entering student prepare for the Physics 24 placement exam?

The placement exams are on classical mechanics, including (but not restricted to) the laws of motion of particles, conservation of momentum, energy, and angular momentum, gravitation, oscillation, and waves. Students interested in advance placement should review material in these areas learned in high school or college courses taken previously.

What is the “next” physics course for advance placed students?

Students who place out of both Ph 23 and 24 in their first year will normally take Ph 51 in the fall; they are then eligible to take Ph 52 (Quantum Physics) in the spring of their first year. For students who place out of Ph 24 (but not Ph 23), a number of options are available. If the number of students placing out of Ph 24 is sufficiently large, a special section of Ph 51 may be offered in the spring semester for first-year students. Otherwise, students receiving advanced placement may take Astronomy 62 (Introduction to Astrophysics), participate in physics research, or pursue coursework outside physics in that semester. They would then take Ph 51 in the fall of the sophomore year and be eligible to take Ph 52 (Quantum Physics) in the spring of their sophomore year.

What if a student withdraws from or does not pass a physics core course?

(1) The student may take the course again one year later. If the course is Ph 23, the student may still go on to take Ph 24 the following semester; if the course is Ph 24, the student may still go on to take Ph 51 the following semester.

(2) The student may pass Ph 23, Ph 24, or Ph 51 by examination. The exam is a three-hour comprehensive final exam; the student must pass it with 75% or more of the possible points.

(3) In case the course is Ph 24 or Ph 51, if the student *fails* the course, he or she may, with the permission of the physics department chair, take an approved course at another institution, and pass that course with a “C” or better. The student will then have passed out of the course. If the student tries hard to pass Ph 24 or 51 up until the drop date and then *withdraws* from the course, he or she may (with the permission of the physics department chair) take an approved course at another institution, and pass the course with a “C” or better. The student must then subsequently take a three-hour exam in the subject at HMC and pass that exam with roughly 50% or more of the possible points. The student will then have passed out of the course.

What next courses should a student take if he or she is interested in pursuing a physics major?

To be well prepared for physics laboratory courses, it is recommended that potential physics majors take the choice lab (CL 57—*What Makes Things Tick?*) offered by the physics department in the fall of the sophomore year. After completing Ph 51 and the choice lab, physics majors

typically take Ph 52 (Quantum Physics), Ph 54 (Modern Physics Laboratory), and Ma 115 (Partial Differential Equations) in the spring of their sophomore year. Other physics courses that can be taken in that semester are Ph 80 (Energy and the Environment), an Integrative Experience course, and Astronomy 62 (Introduction to Astrophysics). Other spring-semester courses appropriate for sophomores that are offered typically on an every-other-year basis include Ph 166 (Geophysics), and Ph 174 (Biophysics). Occasionally sophomores, if they have sufficient background in mathematics, take Ph 111 (Theoretical Mechanics) in the fall of their sophomore year; interested students should speak first with their adviser *and* the Ph 111 instructor.