

NASC103 - Physical Science

Spring Semester 2016 COURSE INFORMATION

Instructor

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Office Hrs : Monday and Wednesday, 11 - 11:50 AM; or by appointment.
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The Course

The overall goal of the course is for you to gain an understanding of how science works, as a process, by studying the role of energy in our society. Energy plays a critical role in our lives and has a significant impact on our collective culture. Energy-related issues are extremely important and will become more so in the coming decades. My hope is that you will gain some insight into the processes underlying scientific inquiry and an appreciation for the complexity of the issues surrounding energy use so that you can make informed decisions in the future. Along the way, we will touch on aspects of physics, astronomy, chemistry, meteorology, geology, and politics. Above all, have fun with this course! Question everything about this beautiful and complex universe we live in!

Physical Science is a Natural Science Division course designed for non-science majors. The only prerequisite is a high school education (curiosity helps, though!). The mathematical level of this course will generally not exceed basic high school algebra. The course fulfills three credit hours of the *General Education/ Natural Science* or *Core/The Natural World* requirement for graduation.

Class Meetings

The class times are from 9:00 - 9:50 AM, M, W, & F, in SCIC 202. Class meetings are very important to this course; attendance is expected and required. It is your responsibility to inform me of any anticipated absences from class meetings or exams. Work done in class can only be made up if you have an **excused absence**; it is your responsibility to inquire about and pursue any make-up work. If you miss class due to a college-sponsored function (e.g., field trip, athletic game), your work is still due at the same time as for your classmates, so you will need to make arrangements to have your work turned in (perhaps by a **Base Group** member - see below).

In class, we will discuss themes from the text as well as many supplemental topics. To facilitate discussion of course material, we will frequently work in groups (see details below). Much of the group work will be collected and graded. Some group projects may extend over several class periods. Hence, class participation is a requirement for this course. Reading the appropriate sections of the text and working on homework before class are essential course requirements as well. The order of topics and relevant sections of our main text are listed below; I will keep you posted on the current reading assignments. You will need a calculator - bring one to each class meeting. One that does scientific notation is best; at minimum, it should be able to do square roots! (BTW, you will not need a cellular phone during class; please insure that yours is OFF during class meetings. All cell phone use during class is prohibited; use will result in point deductions.)

Text and References

One of our main resources is the free, downloadable textbook, **Sustainable Energy- Without the Hot Air**, by David JC MacKay (UIT, Cambridge, 2009). You can download it at www.withouthotair.com/. Other readings will be from materials on the World Wide Web; in particular the U.S. Energy Information Administration website (www.eia.gov) will get some heavy use. I will operate the course with the assumption that you have read all of the assigned material by each deadline. It will be important for you to read difficult sections several times and to take notes on questions that you have about unclear material. Bring these notes with you to discuss in class (or meet with me outside of class, if you prefer). You will probably encounter much new vocabulary in the text. To help you become familiar with important terms used in discussions of energy, I will give you weekly list of **Key Terms** that you should know for the next Monday meeting.

A class Web Page is accessible through the Manchester College Home Page via the Department of Physics. Through the web page you can access **Key Term** lists and other fascinating stuff. The direct URL is <http://users.manchester.edu/Facstaff/GWClark/NASC103/index.htm>.

Homework and Quizzes

Homework will be assigned weekly on Wednesdays and will be due the following Monday. Assignments will be from the end-of-chapter **Questions, Problems, & Further Activities** sections in the text and from additional questions and/or projects placed on the web-site. Homework will also likely include a few small projects (e.g., solar cooker design). Homework must be done on loose-leaf 8.5" x 11" paper (I will not accept any work on paper ripped out of spiral-bound notebooks). Be sure you *understand* the answers to the homework. We will go over any questions about the homework in **Base Groups** (see below). Not all homework will be collected, but the homework will help prepare you for class meetings and quizzes. Collected homework will be spot-checked; I will choose the questions to be graded randomly. All work in this course should be *legible* (if you want it graded!).

We will have weekly Monday quizzes [except on 14 Mar 2016] for a total of twelve quizzes. Your lowest quiz score will be dropped. The format of the quizzes will typically be a combination of short answer, multiple choice, essay, and/or problems (as will the exams). It is important that you know and understand terms from the **Key Term** lists - *some will be on each quiz!* There will be **NO** make-up quizzes. If you have an **excused absence**, a missed quiz score will be replaced by the average of your other quizzes at the end of the semester. You will have the opportunity to add bonus points to each quiz with successful **Base Group** work (see below).

On homework, quizzes, and exams your job is to explain to me your understanding of the material. On quizzes and exams, in particular, explanations of concepts will get you more credit than single-word answers, in most cases (although there will be times when I simply ask you for specific terms). On problems involving calculations, you must show all your mathematical work and/or explain the procedure that led you to your answer; simply writing down a number will result in no credit.

Laboratories

We will have **laboratory** experiences for this course every other week, beginning the week of 08 Feb 2016 in room SCIC 131) for a total of six labs. The labs will help you gain some practical insight into our work. During labs weeks, the Wednesday class will not meet. You will have a laboratory session during each of the following weeks:

LAB 1: Week of 08 Feb - 12 Feb
 LAB 2: Week of 22 Feb - 26 Feb
 LAB 3: Week of 07 Mar - 11 Mar

LAB 4: Week of 28 Mar - 01 Apr
 LAB 5: Week of 11 Apr - 15 Apr
 LAB 6: Week of 25 Apr - 29 Apr

Some lab work will be tied directly to homework (e.g., solar cooker design). A calculator for laboratory work will be extremely useful. Please bring a calculator with you to all lab meetings. Make-up labs will **only** be allowed for excused absences; it is **your responsibility** to see me about make-up work. Additionally, you may only change lab sections with prior permission from me.

Free Points!

Minute Papers: Occasionally, we will take some time to write one or two lines each on two questions:

1. What is the most important/interesting thing you have learned since the last "minute paper?"
2. What are some questions you have about the material covered?

For each **complete** minute paper that you hand in, you will receive one percentage point which will be added to your exam scores at the end of the semester. Half of these will be applied to the midterm and half to the final. You must be present to hand in a minute paper.

Current News Article: You may bring in a photocopy of a **current** (i.e., within the past seven days) newspaper or popular magazine article (e.g., Time, Newsweek) relating to an energy issue to earn *Minute Paper Points* (WWW sources and scientific journals are excluded from this offer!). The article will be posted on the bulletin board in the classroom. To earn points, the date, source, and your name must be indicated and the story must be on an event/topic that was not previously reported by other students' news articles. On occasion, quizzes may refer to these articles - be sure to check out the bulletin board every day. [Limit one article per student per week; six articles for the semester!]

Examinations and Grading

We will have one cumulative *in-class* **midterm examination** on Friday, 11 Mar 2016 and a **cumulative final** during Final Examination Week (time to be published by Office of the Registrar). Please note that the exam dates and times are set and will not be changed due to student vacation or travel plans! The breakdown for the course grade will be as follows:

Quizzes	30%
Graded Homework, Class Participation, Group Work	25%
Laboratory Work	10%
Midterm Exam - Friday, 11 Mar 2016	15%
Final Exam - Date & time TBA	20%

Plagiarism

Plagiarism will not be tolerated and will result in the forfeiture of the work involved with no opportunity to make up that work. *Exception:* cheating on exams will result in a **failing grade for the course**. *The presence of work (labs, homework, etc.) from previous offerings of this course in class or in lab is not allowed and will be treated as plagiarism.* Although you are **expected** to work together on homework and to discuss the material from this class, any work you hand in should be an expression of **your own understanding** of the material, *unless* an assignment is specifically given to a group.

Course Topics

An approximate order of topics is listed below. Please keep in mind that this outline is tentative (and ambitious!), but it will give you some idea of where we will be going if you'd like to read ahead in the text, **Sustainable Energy- Without the Hot Air** (*SEWTHA*). WE will also use selections from the text **Physics for future Presidents** (*PFFP*). For some chapters we will only be doing partial coverage. We will also be making extensive use of other web resources. I will give you specific reading assignments each Wednesday that are to be completed by the following Monday.

<u>TENTATIVE TOPICS</u>	<u>READINGS</u>
I. Why Energy? Energy overview, the scientific study of energy-related issues, what is science? climate change and ozone depletion.	<i>SEWTHA</i> Ch. 1; <i>PFFP</i> Ch. 10
II. Energy Basics: Work, energy, and power. Energy forms and conversion, numbers & units, conservation.	<i>SEWTHA</i> Ch. 2
III. Energy Uses: Transport, residential, industrial, & commercial.	<i>SEWTHA</i> Ch. 3, 5, 7, 9, 11, 13, 15, 20, 22
IV. The Physics of Energy: Law of conservation of energy, heat engines & power plants, the laws of thermodynamics.	<i>PFFP</i> Ch. 1
V. Nonrenewables: Fossil fuels - coal, natural gas, and petroleum.	EIA website and others
VI. Nonrenewables: nuclear power	<i>SEWTHA</i> Ch. 24
VII. Renewables: solar energy, light, hydropower, and wind power	<i>SEWTHA</i> Ch. 4, 6, 10, 12, 14, 16
VIII. Epilogue; Where do we go from here?	

GROUP WORK

Base Groups

Most Mondays, we will begin class with a **Base Group** meeting. You will be assigned to a Base Group and remain with the same Base Group for the term. Ideally, your Base Group that will provide you with additional support, encouragement, and assistance needed to make academic progress. Base groups personalize the work required and the course learning experience. You should be sure to exchange phone numbers and schedules with your base group members as you may wish to meet or chat outside of class. **All** members are expected to participate actively in class discussions, work to maintain effective working relationships with other participants, complete all assignments, assist classmates in completing their assignments and express their ideas. I encourage you to increase your ability to check the accuracy of your groupmates' explanations. Think critically; interact cordially!

In your base group meetings, you should:

- Congratulate each other on survival since the last meeting and check if anyone is under any undue stress.
- Check to see if members have completed their homework or need help/assistance doing so. Insure that each member gets answers to his/her specific questions! Insure that all group members understand the homework.
- Work together to complete any Base Group Assignments, staying on task and insuring that all contribute. Insure that all group members understand the answers given to the assignment.

In order to facilitate these objectives, a suggested procedure will be included each week in your Base Group Folder.

If all members of your Base Group achieve a quiz score of 80% or above, bonus points will be added to the quiz score of each member. The same holds for the Midterm and Final exams, but with a 70% cut-off.

Base Group meetings are **NOT** intended to be times for beginning or copying homework. You must show up with your homework completed, except, perhaps, for a few questions/problems with which you are having difficulty. During Base Group meetings, your homework should be out and visible so that I and your partners can see it. Do not show up to your Base Group meeting without a significant amount of your work done. If you are completely lost on an assignment, you should seek me out before the work is due. I will monitor and grade you on your Base Group participation. Those who do not abide by Base Group expectations will not receive Base Group participation credit. If you are having problems with one of your Base Group members (not contributing, no homework, etc.) please let that person know that their behavior is not acceptable. If problems persist, please inform me.

Informal Group Work

Often, we will work on questions and problems during class in pairs; we will utilize the following procedure:

1. Each student **formulates** his or her answer.
2. Students **share** their answer with their partner.
3. Students **listen** carefully to partner's answer. Don't change your mind unless persuaded by logic or information to do so.
4. Pairs **create** a new answer that is superior to or incorporates each member's initial answer by synthesis, critical analysis, and cooperation.

Formal Group Work

We will occasionally work in the context of **Formal Groups** formed for specific tasks. All members are expected to participate actively, work to maintain effective working relationships with other participants, assist classmates, express their ideas, not change their minds unless persuaded by logic or information to do so, and indicate agreement with the group's work, in writing. You will get more information on these groups as they form!

One lesson, Nature, let me learn of thee. ♣ Matthew Arnold

Every now and then things become clear. ♣ Jane Siberry

God used beautiful mathematics in creating the world. ♣ Paul Dirac

The Book of Nature is written in mathematical characters. ♣ Galileo Galilei

Manchester University Essential Information

Title IX reporting requirements

While students should feel comfortable approaching the professor with issues they may be struggling with or concerns they may be having, students should be aware that faculty members have some reporting requirements that are part of their job duties at Manchester University.

For example, if a student informs a faculty member of an issue of sexual harassment, sexual assault, or discrimination, the faculty member will keep the information as private as possible, but the faculty member is required to bring it to the attention of the institution's Title IX Coordinator (x. 5052 ajmachielson@manchester.edu) or the Human Resources office (ext. 5038). Additionally, students can report incidents or complaints to Campus Safety (ext. 5999 or in Fort Wayne: 260-266-1800). Students can also obtain support from the University Counseling Services (260-982-5306).

Finally, students should know that if, for some reason, the interaction between a student and faculty member involves a disruptive behavior or potential violation of policy, the faculty member will inform the appropriate student experience staff, even when the student and faculty member may have reached an informal resolution to the incident. The purpose of this is to keep University leaders apprised of any behaviors and what was done to resolve them.

Campus resources

Health services 260-982-5306

<http://www.manchester.edu/OSD/Health/Index.htm>

Counseling center 260-982-5306

<http://www.manchester.edu/OSD/Counseling/Index.htm>

Safety NM: 260-982-5999; FW: 260-266-1800

<http://www.manchester.edu/OSD/Security/index.shtml>

Student disability and reasonable accommodation statement

Manchester University, in compliance with federal guidelines, is committed to assuring students with disabilities equal access to programs and activities that are provided to students without disabilities.

Any student who feels she or he may need an accommodation based on the impact of a disability should contact support services for students with disabilities, to establish eligibility and to coordinate reasonable accommodations. It is the student's responsibility to self-disclose the disability. Students whose accommodation requests are approved will be provided with confidential letters to deliver to their professors which verify the nature of the student's disability and document the need for auxiliary aids and services and/or academic adjustments/accommodations. Students are encouraged to meet with each professor early in the semester to discuss the academic implications of the disability as they relate to the specific course and to request appropriate accommodations. The Disabilities Office is located in the Success Center (second floor of the Switzer Center). Students may call 982-5076 or 982-5888 to schedule an appointment.

Medical emergency evacuation schedule

Students should speak to the instructor immediately if (1) they may require medical attention during class, or (2) they have a disability, chronic condition, or a temporary injury that may limit or affect their ability to evacuate the classroom/building in an emergency. The student and the instructor should discuss the student's specific needs and the types of precautions that should be made in advance of such an event. In the event of a fire or other situation requiring emergency evacuation, students with ambulatory disabilities are to go with or without assistance to the nearest stairwell area. Faculty and staff will assist with evacuation management efforts until such time as the Campus Safety and/or Police and Fire Departments arrive on the scene to assist in student evacuation from the building. Elevators are not to be used for evacuation by any persons.

Students who need special arrangements in the event of an evacuation should also register with support services for students with disabilities as early as possible in the semester to help facilitate the provision of needed emergency assistance.