

# A Resource Guide in Mathematics, Physics, and Chemistry for Earth and Atmospheric Sciences Majors

by Pragnyadipta Sen, SUNY Oneonta

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**Purpose:** The purpose of the document is to help Earth and Atmospheric Science majors, or for that matter, any student struggling with basic sciences in college to develop a better understanding of Mathematics, Physics, and Chemistry and to improve their chances of success in those classes during their undergraduate career.

**Caution:** The resources listed below do not replace going to lectures, labs, recitations, CADE, hard work, and critical thinking involved in understanding course material.

In the following sections, I provide a number of easily accessible online resources including short (5-10 minute) to full-length (50-80 minutes) video lectures, resource pages, and software to help students study on their own. Each student learns a topic/concept differently and at a different pace. The primary purpose of this document is to make resources available to students so they can learn at their own pace. These resources will provide you a different approach and perspective on the topics and will help you internalize and understand concepts you are struggling with or need a little help with.

If you have other helpful links, please email them to me [pragnyadipta.sen@oneonta.edu](mailto:pragnyadipta.sen@oneonta.edu)

## Mathematics

The **Geology major** program requires students to take Calculus I (MATH 173) and Calculus II (MATH 174). The **Meteorology major** program requires students to take Calculus I (MATH 173), Calculus II (MATH 174), Calculus III (MATH 276) and Ordinary Differential Equations (MATH 277).

1. Compile a detailed formula sheet for each mathematics class and use it while doing homework.
2. [Highlights of Calculus- The Big Picture and Applications of Calculus](#) This video series is particularly good since it tells you what calculus is all about and used for. This series of video tells you what and why we use differentiation and integration. Students are strongly encouraged to review this video first.
3. [Mathematics from Khan Academy](#) Short videos of different branches of mathematics with short practice problems to develop understanding of the concepts. This series is very good for a quick review of concepts students may have forgotten. Videos are no more than 5-10 mins long.
4. [Calculus by Dr. Richard Delaware-Univ. of Missouri](#) An excellent, organized, and detailed video series. The professor walks you through the concepts by writing them on paper accompanied by lucid discussions and examples. The student can follow him easily. The videos are 50 mins or longer.
5. [Calculus by Bob- Short videos by energetic professor](#) A fun and energetic teacher. The videos are short and instructive.
6. [Single Variable Calculus videos from MIT- Fall 2007](#) This series contains class videos from single variable calculus taught at MIT in Fall 2007 by Dr. David Jerison.
7. [Multiple Variable Calculus videos from MIT Fall 2007](#) This series contains class videos from multiple variable calculus taught at MIT in Fall 2007 by Dr. Dennis Auroux.
8. [Single Variable Calculus- MIT webpage with videos, lecture notes, exams](#) This webpage provides lecture notes, assignments and exams for MIT's single variable calculus course. Links are available for more recent semester classes.
9. [Multiple Variable Calculus - MIT webpage with videos, lecture notes and exams](#) This webpage provides lecture notes, assignments and exams for MIT's multiple variable calculus course. Links are available for more recent semester classes.
10. [Free Mathematics Videos](#) This link contains multiple links to different fields of mathematics e.g., calculus, linear algebra, trigonometry etc.
11. [Calculus Videos](#) A series of videos regarding topics in calculus I and II.
12. [Mathematics Stack Exchange](#) A forum to ask questions regarding mathematics problems.
13. [Differential Equations - MIT](#) Video of differential equations lecture at MIT. This series contain 50 min to an hour long videos on differential equations taught at MIT in Fall 2006.
14. [Partial Differential Equations](#) A series of short videos on partial differential equations
15. [Linear Algebra - MIT](#)

Software: Please note step-by-step solution may require a purchase of the software.

1. [Symbolab Calculus Helper](#)
2. [Wolfram Alpha- Calculus](#)
3. [Calculus Assistant by MathXpert](#)

Books: I am providing links to Amazon so you can get all the necessary information about the book. This list is in no way an exhaustive list of excellent calculus books but a starting point for students struggling with calculus

to find a book that speaks to them! Look for these books in the library or request them through the library and see which book appeals to you.

1. [The Calculus Lifesaver](#)
2. [How to Ace Calculus: A Streetwise Guide](#)
3. [How to Ace Calculus: A Streetwise Guide - Multivariate Calculus](#)
4. [Humongous Book on Calculus Problems](#)
5. [Calculus: A Physical Approach](#)
6. [Mathematics for Non-Mathematicians](#)
7. [Essential Calculus Applications](#)
8. [No Bullshit Guide to Mathematics and Physics](#)

## Physics

The **Geology major** program requires students to take General Physics I- Non-Calculus (PHYS 103) and General Physics II- Non-Calculus (PHYS 104). The **Meteorology major** program requires students to take General Physics I (PHYS 203) and General Physics II (PHYS 204).

1. Compile a detailed formula sheet for each class and use it while doing homework.
2. [Physics from Khan Academy](#)
3. [Physics I from MIT](#)
4. [Physics II at MIT](#)
5. [Physics I lectures at Univ. of Missouri](#)
6. [Physics II lectures at Univ. of Missouri](#)
7. [Physics I lectures at Yale University](#)
8. [Physics II lectures at Yale University](#)
9. [Video lectures in Physics](#)
10. [Physics Stack Exchange](#)

## Chemistry

The **Geology major** program requires students to take General Chemistry I (CHEM 111) and General Chemistry II (CHEM 112). The **Meteorology major** program requires students to take General Chemistry I (CHEM 111).

1. [Chemistry from Khan Academy](#)
2. [Chemistry Stack Exchange](#)
3. [General Chemistry](#)
4. [General Chemistry at MIT](#)
5. [Video lectures in Chemistry](#)

**Study Technique:** The key to success lies in putting in sincere effort, being patient, and keeping at it. So let us spell out what you need to do to succeed in a class, in this case Mathematics, Physics, and Chemistry.

- a. You must have a desire to succeed.
- b. You must be curious and always thinking about how you can apply a new technique learned in Mathematics/Physics/Chemistry to your discipline of choice. You cannot think that “I won’t use anything from this class ever in my life” because you never know what you learn in a class will be

helpful later in life. Think of yourself as a certain caped superhero with a toolkit and the different classes are the tools you are procuring for different scenarios that life might throw at you.

- c. Do not allow common excuses like “I don’t understand the teacher”, “the teacher is horrible”, “this is too hard for me”, or “I don’t have time” to distract you from your goal of succeeding, even if those assertions are true. It is your job to ensure that you do everything (lawfully) within your powers to overcome the challenges that are holding you back.
- d. Set aside some time (a minimum of 1 hour) every day for working on the subject you are struggling in. If you need more time, find that time.
- e. Develop a system where you study a concept from the resources you have, including the resources in this guide, your textbook, and then solve pre-solved examples in your book/class notes/examples in the resources followed by solving problems from your assignment/textbook.
- f. You may feel frustrated, but it is natural to feel this way when learning new and challenging concepts. There will be numerous occasions when you will not be able to make any headway despite your sincerest efforts. Take a 5-15 minute break and then try again.
- g. The best way to completely understand something is to do it over and over again. Review material often. Do not take shortcuts as they will harm you more than help.
- h. Do not be afraid to ask questions and seek help. Often students are afraid to ask questions because they think they might make themselves look silly. We put enough embarrassing things on social media for the world to see so there is no shame in asking something that seems simple. Wouldn’t you rather look silly for 5 minutes than earn a bad grade on your assignments and exams, thereby affecting your GPA.
- i. Think, Think, Think.....Think some more. Try and figure out what is it that you have to solve and break down the problem into smaller manageable parts.
- j. Plan out your classes carefully with your academic advisor.