1. **Overview of First-Year for Science Students**
   a. Science Core Courses
   b. Notes on the Fall Semester

2. **Planning a Schedule**
   a. General Information
   b. Typical Schedule for an Undecided Major

3. **Humanities, Social Sciences, and Fine Arts Requirements**

4. **Information on Selected Courses and Departments**
   a. Description of Optional First-Year Lab / Seminars
   b. Introduction to Programming
   c. Modern Languages
   d. Music
   e. Physical Education

5. **Advanced Placement Credit**
   a. AP Credit for Biology
   b. Transfer Credit & Additional AP Information

6. **Information from the Biological Sciences Department**
   a. Majors offered in Biological Sciences
   b. 03-115 & 03-116 Phage Genomics Research
   c. First-year Lecture courses offered by Biological Sciences
   d. Typical Fall Semester Schedule for Biological Sciences Students

7. **Information from the Chemistry Department**
   a. 09-107 Honors Chemistry
   b. Typical Fall Semester Schedule for Chemistry Students

8. **Information from the Mathematical Sciences Department**
   a. Placement into Calculus Courses
   b. Math Majors and Minors
   c. Mathematical Sciences Honors Sequence
   d. Typical Fall Semester Schedule for Math Students

9. **Information from the Physics Department**
   a. 33-131 Matter and Interactions I
   b. Typical Fall Semester Schedule for Physics Students

10. **Health Professions Program**

11. **Glossary**
1. Overview of First-Year for Science Students

A Mellon College of Science education is based on a broad foundation in the sciences: two semesters each of calculus and physics and one semester each of biology, chemistry and computer science. This foundation corresponds to the following “science core courses” required for all MCS students.

Science Core Courses:
- 03-121 Modern Biology
- 09-105 Introductions to Modern Chemistry
- 15-1xx or 02-201 Programming Requirement*
- 21-120 Differential & Integral Calculus
- 21-122 Integration, Differential Equations, and Approximation
- 33-111 Physics for Science Students I
- 33-112 Physics for Science Students II

*Students can fulfill this requirement by taking 15-110, 15-112, or 02-201. (See Section 4B)

Course descriptions including prerequisite/corerequisite information can be found in the CMU Course catalog. Scroll down to “First Year for Science Students” on the Mellon College of Science catalog webpage for more detailed course information or you can look in the CMU Schedule of Classes.

In your first year, you will complete the required calculus courses and three of the remaining five science core courses. You will complete the other two science core courses by the end of your junior year. During your first year, you will also take humanities or social science courses; a departmental elective from your intended major; and Computing @ Carnegie Mellon (C@CM), a course that introduces students to the computing environment at CMU.

With this broad science background, you will be prepared to undertake any of the degree programs offered by MCS. Typical fall schedules can be found in each department section of this packet. The following notes apply to all majors:

1. Three CMU units equal one credit hour at other universities.
2. All MCS first-year students are required to take 76-101 Interpretation and Argument during the first year either in the first or second semester.
3. If you are entering with advanced placement credit, you will follow a similar schedule with modification for your AP work. For now, assume that you will not receive credit when planning your schedule. See Section 5 – Advanced Placement Credit.
4. You may take a combined total of nine units of physical education (pass/fail grade) and military science (letter grade) as free electives in any MCS degree program. The credit you earn for these courses will count toward your graduation requirements, but will not be calculated in your Quality Point Average (QPA). Here is how this works: If you take 3 units of physical education and 12 units of military science, a total of nine of these units will count as free elective credit. The remaining six units will not be counted toward the units needed for your degree.
2. Planning a Schedule

A. First-year students usually take four courses during the fall semester plus Computing @ Carnegie Mellon (C@CM). Refer to the sample schedules available in each department’s section of this packet in order to see what a typical schedule in MCS looks like. In addition to those basic schedules, you may opt to take one of the following three to six unit elective courses (see Section 4 for these course descriptions).

- 03-101 Biology Seminar: Controversies in Neuroscience, 3 units
- 03-115 Phage Genomics Research, 6 units (see Section 6; admission to course requires an essay)
- 09-109 Kitchen Chemistry, 3 units
- 21-101 Mathematics Seminar: Discrete-Time Dynamical Systems, 3 units
- 33-101 Physics Seminar: Science and Science Fiction, 3 units

You may also petition to take an additional course of nine units or more this fall by completing the petition request on the registration form. For this additional course, you might consider another science core course from the list on page 2, or you may want to choose another humanities or social sciences course.

B. If you are unsure of what you want to major in, the schedule below will keep all of your options open:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-120 Differential &amp; Integral Calculus*</td>
<td>10</td>
</tr>
<tr>
<td>xx-xxx Science Core Course</td>
<td>9-12</td>
</tr>
<tr>
<td>xx-xxx Science Core Course</td>
<td>9-10</td>
</tr>
<tr>
<td>76-101 Interpretation &amp; Argument</td>
<td>9</td>
</tr>
<tr>
<td>99-10x Computing @ Carnegie Mellon</td>
<td>3</td>
</tr>
<tr>
<td>xx-xxx Optional course listed above</td>
<td>3-6</td>
</tr>
</tbody>
</table>

* Scores from Advanced Placement exams will be used to place students into the appropriate calculus course (See Section 8.)
3. **Humanities, Social Sciences, and Fine Arts Requirements**

All candidates for the bachelor’s degree must complete a minimum of 72 units offered by the College of Humanities and Social Sciences (H&SS), Business Administration (BA), and /or the College of Fine Arts (CFA). For the fall semester, you will only have access to the courses listed below. **Make your selection from these courses.**

A.  **Designated Writing Course (9 units)** The designated writing course **must** be completed during your first year.

   - 76-101 Interpretation and Argument

B.  **Distribution Course Requirements (27 units)** Course descriptions can be found here: [https://enr-apps.as.cmu.edu/open/SOC/SOCServlet](https://enr-apps.as.cmu.edu/open/SOC/SOCServlet) in the Schedule of Classes or here: [http://coursecatalog.web.cmu.edu/melloncollegeofscience](http://coursecatalog.web.cmu.edu/melloncollegeofscience) in the Course Catalog if you scroll down to “Humanities, Social Sciences, and Fine Arts Requirements.”

   **Category 1: Cognition, Choice, and Behavior**
   - 80-180 The Nature of Language
   - 85-102 Introduction to Psychology

   **Category 2: Economic, Political, and Social Institutions**
   - 73-100 Principles of Economics
   - 88-104 Decision Processes in American Political Institutions
   - 79-203, Social and Political Change in 20th Century Central and Eastern Europe
   - 79-221, The Development and Democracy in Latin America
   - 79-245, Capitalism and Individualism in American Culture
   - 79-246, Industrial America
   - 79-252, Recent U.S. History: 1945-Present
   - 79-268, World War I: the Twentieth Century’s First Catastrophe

   **Category 3: Cultural Analysis**
   - 79-104 Global Histories
   - 80-100 Introduction to Philosophy
   - 82-xxx Any course from Modern Languages (see **Section 4C**)
   - 79-225, West African History in Film
   - 79-235, Caribbean Cultures
   - 79-242, African American History: Reconstruction to the Present
   - 79-297, Dilemmas and Controversies in Anthropology
A. Description of Optional First-Year Lab / Seminars

During the fall semester, you will have an opportunity to participate in a first-year lab / seminar courses for science students. These offer an opportunity to participate in a small class that will deal with topics to stimulate your thinking and broaden your views of topics in science.

We will have space for a limited number of students in these courses, so we will fill the courses on a first-come, first-served basis. If you would like to take one of these courses, please indicate your interest when you submit the Fall Registration Form.

- **03-101 Biological Sciences Seminar: Controversies in Neuroscience**
  This course is designed to be an introduction to neuroscience with an emphasis on current research topics. Students are expected to develop an appreciation for modern hypotheses of brain function and of the problems that contemporary systems neuroscience seeks to address. They will also become conversant in the scientific techniques that facilitate our understanding of brain function.

- **03-115 / 03-116 Phage Genomics Research** (See Section 6)

- **09-109 Kitchen Chemistry**
  Ever wanted to boil water in ice? Cook an egg so the yolk is set but the white still runny? Lick a lemon or drink vinegar but have it taste sweet? Make "caviar" from fruit juice and noodles from yogurt? Explore the science of molecular gastronomy through the lectures and demonstrations that reveal the chemistry and biochemistry of food ingredients and their preparation. Then use a kitchen as your “laboratory” to test hypotheses and delve into molecular cooking - you may just get to eat your lab results. For this course high school background in chemistry would help but nothing more advanced is required.

- **21-101 Discrete-Time Dynamical Systems**
  A dynamical system is a mapping S that takes two inputs: a nonnegative time variable t and a “state variable x. The value S(t,x) characterizes the state of some system at time t given that the initial state (i.e., the state at t=0) was x. The mapping S is required to satisfy a natural type of translation invariance in the time variable. In the continuous-time case, the set of allowable times is the set of nonnegative real numbers. In the discrete time case, the set of allowable times is taken to be the set of natural numbers (i.e., nonnegative integers).

  Dynamical Systems are used to model many real-world phenomena such as the size of a population, the position of a particle in a mechanical system, or the effectiveness of a medication in treating a disease. Dynamical systems are also of interest from a purely mathematical perspective.

  Analysis of the continuous-time case requires a great deal of advanced mathematical preparation (including Real Analysis I and II, 21-355, 21-356). On the other hand a lot of important aspects of discrete-time dynamical systems can be obtained using only mathematics that many freshmen have already encountered. Moreover, many important concepts, such as stability and invariance, can be presented and understood much more readily in the discrete-time case.

  This course will introduce and analyze discrete-time dynamical systems and discuss a number of applications. Calculus I (21-120) is a prerequisite and Calculus II (21-122) is a co-requisite. The mathematics discussed should reinforce many ideas that will be encountered in 21-127 (Concepts of Mathematics) and 21-241 (Matrices & Linear Transformations). The grade will be based entirely on homework performance. (There will be no exams.)

- **33-101 Physics Seminar: Science & Science Fiction**
  Participants in this seminar will examine a number of works of science fiction cinema, chosen from
throughout the nearly 100 year history of the genre, and will critique the science content of these works in light of our current understanding. The goals of our discussion will be to sort out fact and fantasy, and to identify some ideas that may be possible in principal, but for which the technology is not yet available. Laboratory investigation of the relevant physical phenomena will be performed whenever feasible. Topics for discussion will include the nature of space-time and the possibilities of faster-than-light space travel and time travel; the fundamental interactions and the ideas of" tractor beams," "force fields," and "directed energy" weapons; the conditions necessary for life and the search for extraterrestrial life forms; artificial intelligence and robotics; advanced medical technology; human-computer interaction; and human life in the future. The final week of the course will be devoted to short presentations by the students on topics of their own choosing. The full group will meet once each week for two hours of discussion and viewing of film excerpts. Additional time will be scheduled as needed for individual or small group investigations in the laboratory and for viewing of full-length films.

B. Introduction to Programming
The School of Computer Science offers three introductory programming courses. Course descriptions can be found here: https://enr-apps.as.cmu.edu/open/SOC/SOCServlet.
02-201 Programming for Scientists, 12 units
15-110 Introduction to Programming, 10 units
15-112 Fundamentals of Programming, 12 units

All MCS students must complete or receive credit for one of the following: 15-110, 15-112, or 02-201.

- Students who plan to take additional computer science courses and have AP credit for 15-112 should take 21-127 Concepts of Math.
- Which programming course should you take? Take 15-112 only if you have prior programming experience and intend to take additional computer science courses. Otherwise take 02-021 or 15-110. 15-112 is a very rigorous course that is designed for students who want to pursue additional computer science courses. We recommend that you choose 02-201 or 15-110 and if you do well, you can then take 15-112.
- If you have extensive programming experience but did not take the AP Computer Science exam, there is a placement exam that you can take. Contact Veronica Peet (vpeet@andrew.cmu.edu) and she will make the placement exam available to you on blackboard.

C. Modern Languages
Entry Level Language Courses
For students who have not previously studied French, Arabic, German, Mandarin Chinese, Spanish, Italian, Japanese, or Russian, the following elementary level courses are available this fall:
82-101 Elementary French I
82-111 Elementary Arabic I
82-121 Elementary German I
82-131 Elementary Mandarin Chinese
82-141 Elementary Spanish I
82-161 Elementary Italian I
82-171 Elementary Japanese I
82-191 Beginning Russian I

Upper Level Language Courses
If you have studied any of the above languages elsewhere and wish to continue studying those languages at Carnegie Mellon, the Modern Languages Department requires you to take a placement test before enrolling in the language course. To take exams you need to go to the URL listed below. The password for all languages is scotty3.
If you have any questions, please contact Sue Connelly in Baker Hall 160, sc7k@andrew.cmu.edu.

D. Music
You can take private music lessons or join a musical ensemble (by audition) for credit this fall. However, you cannot preregister for these courses — that is, you cannot use the Fall Registration Form to sign up for music courses. Instead, for private music lessons (elective studio), please go to the following web site: http://music.cmu.edu/pages/music-for-non-majors-registration

For musical ensembles, you should send email to Sharon Johnston at slj@andrew.cmu.edu. She will send you information this summer concerning auditions. The following music courses are options for first-year students:

- 57-1xx Elective Studio*
- 57-117 Choral Ensemble for Non-Majors†
- 57-118 Instrumental Ensemble for Non-Majors†
- 57-227 Jazz Orchestra†
- 57-420 Jazz Vocal Ensemble†

* Elective Studio is for non-music majors interested in private lessons on instruments, or in composition, jazz improvisation, or voice. A fee will be charged according to the length of the lesson.
† Auditions required.

E. Physical Education
Physical education courses are not required for graduation, but they are available. You cannot preregister for these courses by using the Fall Registration Form; however, you can add a course during orientation if there is space in your schedule.
5. Advanced Placement Credit

We will be considering Advanced Placement Examination results over the summer (see the Mellon College of Science Advanced Placement Policy at: http://www.cmu.edu/mcs/prospective/ap.html). Make sure that you have asked the Educational Testing Service to send Carnegie Mellon all of your AP scores—from this year and past years. Also, please bring a copy of your AP or IB score report when you come for orientation.

When you are planning your schedule, you probably will not know the results of all your AP exams. For this reason, you should choose courses with the assumption that you will not receive AP credit. When we receive your scores this summer, we will adjust your schedule as necessary.

See below for the conditions on biology, calculus, and English credit.

A. AP Credit for Biology
If you receive a five on the Biology AP exam, you will receive credit for 03-110 General Biology. This course fulfills the MCS General Education requirement. If you have an AP score of five, you can elect to take an attainment exam that will be administered by the Department of Biological Sciences that will enable you to receive credit for 03-121 Modern Biology, which is a prerequisite for further studies in biological sciences.

B. Transfer Credit and Additional AP Information

Transfer Credit: To receive credit for a course or courses you took at a college or university, provide us with:

- A course description (typically from the course catalog or web site)
- An official transcript showing your final grade in the course

Additional AP Information:

- There will be no credit given for a score of one, two or three on an AP examination.
- You must decide whether you wish to accept AP credit and/or placement into higher-level courses based on your understanding of course material. If you do not wish to receive AP credit in one or more subjects, please indicate this on the “Advanced Placement Exams” section of the registration form.
- For students interested in the Health Professions, please see Section 10.
6. Information from the Department of Biological Sciences

A. Majors offered in Biological Sciences
The Department of Biological Sciences offers several majors, which are described in detail on our departmental website:

- Biological Sciences
- Biological Sciences with a Neuroscience Track
- Biological Sciences and Psychology
- Computational Biology
- Neuroscience (NEW for Fall 2014!)

**Students intending to pursue ANY of these majors should plan to take the suggested courses outlined in the sample schedule in section D. For students considering the Bio/Psych or Neuroscience majors, we suggest that you take 85-102 or 76-101 (respectively) for your nontechnical course in the fall semester.**

B. 03-115 / 03-116 Phage Genomics Research
The department of Biological Sciences will be offering a two-semester research course in bacteriophage genomics. If you are interested in biological research, this course may be ideal for you. Seating is limited to an enrollment of 20 students; therefore, you must apply to participate in this course. (See how to apply below.)

**Course numbers: 03-115 (6-units fall semester) and 03-116 (6-units spring semester).** This is a two-semester course. If you are accepted for the first semester, you will be required to take it in the spring semester. Genomics research combines experimental and computational approaches for large-scale analysis of the biological information contained in DNA sequences. The most abundant biological entities are bacteriophages. Their enormous diversity and number make bacteriophages important models for the study of gene structure, function and regulation, population genetics and evolution.

**Prerequisites:** none.

**Lab Fee:** $100 per semester

**Work required:** Two 3-hour lab sessions per week, with no additional work to be completed outside of the lab sessions

**Description:**

**Fall semester:** Students will collect environmental samples. From these samples, you will identify and purify bacteriophages. The bacteriophages will be characterized structurally by electron microscopy and their DNA will be purified and analyzed multiple methodologies.

**Spring semester:** Students will use Ion Torrent sequencing technology to sequence the genomes of the phages that they isolate in the fall semester. The DNA sequences will be analyzed with bioinformatic tools and compared with those of phages isolated at other locations to identify genes, their organization, the differences that may characterized different phage groups, and how these have arisen during evolution.

**How to apply:** Admission to Phage Genomics Research will be based on a written application. You must submit an essay describing why you want to participate in the program. Selection criteria will include an interest in doing discovery science, a willingness to carry a major responsibility for you own learning and an attitude of independence of thought and action. Essays should be approximately 500 words in length. The web page for applying for Phage Genomics Research is:

C. First Year Lecture courses offered by Biological Sciences

The Department of Biological Sciences will also offer 2 lecture-based courses that may be of interest to students planning to pursue a Biological Sciences related major. These courses are both offered in the fall semester: 03-151 is the honors version of our introductory biology course. 03-101 is an optional mini-format seminar style course where students will discuss current research in the field of neuroscience. Please express interest for either or both of these courses on your fall registration form.

1. **03-151 (10 units) Honors Modern Biology. Fall semester for 15 weeks.** Modern Biology (03-151) is an honors introductory course. This section of Modern Biology has been designed for students with an interest in a major in the biological sciences who have had solid preparation in this field as indicated by the following examinations: SAT II Molecular Biology, AP, or IB Biology. This course will present the concepts and principles necessary for a general understanding of the processes occurring in living cells and is the basis for further study in cell biology, biochemistry, genetics, molecular and developmental biology. While similar core topics will be covered in all sections of Modern Biology, this section will be offered at an accelerated pace, requiring more independent learning. The extra class time this pacing provides will allow the exploration of the molecular basis of life to help students integrate and apply the core principles of biology covered in the course.

2. **03-101 (3 units): Freshmen Seminar: Controversies in Neuroscience. Fall semester only for 7 weeks.** This lecture-style course is designed to be an introduction to neuroscience with an emphasis on current research topics. Students will read and discuss primary journal articles in this course. Students are expected to develop an appreciation for modern hypotheses of brain function and of the problems that contemporary systems neuroscience seeks to address. They will also become conversant in the scientific techniques that facilitate our understanding of brain function. The course will be structured around historical and active controversies in neuroscience. Students will be expected to understand the foundational material and its relationship to the controversies discussed. Additionally, students should understand the methodology and data behind each competing theory. This course can accommodate up to 20 MCS students total.

D. Sample Fall Schedule for intended majors within the Department of Biological Sciences (including Neuroscience)

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-xxx Calculus Course</td>
<td>10</td>
</tr>
<tr>
<td>03-121 Modern Biology</td>
<td>9</td>
</tr>
<tr>
<td>09-105 Introduction to Modern Chemistry</td>
<td>10</td>
</tr>
<tr>
<td>76-101 Interpretation and Argument</td>
<td></td>
</tr>
<tr>
<td>or xx-xxx Humanities or Social Sciences Course</td>
<td>9</td>
</tr>
<tr>
<td>99-10x Computing@Carnegie Mellon</td>
<td>3</td>
</tr>
<tr>
<td>xx-xxx Optional 3-6 Unit Course</td>
<td>3-6</td>
</tr>
<tr>
<td><strong>Total Units:</strong></td>
<td>41 – 47</td>
</tr>
</tbody>
</table>

* Students with AP credit should consult with the first year advisors to find appropriate substitutions for these courses. We strongly recommend our Honors Modern Biology course for students with a strong biology background, especially if you pass the placement exam for 03-121.
A. The Department of Chemistry offers two introductory chemistry courses: 09-105, Introduction to Modern Chemistry and 09-107, Honors Chemistry. Honors Chemistry is a small class, with enrollment limited to 40 students, the majority of whom are considering chemistry as a major. The instructor in Honors Chemistry uses the small class setting to present the course material supported by lecture demonstrations, hands-on lab experiences and technology to illustrate important concepts. This is an accelerated course with topics drawn from both 09-105 and 09-106, Modern Chemistry II. Course material is frequently presented in the context of current research topics in chemistry. The course presumes a strong high school chemistry background (e.g. AP Chemistry exam with a score of 3 or greater; IB Chemistry score 5 or greater or SAT II Chemistry exam with a score of 700 or greater). Students who perform well in the course can receive a waiver for 09-106 and be eligible to enter the sophomore level course in inorganic chemistry, 09-348, during the second semester. If you meet the above criteria and are interested in taking the honors section, you can select it on the Fall Registration Form.

B. Sample Fall Schedule for an intended Chemistry Major

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-xxx Calculus Course</td>
<td>10</td>
</tr>
<tr>
<td>33-111 Physics for Science Students I</td>
<td>12</td>
</tr>
<tr>
<td>09-105 Introduction to Modern Chemistry</td>
<td>10</td>
</tr>
<tr>
<td>76-101 Interpretation and Argument</td>
<td>9</td>
</tr>
<tr>
<td>or xx-xxx Humanities or Social Sciences Course</td>
<td>9</td>
</tr>
<tr>
<td>99-10x Computing@Carnegie Mellon</td>
<td>3</td>
</tr>
<tr>
<td>xx-xxx Optional Course</td>
<td>3-6</td>
</tr>
<tr>
<td>Total Units:</td>
<td>44 – 50</td>
</tr>
</tbody>
</table>
8. Information from the Department of Mathematical Sciences

A. Placement in Mathematics Courses:
Scores from advanced placement exams will be used to place students into one of the following three calculus courses:

- 21-120 Differential and Integral Calculus
- 21-122 Integration, Differential Equations and Approximation
- 21-259 Calculus in Three Dimensions (Calculus of 2 and 3 variables.)

If you will be majoring in Biological Sciences or Chemistry, you are not required to take 21-259. If your advanced placement credit satisfies your calculus requirements, you will not be required to take additional calculus courses unless you wish to pursue further study in mathematics. However we do recommend that if you receive AP credit for 21-120 and 21-122 that you take 21-124 Calculus II for Biologists and Chemists in the Spring semester.

B. Mathematics Majors and Minors:
The department offers a variety of majors and minors, which are described in detail in the catalogue:

Mathematics Degree Options  Currently there are five concentrations:

- Mathematics
- Operations Research and Statistics
- Statistics
- Discrete Mathematics and Logic
- Computational and Applied Mathematics

Students who are intending to major in mathematics, and who already have advanced placement credit for 21-120 and 21-122, should consider taking one of the following schedules in their first semester:

- If you **DO** have prior experience with writing elementary proofs:
  - 21-127 Concepts of Mathematics
  - 21-141 Matrices and Linear Transformations
- If you **NOT** have prior experience with writing elementary proofs:
  - 21-127 Concepts of Mathematics
  - 21-259 Calculus in Three Dimensions

Students who are exceptionally well-prepared may also consider the undergraduate honors sequence, which is described in detail in the following section.

C. Mathematical Sciences Undergraduate Honors Courses:
The department has an undergraduate honors sequence. Courses in the honors sequence emphasize mathematical reasoning, problem solving and proof writing. These courses go at a rapid pace, have challenging problem sets and examinations, and demand a very substantial investment of time outside the classroom.

Admission to these courses requires the permission of the department. While there is no official minimum test score for admission, students who are admitted to the honors sequence typically have a score of **5 on the AP Calculus BC Exam, a combined Math SAT I and II scores of at least 1580, and prior success in writing Elementary Proofs.** The core undergraduate honors courses are:
• First Year: fall and spring
  o 21-242 Matrix Theory (honors version of 21-241 Matrices and Linear Transformations)

If you are interested in taking this course, you must answer the following questions in one or two paragraphs on the online MCS Freshman Registration Form:
  i. Please describe the mathematics courses that you have taken to this point, in particular, courses that require mathematical reasoning and proof.
  ii. Please explain why you would like to take 21-242 and how it would impact your first semester at Carnegie Mellon.

• First Year: spring
  o 21-269 Vector Analysis (honors version of 21-268 Multidimensional Calculus)

• Sophomore Year: fall
  o 21-237 Math Studies Algebra I (honors version of 21-373 Algebraic structures)
  o 21-235 Math Studies Analysis I (honors version of 21-355 Principles of Real Analysis I)

• Sophomore Year: spring
  o 21-238 Math Studies Algebra II (honors version of 21-341 Linear Algebra)
  o 21-236 Math Studies Analysis II (honors version of 21-356 Principles of Real Analysis II)

The department may offer honors versions of other courses. There is also a "graduate stage" of the honors program, in which students take graduate courses, write an honors thesis and receive a masters degree at the same time as the bachelors degree: please note that a) There is a separate admissions process for the graduate stage b) The undergraduate honors sequence provides a good background for the graduate stage, but is not a prerequisite for admission.

Important timetabling issue: if you are interested in pursuing the undergraduate honors sequence, you should plan on taking 21-127 and 21-242 in the fall of your freshman year and then taking 21-269 in the spring.

D. Sample Fall Schedule for an intended Mathematical Sciences Major

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-xxx Calculus Course</td>
<td></td>
</tr>
<tr>
<td>or 21-241 Matrices and Linear Transformations</td>
<td>10</td>
</tr>
<tr>
<td>21-127 Concepts of Math</td>
<td>10</td>
</tr>
<tr>
<td>xx-xxx Science Core Course</td>
<td>9-12</td>
</tr>
<tr>
<td>76-101 Interpretation and Argument</td>
<td></td>
</tr>
<tr>
<td>or xx-xxx Humanities or Social Sciences Course</td>
<td>9</td>
</tr>
<tr>
<td>99-10x Computing @ Carnegie Mellon</td>
<td>3</td>
</tr>
<tr>
<td>xx-xxx Optional Course</td>
<td>3-6</td>
</tr>
<tr>
<td>Total Units:</td>
<td>41-50</td>
</tr>
</tbody>
</table>
A. When you are completing your Fall Registration Form, you will see that you have a choice between two introductory physics courses: Physics for Science Students I (33-111), and a more advanced version, Matter & Interactions I (33-131). If you have a strong interest in physics and have a good high school preparation in physics, you may wish to register for the more advanced course (33-131), which is more challenging and requires substantially more work, including a significant computer programming component.

Both courses stress the atomic structure of matter, and the connections between microscopic and macroscopic views of phenomena. In addition to treating classical (Newtonian) physics, important themes are the limitations of classical physics and the need for quantum mechanics and relativity. An important emphasis is physical modeling: the prediction and explanation of physical phenomena starting from fundamental principles, making appropriate simplifying assumptions and approximations.

Who should take 33-131 Matter and Interactions I?

- If you scored a 4 on the AP Physics C: Mechanics exam or 750 or greater on the Physics SAT II exam, we encourage you to take Matter and Interactions I.
- In addition, if you have a 5 on the AP Physics C: Mechanics exam (and therefore qualify for AP credit), we encourage you to take Matter and Interactions I since it will be substantially different than the physics you took in high school and will lead you smoothly into the Physics curriculum. In this case, you will forfeit your AP credit.

B. Sample Fall Schedule for an intended Physics Major

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-xxx Calculus Course</td>
<td>10</td>
</tr>
<tr>
<td>33-111 Physics for Science Students I</td>
<td>12</td>
</tr>
<tr>
<td>xx-xxx Science Core Course</td>
<td>9-10</td>
</tr>
<tr>
<td>76-101 Interpretation and Argument</td>
<td>9</td>
</tr>
<tr>
<td>or xx-xxx Humanities or Social Sciences Course</td>
<td></td>
</tr>
<tr>
<td>99-10x Computing@Carnegie Mellon</td>
<td>3</td>
</tr>
<tr>
<td>xx-xxx Optional 3-6 Unit Course</td>
<td>3-6</td>
</tr>
</tbody>
</table>

Total Units 43 – 50 units

*See page 2 for a list of courses.*
The Carnegie Mellon University Health Professions Program (HPP) is an advising resource for students interested in pursuing a career in a health profession (e.g. medicine, dentistry, veterinary medicine, pharmacy, physical therapy, etc.).

The program provides the following opportunities:

- Exploration of careers in the health professions.
- Assistance with planning for health career applications. This entails guidance on coursework as well as on extracurricular and research opportunities.
- Application support, including pre-health committee meeting and letter process.

If you are interested in exploring and/or preparing for a health profession, visit the web address below and click on the link to enroll in the HPP program. You will be placed on the HPP email distribution list, which is the easiest way to stay informed about events, procedures, and opportunities. It is never too early to begin planning for your future!

http://www.cmu.edu/hpp/

A note about AP credit

Many health professions schools (e.g. medical schools) do not encourage or accept AP credit for their prerequisite courses (Biology, Chemistry, Physics, Math & English). Students interested in these careers should consider one of the following plans to ensure that they remain competitive for admissions.

1. Take Carnegie Mellon’s introductory sequence despite the availability of AP credit. Many students with AP credit find that they are challenged in Carnegie Mellon's introductory courses. This can build a more solid foundation for advanced study. Students are encouraged to take the honors level version of Modern Chemistry: 09-107 - Honors Chemistry: Fundamentals Concepts and Applications and the honors level version of Modern Biology: 03-151 - Honors Modern Biology, if you qualify to place into those courses.

2. Accept the AP credit you have earned and then take an upper level course in the same discipline or sub discipline. The general guide would be to take upper level courses that have the introductory courses as a prerequisite. For example:
   - With AP credit for Chemistry, one could demonstrate mastery of the material by taking a course in Inorganic or Physical Chemistry (but not organic chemistry, which is also typically required).
   - With AP credit for Physics, one could demonstrate mastery of the material by taking Physics III or another upper level Physics course such as Stars Galaxies and the Universe, Introduction to Computational Physics, or Nanoscience and Nanotechnology.

3. Consult with the Health Professions Program (http://www.cmu.edu/hpp/) or the Mellon College of Science advising staff if you have questions.
11. Glossary

*Advanced Placement Credit*
Credit awarded because of scores on an Advanced Placement Exam. See the enclosed Mellon College of Science Advanced Placement Policy.

*Free Elective Courses*
Any Carnegie Mellon course. The curriculum for each major in MCS allows for a designated number of free elective courses. Free elective credit is counted toward your total units for graduation. No more than a combined total of nine units of free elective credit can come from physical education and military science courses.

*Full-Time Student*
A Carnegie Mellon student carrying 36 or more units during a semester. Students carrying a full time load as of the tenth regularly scheduled class day may not drop below 36 units after that day.

*Mini Course*
A course lasting just half a semester—7 weeks. Mini courses either begin on the first day of the semester (ending at midsemester) or begin in the eighth week of classes (ending on the last day of the semester).

*Science Core Courses*
The foundation of science courses required by all departments in the Mellon College of Science. The requirements are two semesters each of calculus and physics and one semester each of biology, chemistry and computer science. See Page 2 for the list of courses.

*Transfer Credit*
Credit awarded based on courses taken at another college or university. Students need to submit a course description and an official transcript in order to be granted credit. Grades for transferred courses are not factored into the Carnegie Mellon QPA.

*Units*
Three units at Carnegie Mellon equal one credit at other universities. For example, a nine-unit course is one that requires on average nine hours of work per week. If the class meets three hours per week, on average six additional hours of study are required outside class. At many universities, such a course would be described as a “three-credit” course, and it is assumed that for each “credit” (class hour) students do two hours of study outside of class.