

# Self-Study of the Geo/Physical Sciences Department

March 24, 2015

γράφον οὖν ἃ εἶδες καὶ ἃ εἰσὶν καὶ ἃ μέλλει γενέσθαι μετὰ ταῦτα.  
*Rev. i.19*

Write, therefore, the things you see,  
both the things that are and the things about to happen after these.

felix, qui potuit rerum cognoscere causas,  
atque metus omnes et inexorabile fatum  
subiecit pedibus strepitumque Acherontis avari.

Virgil, *Georgicon* II.490-492

Happy, who had the skill to understand  
Nature's hid causes, and beneath his feet  
All terrors cast, and death's relentless doom,  
And the loud roar of greedy Acheron.

translated by J.B. Greenough

Sweet blossom, come on under the willow, we can have high times if you'll abide.  
We can discover the wonders of nature, rolling in the rushes down by the riverside.

Robert Hunter

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# Chapter 1

## Departmental Overview

### 1.1 Prolegomena

The Geo/Physical Sciences Department comprises the fields of Earth Systems Science, Geographic Science & Technology, and Physics.

Among the various sections that a Fitchburg State departmental self-study should have is an overview which includes both recommendations made by the previous external reviewer and a determination whether discipline-specific “best practices” are being followed. Neither of these two is found here. At the time of our previous self-study the university was unable to secure the services of an external reviewer. In neither Earth Systems Science nor Geographic Science and Technology (more generally known as Geography) do the national academic societies officially prescribe best practices or even a standard undergraduate curriculum. The same holds true for Physics, although that is less of an issue, as we do not have an active physics major.

### 1.2 General Overview

#### 1.2.1 Recent History

From September 1, 2007, we numbered five faculty members. A request was made to hire a new geographer (a social geographer with professional interests in environmental science), a new earth systems scientist and a new physicist. A search for the new earth scientist was started in the fall of 2012 and successfully concluded with the hiring of Dr. Reid Parsons in 2013. From September 1, 2013, we number six, a size which will allow us to rely less on adjuncts, to revive dormant courses and to create new ones.

Prior to June 2012 physics instruction took place in the Condike Science Building, while geo instruction was held in the McKay C Wing. From that time on physics joined geo in the McKay building while Condike was being renovated, although some offices were relocated to the lower level of the Sanders Administration Building. In June of 2014 the renovated Condike was opened for one summer course, a forerunner of the opening to a full schedule of courses in the fall.

### 1.2.2 Evaluation of our 2008 Plans for Change

From our previous self study:

Within five years we expect the Geography major to be more human oriented, and the Earth Systems Science major will live up to its name, one that is implicitly interdisciplinary, integrating as a *gestalt* the study of our planet's physical components (geosphere, hydrosphere, atmosphere, biosphere and anthrosphere). Within the latter major we expect there to be two tracks, an Earth Systems Science track and an Environmental Science track.

Although we continue to offer geography courses with a human focus, e.g., U.S. & Canada and Urban Geography, we have instead accentuated the technological aspect, to the point of renaming the major as Geographic Science & Technology (GST). By renaming the major we also hope to address a misunderstanding that geography students concentrate on memorizing state capitols *etc.* In this we take advantage of Prof. Jane Huang's strength in physical geography and in particular on technology and analysis. The Earth Systems Science (ESS) major continues to manifest its interdisciplinary nature, in particular with more emphasis on climate change. And, as mentioned earlier, we no longer use the terminology of 'tracks,' nor do we have officially recognized concentrations within the majors.

#### Geography [now known as Geographic Science & Technology]

From our previous self study:

We expect the Geography major to have greater interaction with other departments than it currently does. We further expect that some of the advanced courses will be offered by faculty in the Social Science Department, e.g., political, regional and economic geography.

There has been some increase in interaction (cf. §1.2.10 below), but so far all of the GST courses are taught by our faculty and adjuncts. There has been an increase in students from other departments taking minors in both GST and ESS, but as we were starting out with no minors at all, it is difficult to ascribe the increase to a particular aspect of our program.

In the table below are data from the Fitchburg State Office of Institutional Effectiveness and Research (hereafter Institutional Research) stating the number of minors in recent years. It seems that the renaming of the majors may be reflected in the numbers given, e.g., we did not go from zero ESS minors to 17, nor did the number of GST minors go from 4 to 21 to 8. Most likely, the 21 in 2011 refers to both minors together.

Minor	2010	2011	2012	2013	2014
Geographic Science & Technology	4	21	8	11	7
Earth Systems Science	0	0	17	11	5

**Minors and Option B LA&S Program**

From our previous self study:

The Department of Geo/Physical Sciences is well positioned to serve our campus-wide community and meet the demands and the intent of the framers of the LA&S Program to “encourage many students to take minors.” We do not expect a substantial change to our current flexible requirements for a minor which allow students to create in consultation with their Geography/Earth Science advisor a coherent program of study based on the core courses but tailored to match the interests and educational goals of each individual student within any degree track offered by the department.

There has been a substantial change to our requirements for minors. Previously, all that was required was for a student to take GEOG 1000 and five additional courses. Now each minor plan has a different core that students must satisfy; cf. Table 4.2. Fitchburg State students have a few different paths to satisfying Liberal Arts & Sciences requirements. One of these is to pursue a “mini minor,” a coherent plan of four courses that have the same prefix (e.g., GEOG). Not many students choose GEOG as their Option B to satisfy their LA&S requirement; furthermore, the changes are of recent vintage, so it is not meaningful at this point to attribute any change in the number of students taking our minors to our efforts. However, we have maintained a robust number of declared minors.

**Service Courses**

From our previous self study:

Without sacrificing our commitment to our majors the department intends to continue to offer courses to non-majors, including service courses for other departments and courses to satisfy Liberal Arts and Sciences requirements. In particular we expect Earth Systems Science, Principles of Human Geography, Physics I and II, Physical Science I and II and Astronomy will be offered every semester, as done currently; moreover, at least one other lab science course is offered each semester (Geology, Meteorology, Oceanography and Earth, Sea & Air). We hope to expand our offerings across disciplines, e.g., connections to Criminal Justice and Industrial Technology.

We have continued to offer this variety of courses; however, beginning with the fall semester of 2014 Physical Science I will be offered bi-annually. This change is due to the increased teaching load the physicists have in teaching General Physics in a studio format. Furthermore, additional service courses have been added, *viz.* the Honors Seminar in Geo Science and Climate Change & Human History, both so far offered only by Prof. Gordon. These are also the only courses we’ve established that explicitly cross into other departments.

From our previous self study:

Consonant with an Environmental Science major is an increased exploration of the scientific and technological aspects of energy issues. This is envisioned as an interdisciplinary venture between the physics part of our department and the Industrial Technology department. Such an undertaking would best be addressed by a new, full-time faculty member based in either department but working in both, and whose work would not be restricted to energy.

This “increased exploration” did not occur, nor was there a new hire with this in mind.

From our previous self study:

There is an increasing interest in introductory physics courses geared toward specific student populations. There has already been some discussion about a Technical Physics course with Industrial Technology students in mind, and we have been approached by the Exercise and Sports Science Department to accommodate their students who will need physics in order to pursue graduate study in their field. We hope to offer Calculus-based Physics in the spring of 2011, in part to address the desire of the Computer Science Department.

The administration appropriately discouraged “boutique” introductory courses, especially since the interest that was evinced five years ago in such introductory physics courses has since disappeared. Exercise & Sports Science students had been taking physics in greater numbers; however, lately that population has decreased. Furthermore, the number of Industrial Technology students has dropped, largely due to the removal of the requirement of Physics II for one concentration in that department. We’ve offered Calculus-based Physics, but only once was there sufficient student enrollment for it to run as a class rather than a directed study. That occurred when Mark Snyder of the Mathematics Department taught Calculus-based Physics I and made a serious recruitment of math majors.

The table below shows the enrollment in the General Physics courses (*i.e.*, not the calculus-based courses), reflecting the significantly greater numbers of Physics I students over Physics II students:

term	Physics I	Physics II
spring 2011	35	25
fall 2011	32	26
spring 2012	65	20
fall 2012	50	40
spring 2013	37	26
fall 2013	49	28
spring 2014	50	11
fall 2014	48	28

## Required Resources

From our previous self study:

We would like to hire a second geographer, someone with a professional interest in the environment. However, to attempt to realize our vision as laid out here the department needs another, full-time, tenure track hire with skills and interest in traditional Earth Systems Science and in Environmental Science, with possible additional strength in teacher preparation. When the new science center is opened at least a third physicist will be needed, perhaps someone with a background in energy issues.

We wound up hiring another geo scientist, Dr. Reid Parsons, a specialist on the Martian surface. He has given us the opportunity to offer GEOG 2100 Geology every semester rather than just once a year. In addition to other courses his repertoire will include Remote Sensing, Geomorphology, Planetary Atmospheres (soon to be renamed Planetary Science) and eventually Astronomy (on a rotating basis). The need for the other hires remains.

**Physics & the Applied Mathematics Concentration**

From our previous self study:

The Applied Mathematics concentration in the Mathematics Department is gaining some numbers. Students interested in following such a concentration would be well equipped to minor in physics.

The number of Applied Math majors is increasing but has not yet reached the point where a physics minor could be supported. In fact, a proposal to initiate a physics minor was tabled by the president because it would *require* independent studies to be offered. Consider our 2009 hopes:

The physics plan of study for a minor would begin early in a student's career with two introductory courses, the algebra-based PHYS 2300 General Physics I or PHYS 2600 Calculus-based Physics I; and PHYS 2400 General Physics II or PHYS 2700 Calculus-based Physics II. This could be followed by a selection from PHYS 3000 General Physics III, PHYS 2000 Astronomy, and independent studies in Intermediate Mechanics, Electricity and Magnetism, Quantum Mechanics and Thermodynamics & Statistical Mechanics.

These advanced physics courses would now have to be offered as independent studies since they have been removed from the catalog.

One math major has in fact taken this path, but because the physics minor proposal was not approved, his effective physics minor is not recognized and not recorded on his transcript as a minor. A second math major has gone as far as Quantum Mechanics.

The establishment of a physics minor has been a long time dream, going back to the 1999 self-study. From the 2009 self-study:

It should also be observed that recently little interest in advanced physics courses has been evinced by students majoring in these areas [education, biology and computer science]; however, in the spring of 2010 four Industrial Technology majors and one Biology major took an independent study in modern physics, a topic of intellectual interest to them but not of professional use. In 2001 Jiang Yu and Lawrence Guth proposed the establishment of a physics minor, but this was defeated by the All Campus Committee.

Bruce Duncan attempted in 2012 to establish a physics minor, but it was tabled by the president, as mentioned above. We have a "chicken or the egg" problem: The administration wanted established courses to be the basis of the minor, but these courses wouldn't be allowed to run as courses unless there were sufficient enrollment and thus, if allowed at all, would have to be directed studies. Without an established minor we wouldn't expect students to enroll here in numbers sufficient for the courses to run. We've had three or four students express an interest in minoring in physics, but they were spread out over three years and couldn't take the classes together. We observe that if the minor could have been established, we would expect it to attract students at the rate typical for schools of our size, roughly two or three per year. That still presents us with a problem of adequate enrollment to justify to the administration that these courses should be run.

Now that Fitchburg State has regained its chemistry major there is a possibility that some years in the future there will be another student pool (besides math majors) for potential physics minors.

## **Human Geography**

From our previous self study:

As there seems to be significant interest both on campus and off in human geography, Prof. Huang has indicated that she would like to teach courses in that area (broadly defined), in particular Urban Geography, and perhaps to develop new courses. The faculty of the History major within the Social Sciences Department has been granted an opening for an Americanist with geography expertise, and as of the time of this writing an offer has been made to one candidate. It could be that Prof. Huang can in part satisfy this need, or a new hire in Social Sciences could help the Geo/Physical Sciences Dept. in its expansion into human and social geography.

This “significant” interest leveled off at a level some what short. Urban Geography has been regularly offered, but our path in the past five years has been toward the technological side, although most of that technology has been directed to human topics. The Social Sciences Department (now called the Economics, History & Political Science Department) did not succeed in hiring someone with geography expertise and no longer has plans to pursue such a hire.

## **The Instrument of Unity and the New Science Building**

The last time all faculty members of our department were housed in the same building was the spring of 2005. In 2013 a new science building was opened, accommodating biology and chemistry labs. That structure is joined to the renovated Condike Science Building (re-opened in the fall of 2014), which contains the offices of all science faculty plus the instructional spaces for ESS, GST and physics, with their support spaces (storage and lab preparation rooms) and rooms for diverse purposes, such as lounges, student study spaces, research labs and collaboration spaces. Our department will now enjoy the benefits of propinquity, both with our immediate colleagues and with our colleagues in biology and chemistry.

## **Revival of the Environmental Science Major**

### **An Interdisciplinary Major**

The idea of an environmental science major has been around for a while, including being mentioned in the 1999 self-study. From the 2009 document:

The 1999 self-study had as one of the goals for the Geo/Physical Sciences Department “[t]o better prepare our students for immediate entry into advanced levels of environmental remediation and consulting.” This goal is adopted here under the umbrella of Environmental Science.

Bruce Duncan initiated discussions among interested parties in this department and in the Biology & Chemistry Department in 2007. These discussions eventually led to potential Four Year Plans of Study, described in detail in the previous self-study; however, as of February 2012 the meetings ceased, as all involved got more concerned in other activities, in particular the members of the other department with the re-establishment of the chemistry major. As of this writing no work is being done towards the realization of an Environmental Science program. At best we provide the opportunity for students under the guidance of a geo advisor to concentrate on the environment while majoring in ESS or GST and taking more chemistry than is usual for our majors.

### 1.2.3 Initiatives and changes

**new science building project** The planning of a new science building started with the convocation of a building committee in the fall of 2005. After a suspension of some years the committee again reconvened, culminating in the fall of 2013 with the opening of the new science building for biology and chemistry labs and in the fall of 2014 with the re-opening of the Condikey Science building, which in addition to generic classrooms and offices for all science faculty houses the labs and storage rooms for Geo/Physical Sciences. The renovated Condikey Wing provides a computer lab (primarily for geography instruction), both a “dry” lab and a “wet” lab for Earth Systems Science instruction, and three spaces for physics instruction. There are lab prep rooms and abundant storage spaces now available.

**renaming of the Earth Science major** In the 2010-11 Academic Year we renamed the Earth Science major to Earth Systems Science. This was done in recognition of advancements in Earth Science that incorporate a systems approach, and followed recommendations of the American Geophysical Union’s “Shaping the Future of Undergraduate Earth Science Education: Innovation and Change Using an Earth System Approach,” to integrate Earth Systems thinking into Earth Science curricula and to develop degree programs in Earth Systems Science. Among our sister institutions, we are the only university to offer a degree in Earth Systems Science.

**renaming of the Geography major** In the 2012-13 Academic Year we renamed the Geography major to Geographic Science & Technology. This was done to address the mistaken impression on the part of potential students and the general public that geography was essentially knowing where things are, like mountains, rivers, state capitals, and the like. The new name more accurately conveys the current trends in the discipline, in particular the role of technology and spatial information science.

**new hire** In response to a burdensome teaching load on our ESS faculty the administration granted us a new tenure-track position. We used that opening to hire Dr. Reid Parsons, an expert on Martian surface geology.

**REDI** In September 2009 the university established the Regional Economic Development Institute, or REDI. Jane Huang has been an active researcher in the Institute since its inception. Her work has encompassed the geographic analysis of diverse fields, including neighborhood health conditions, of trail locations and conditions in state parks, of broadband access and locations of crime. Students have been engaged in much of this work; cf. §2.6. For more information refer to §3.2.4.

**curricular changes** In the past five years we’ve renumbered numerous courses in an attempt to achieve a balance between the level of the course and our expectations of the work demanded of the students. We have also changed the plans for majors and minors in some small ways. Furthermore, we’ve added new courses: the Honors Seminar in Earth Science, Climate Change & Human History (both taught or co-taught by Prof. Gordon), and Calculus-based Physics I & II. We hope to add more courses in the next five years (cf. §1.2.4).

Beginning in fall of 2014 with the move to the renovated Condikey building instruction in physics changed from the 19<sup>th</sup> century format of lecture and lab to the late 20<sup>st</sup> century mode of studio physics, a form of active learning. Also, in May 2014 Bruce Duncan asked the chairs of the departments that provide most

of the students to the Physics sequence why they require at least some of their students to take physics and what they expected their students to get from the physics courses. As of this writing the Mathematics Department responded, stating that they require physics for their applied math major because “[physics] is the fundamental way of looking at many problems in applied mathematics in that many examples of models and differential equations require a firm grasp of physics to understand the problem.” As the calculus-based versions are not being taught this year, the differential equation part of this has not been raised; however, the idea of modeling has been brought to the fore, at least in General Physics II.

In 2010 we changed our requirements for minors. Previously, all that was required was for a student to take GEOG 1000 and five additional courses. That was changed so that the minor in each discipline has a different core that students must satisfy; cf. Table 4.2.

**providing online course offerings** In order to increase student access to our courses, several undergraduate and graduate courses have been modified and approved for online delivery. Undergraduate lab courses such as Earth, Sea & Air, Meteorology, and Oceanography are typically offered once every two years in a hybrid format (online content delivery with face-to-face labs); while Earth Systems Science and Environmental Geology are online only. All graduate Earth Science courses are fully online, which has enabled a number of in-service middle and high school teachers to enroll.

**course scheduling** In the fall of 2014 we addressed two issues: the scheduling of General Physics I & II to accommodate some of the departments whose students enroll in those courses, and the scheduling of geo courses so they don’t conflict with one another. There had been some conflicts between physics courses and a few of those of biology, chemistry, computer science and mathematics (there seemed not be a problem with industrial technology or exercise & sports science). A meeting of Jiang Yu and Bruce Duncan with the chairs of the affected departments resulted in a suggested two semester schedule that maximized the availability of physics courses to the students of those departments. Regarding the scheduling of geo courses, our dean expressed concern that in our schedules submitted for spring 2015 some of our intermediate and advanced courses interfered with other such geo courses. While that turned out not to be an issue for that term, the dean’s unease spurred us to establish a four semester schedule that reduced potential conflicts.

**failed initiatives** Of course not all of our initiatives were successful. An attempt to begin an environmental science major stalled (cf. §1.2.2), and another attempt at establishing a physics minor was tabled (cf. §1.2.2).

### 1.2.4 2014 Vision and Plans

- 1 Given our hope to increase the number of majors, we hope to hire an additional geographer. At this point we are open as to the specialty of such a new colleague. However that may turn out, we expect to continue and to nurture the relationship between GST and the Criminal Justice major.
- 2 The format of studio physics requires the hiring of another physicist, one to cover current needs and future possibilities.
- 3 Within the next five years we hope to institute some new courses, including the Physics of Music, Geographic Information System II, GIS for Crime Analysis, and Biogeochemistry.



**4** We wish to develop a marketing strategy or at least to work to make our programs more well known among potential feeder institutions. As mentioned elsewhere, a large fraction of our majors comes from other disciplines, i.e., we rarely get them directly from high school. This could be because they have not heard of our program or have not considered studying the earth sciences. To address this issue we are currently discussing with our Admissions Department the possibility of sending out our departmental information sheet to high schools and community colleges throughout New England and possibly eastern New York. The flyer follows on the next page.

**5** Another marketing issue is the perceived awkwardness of the department's name. During university open houses we attract more puzzled stares than inquiries. In a real sense our current name misrepresents us and is a hindrance to our recruiting of students. We are considering other names that would be both more accurate and more appealing.

**6** Although we are satisfied with our assessment outcome analysis, we have yet to turn this into actionable items. We seek to address this very soon.

## GEO/PHYSICAL SCIENCES



*The Geo/Physical Sciences Department encompasses the disciplines of Earth Systems Science, Geographic Science & Technology and Physics. Consistent with the mission of the university, the Geo/Physical Science faculty is committed to excellent teaching in a challenging yet cooperative atmosphere. Students explore the distribution and interaction of natural and human systems on global, regional, and local scales. A large part of the learning is experiential and steeped in investigation in order to teach essential content knowledge and skills in critical thinking and problem solving. Hands-on experiences in the laboratory and the field bring together theory and application, contribute to scholarly development, and prepare students for a range of careers. As members of the global scientific community we value leadership, a culture of sustainability, lifelong learning and promotion of science as a way of knowing.*

### Four-Year Undergraduate Program

In choosing a major field of study students may select from four degree options, namely, the Bachelor of Arts or Bachelor of Science degree in each of Earth Systems Science or Geographic Science & Technology. We also offer minors in each field.

Faculty in the Geo/Physical Sciences Department pay close attention to creating an atmosphere of caring and guidance, in which students are encouraged to develop a sense of identity and self-reliance as part of a larger community. This attentive and supportive environment is experienced in the many opportunities that students have to interact with their peers and the faculty: through the activities of the GeoClub, while fulfilling internships, on field trips, during academic advising periods, in class presentations of research results, and at departmental social events and awards presentations.

Students interested in Environmental Science would be well served by our department. With the guidance of an advisor a student would select a coherent plan of Earth Systems Science courses concerned with the environment, plus a solid foundation of relevant chemistry and biology courses.

### Faculty

There are six full-time faculty members. The foremost objective for each faculty member is to provide students with the highest levels of academic and professional training in their chosen fields of specialization. They all contribute to their field through rigorous and carefully structured courses, publications, conferences, professional organizations, and work with schools and community. Brief descriptions of the research interests of three of the geo-faculty follow:

Dr. Jane Huang is actively involved in research and teaching activities focusing on geographic information science (GIS) and technology. She is the 2006 recipient of the Faculty Innovation Grant, and has utilized the grant to help equip the campus with the prevailing GIS software packages and to develop a new GIS curriculum. Since then, Dr. Huang and her student teams have been awarded multiple interdisciplinary research grants in GIS teaching, research, and community service projects. The topics of the projects range from community de-leading, watershed trail surveying and mapping, regional housing market mapping analysis, broadband high-speed internet distribution mapping, GPS survey of local traffic congestions, community crime hotspots mapping analysis, urban structure study, and regional economic development mapping. Dr. Huang has presented her GIS research projects at both international and local conferences and workshops.



Dr. Elizabeth Gordon's scholarly interests include marine biogeochemistry and geoscience education. Her marine biogeochemistry research has been focused on organic carbon dynamics in the ocean and analysis of sedimentary records to understand climate variability. She is actively engaged in improving undergraduate geoscience education, participating in workshops for geoscience faculty, developing and reviewing classroom activities, and presenting results from learning assessments at national meetings. She currently serves as Vice President of the National Association of Geoscience Teachers, New England Section, and will become President in December 2014.

Dr. Reid Parsons, who joined the department in the Fall of 2013, has been working with NASA to investigate the recent climate history of Mars. Using data and images collected from orbiting spacecraft, Dr. Parsons is studying the role solid and liquid water has played in shaping the martian surface. At Fitchburg State he plans to engage undergraduates in planetary science and climate change topics through teaching, field trips, and student research opportunities.

#### Results

Our graduates pursue employment in the non-profit, government, education, and business sectors in positions such as:

- Geologist
- Hydrologist
- Environmental Scientist or Engineer
- Environmental Consultant
- Laboratory Technician
- Geospatial Analyst
- Geographic Information Systems (GIS) and GPS Technician
- Urban and Regional Planner
- Transportation Planner
- Cartographer
- Atmospheric Scientist
- Soil Scientist
- Earth Science or Geography Teacher
- Inventory Arborist

In addition, some of our graduates have been accepted to programs of advanced studies in graduate departments at colleges and universities throughout the country.

#### Facilities

Beginning Fall 2014 the geosciences and physics now occupy new laboratories located in the renovated Condikey Science Building. Geographic Science & Technology and Earth Systems Science have the latest version of the prevailing GIS software program with a campus-wide license and a dozen GPS units. Also available are research projects, both local, national and global in scale, led by geo-faculty.

#### Internships

There are diverse internship opportunities for students in our department. In recent years sponsors have included the City of Fitchburg, Leominster High School, the National Weather Service, the Montachusett Regional Planning Commission, the Blue Hill Meteorological Observatory and the United States Army. While completing internships students have been directly involved with:

- teaching high school science
- science outreach to the public
- mapping and grading the sewer system of Fitchburg
- analyzing regional zoning, transportation, and pedestrian walkways
- mapping local trail systems
- mapping crime and traffic violations
- researching broadband accessibility in Worcester County
- developing a winter storm rating system

#### Contact

For more information about the Geo/Physical Sciences Department at Fitchburg State University, please contact the Admissions Office for open house and other visit options.

Fitchburg State University, Admissions Office  
160 Pearl Street, Fitchburg, MA 01420  
Phone: 978.665.3144  
Fax: 978.665.4540  
E-mail: [admissions@fitchburgstate.edu](mailto:admissions@fitchburgstate.edu)  
Web: [www.fitchburgstate.edu/admissions](http://www.fitchburgstate.edu/admissions)

Rev. 8-2014

## 1.2.5 Our mission and the college's mission

### College mission

#### Core Values

##### *Accessibility*

Offering equitable access to high-quality programs and services to people of varying cultural backgrounds living within and beyond our diverse community of North Central Massachusetts.

##### *Affordability*

Providing opportunities for students of varying socioeconomic backgrounds to pursue an affordable, quality education

##### *Community*

Forging partnerships with businesses and community organizations within the region to enhance quality of life

##### *Enrichment*

Sustaining a supportive campus environment for students, faculty, staff, and alumni in which all members can grow and excel in their personal and professional lives

##### *Excellence*

Striving for excellence in academic programs and services through innovative teaching and professional practices

#### Mission

Fitchburg State University is committed to excellence in teaching and learning and blends liberal arts and sciences and professional programs within a small university environment. Our comprehensive public university prepares students to lead, serve, and succeed by fostering lifelong learning and civic and global responsibility. A Fitchburg State education extends beyond our classrooms to include residential, professional, and co-curricular opportunities. As a community resource, we provide leadership and support for the economic, environmental, social, and cultural needs of North Central Massachusetts and the Commonwealth.

#### Vision

Fitchburg State University will be nationally recognized for its excellence in teaching and learning in current and emergent fields, for its commitment to transforming lives through education, and for its dedication to public service. In order to achieve this, we will:

- Prepare students for a global society through curricular innovation and program development
- Achieve academic excellence by investing in our faculty and librarians in their pursuit of knowledge, professional competency, and scholarship.
- Employ innovative uses of technology in the library and across our campus to maximize student learning
- Create a culture of diversity to meet the needs of the region and enhance the personal and academic lives of the university community

- Build partnerships within our community to provide realworld opportunities for our students and collaborative solutions to community issues

### **1.2.6 The Mission of the Board of Higher Education**

The mission of the Board of Higher Education is to ensure that Massachusetts residents have the opportunity to benefit from a higher education that enriches their lives and advances their contributions to the civic life, economic development and social progress of the Commonwealth. To that end, the programs and services of Massachusetts higher education must meet standards of quality commensurate with the benefits it promises and must be truly accessible to the people of the Commonwealth in all their diversity.

### **1.2.7 Departmental mission**

Consistent with the mission of the university, the Geo/Physical Science faculty is committed to excellent teaching in a challenging yet cooperative atmosphere. Students utilize scientific methods and hypothesis testing as a way of understanding the natural world. Moreover, they explore the distribution and interaction of natural and human systems on global, regional and local scales. A large part of the learning is experiential and steeped in investigation in order to teach essential content knowledge and skills in critical thinking and problem solving. Hands-on experiences in the laboratory and the field bring together theory and application, contribute to scholarly development, and prepare students for a range of careers. As members of the global scientific community we value leadership, a culture of sustainability, lifelong learning and promotion of science as a way of knowing.

Furthermore, we recognize the indispensable role that the study of nature has in a liberal education, not only in acquiring knowledge and skills (in particular skills of quantifying and physical intuition), not only in exercising reason, indeed, not only in fostering a spirit of inquiry, but also in educating the whole person. We seek to do this in a humane environment where individuals learn how to learn, both on their own and together with others.

Although the following was written of liberal education in general, the department subscribes to and supports the ideas expressed:

All significant education is self-education and if you are to get the kind of thing we are talking about, it will call for the best of your abilities and qualities—not only the capacity to know and think, but the desire to; not only a disciplined mind but an imaginative one; not only the will to do but the capacity to develop a love for it; not only an open and adventurous mind but one capable of faith and commitment; not only a critical capacity but a creative one as well; not only a tolerant spirit but a generous one. In other words, a liberal education is learning to love the right things, and the capacity for love is as important as the capacity to know.

Victor Butterfield, philosopher and educator

### **1.2.8 Connection between our mission and the university's**

The department provides the opportunities for and the structures within which a student may learn and develop. This learning includes not only a factual knowledge but also an affective knowledge of the skills, methods and most important the habits of thought of the various disciplines composing the department. A

student's moral formation is primarily accomplished in the area of academic honesty and how seriously the faculty take this, but also a student is exposed to an ethic of hard work, hard intellectual work, with the happy rewards that come from such exertions.

### 1.2.9 Program structure

The department offers majors (both BA and BS) and minors in both Earth Systems Science (ESS) and Geographic Science & Technology (GST). We no longer offer any officially recognized concentrations within the majors. Unofficially we provide an environmental science program within the ESS major.

### 1.2.10 Interdisciplinary participation

The department's ongoing involvement in interdisciplinary programs is largely the work of Elizabeth Gordon and Jane Huang. Our involvement in the process to overhaul the Leadership Program—now denominated the Honors Program—began in 2007 with a meeting between the head of that program and the physicists. The end result of that meeting was Prof. Gordon taking on the task of offering the Honors Seminar in Earth Science; to date she has been the only one to teach this bi-annual course. Furthermore, she and Prof. Benjamin Lieberman of Economics, History & Political Science offer Climate Change & Human History (cross-listed as a history course), also a bi-annual course, offered in the fall of even years.

Jane Huang has worked with Prof. Luis Rosero of the Economics, History and Political Science Department on a project in the Regional Economic Development Institute (REDI). During the spring 2013 semester Dr. Rosero and Dr. Huang “conduct[ed] and expand[ed] the ongoing REDI Research Project on the Economic Development Indicators Matrix (EDIM) in order to develop EDIM trend analyses based on Geographical Information Systems (GIS) analysis” (from the draft proposal submitted to the university's administration). She has also worked with Dr. Michael Turk, another economist and researcher in the REDI. In addition Prof. Huang has an ongoing collaboration with Profs. Beth Walsh and Marcel Beausoleil of the Criminal Justice (CJ) Department on a project called DDACTS, or Data Driven Approaches to Crime and Traffic Safety. This collaboration has produced a paper submitted to a peer reviewed journal, a paper which has a recent alumnus who majored in both departments. Another consequence of this joint work is that the CJ department is considering the incorporation of GEOG4000 GIS as an elective in their major.

In physics education research Jiang Yu is currently collaborating with Thomas Schilling, professor of psychology at FSU, on a project assessing the psychological and academic characteristics of FSU students taking an introductory, algebra-based physics course. Particularly, the project tries to gain an understanding of the students' attitudes, beliefs, expectations, and epistemological frames towards studying physics by measurements of executive functions to assess cognitive ability, self-efficacy to measure students' beliefs in ability to perform successfully in a physics class, and students' engagement and enjoyment for thinking.

Initiated by events co-ordinator Mary Chaping Durling a several month collaboration between her, the Grants Development Co-ordinator Karen Frank Mays, Theater professor Richard McElvain, History professor John Paul and associate professor of physics Bruce Duncan culminated in a three part series celebrating Galileo. Professor McElvain recreated some scenes from Brecht's “The Life of Galileo,” after which Professors Paul and Duncan discussed Galileo's impact. The event also involved a talk given by Dava Sobel, author of “Galileo's Daughter,” a book that casts new light on his life and in particular gives a more nuanced

picture of the relationship between him and the Vatican, using the more than 100 extant letters of Galileo's eldest daughter, a nun, to her father.

## **1.3 Policies and procedures**

Departmental policies and procedures may be found in Appendix A.

### **1.3.1 Internship Program**

Our policy regarding internships is included as Appendix B. The department has established connections with the Montachusett Regional Planning Commission, Leominster High School and the Regional Economic Development Institute, although the number of students taking advantage of the internships provided is rather small. Also included in this section is a list of internships assembled by Reid Parsons for his Planetary Atmospheres class.





## Chapter 2

# Students

### 2.1 Enrollment

Our student numbers are presented graphically on the following page. Figure 2.1 shows the number of majors (both Earth Systems Science and Geographic Science & Technology) by year since 2005, and Figure 2.2 shows the number of graduates for the same period. In the period from 2009 to 2014 the number of majors fluctuated between 12 and 28. Note: the university initially held its winter commencement in January. In 2013 winter commencements were held in both January and December; both of these count toward the 2013 number.

The number of minors is given in Table 1.2.2.

The number of students entering our majors from outside Fitchburg State (as determined by Institutional Research) is detailed in the table below.

Student type	2010	2011	2012	2013	2014
New freshmen	6	1	0	1	4
New transfers	2	2	2	4	1

The data for Fitchburg State students changing their major to either ESS or GST are incomplete. We tend to get one or two each year from the pool of students who did not matriculate with a declared major (referred to as “pre-majors”). Recently we’ve received students from Business Administration, Communications Media and English Studies.

### 2.2 Advising

Our suggested plans of study are found in §4.5. Earth Systems Science and Geographic Science & Technology majors and minors are advised by the four geo scientists: Lawrence Guth, Jane Huang, Elizabeth Gordon and Reid Parsons. The faculty often develop their own ancillary materials to assist students in

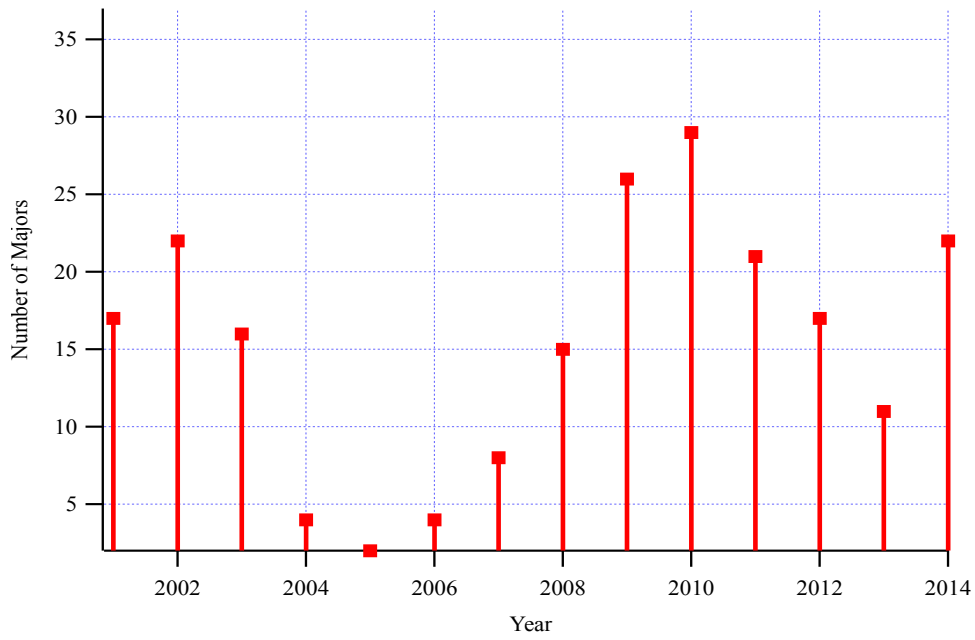


Figure 2.1: Number of department majors by year.

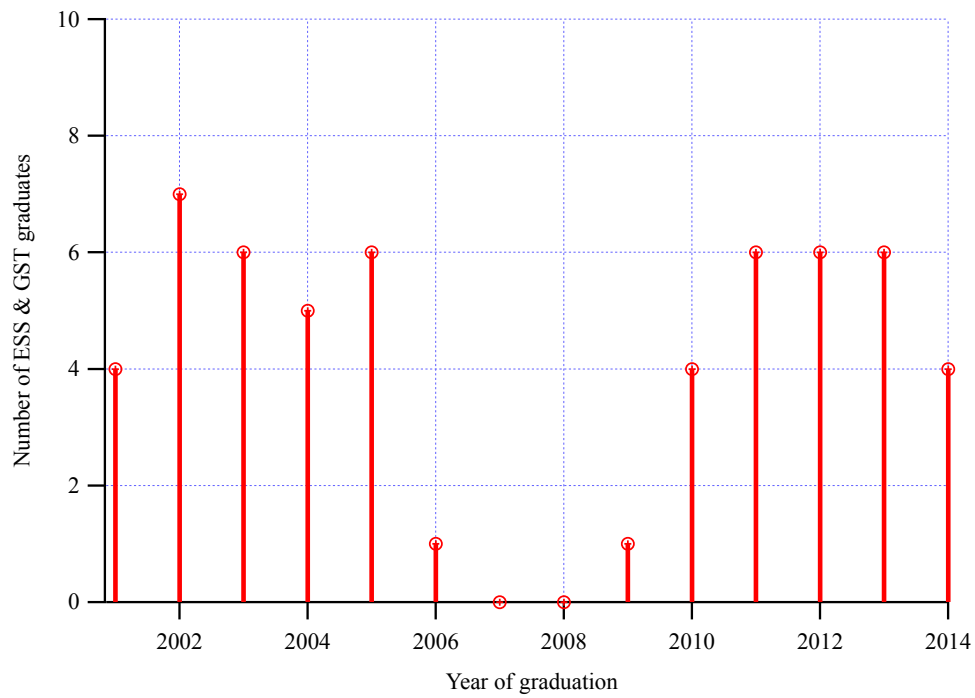


Figure 2.2: Number of department graduates per year.

seeing what they need to do in order to graduate, including meeting department requirements to meet the major or minor and university requirements for general education, known on campus as the Liberal Arts & Sciences requirements. The department faculty also advise students on non-scheduling issues, including post-graduation opportunities, internships and the Geo Club, which is the association of students interested in ESS and GST.

## **2.3 Effectiveness of advising**

Although strongly encouraged to fill out and turn in the advising evaluation forms, our students do not seem to do so in great numbers. Furthermore, however many (or few) do so, we have not received any feedback on what these forms say.

## **2.4 Integration into department**

In accordance with the MTA contract there is student representation on the department curriculum committee.

Shortly after the beginning of the fall 2008 semester the Geo Club was reformed after numerous years in desuetude. In the following academic year the club was officially recognized and its constitution approved by the university. In the fall of 2014 the officers are: president, Olivia Bellegarde; vice president, Katelyn Wiita; treasurer, Janice Orta; and secretary, Jesse Roberts. The faculty advisor is Elizabeth Gordon.

## **2.5 Internships**

There are diverse internship opportunities for students in our department. In recent years sponsors have included the City of Fitchburg, Leominster High School, the National Weather Service, the Montachusett Regional Planning Commission, the Blue Hill Meteorological Observatory and the United States Army. While completing internships students have been directly involved with:

- teaching high school science
- science outreach to the public
- mapping and grading the sewer system of Fitchburg
- analyzing regional zoning, transportation, and pedestrian walkways
- mapping local trail systems
- mapping crime and traffic violations
- researching broadband accessibility in Worcester County
- developing a winter storm rating system

## **2.6 Fitchburg State's Undergraduate Conference**

While on the advisory board of the Center for Teaching and Learning (CTL) in the fall of 2007 Bruce Duncan suggested the possibility of a day devoted to the presentation of student research and capstone projects.

The suggestion was not acted on for two years, as he was occupied with chair duties, including meetings about the new science building. However, largely due to the efforts of Peter Staab of the Mathematics Department and at the time co-director of the CTL, the first Undergraduate Conference on Research and Creative Practice was held during the morning of April 22, 2010, the day on which Fitchburg State's Honors Convocation was held in the afternoon. Earth Systems Science student Jessica Durette, sponsored by Elizabeth Gordon, gave a talk on their research in the Gulf of Mexico, specifically on the  $^{18}\text{O}/^{16}\text{O}$  ratio in water samples. Jenn Tuomala, sponsored by Jane Huang, spoke about the work of several students in mapping the trails around the Fitchburg reservoir, a volunteer, community effort. Chris Mills, sponsored by Lawrence Guth (who also was the faculty moderator of the session), spoke of his internship at Leominster High School, an internship directed by our adjunct Sharon Alley. In addition to some participation on the committee organizing the first conference, Bruce Duncan assisted in the mechanics of the poster session. For the subsequent conferences Elizabeth Gordon has been on the organizing committee, as well as advising some of our students in their presentations. Jane Huang likewise continues to advise students for the conference.

Since the Conference's inception our faculty have sponsored students presenting the following topics:

- 2014:
  - Predicting New England Bound Hurricane by Offshore Location (Jane Huang)
  - GIS Internship with the Fitchburg Wastewater Department (Jane Huang)
  - Dynamics of a Cigar Box Guitar (Bruce Duncan)
- 2013:
  - TravTime Traffic Congestion Study in the Montachusett Region (Jane Huang)
  - Mapping Hotspots of Crime and Traffic Violation in Fitchburg (Jane Huang)
  - Urban Structure Study of Fitchburg, MA (Jane Huang)
  - Palestinian Women and Determinants of Public Health: Social Mobility and Economic Empowerment in the Occupied Palestinian Territories (Elizabeth Gordon)
- 2012:
  - GIS Analysis for the Project: Bringing Broadband to North Central Massachusetts (Jane Huang)
  - GPS Survey of Community Trails (Jane Huang)
- 2011 :
  - My Involvement in the Project—Bringing Broadband to North Central Massachusetts (Jane Huang)
  - Mapping Stone Walls in the Crocker Conservation Area Using GPS and GIS Technologies (Jane Huang)
  - Methodologies in Grain Size Determination for the Study of Hurricane Effects on Sediment Burial for the Continental Shelf Adjacent to the Mississippi River Delta (Elizabeth Gordon)
  - Surficial Grain Size Analysis and Organic Carbon Transport From Hurricane Katrina (Elizabeth Gordon)
  - Remobilization of Sediments along the Louisiana Continental Shelf after the Passage of Hurricane Katrina (Elizabeth Gordon)
- 2010:
  - GPS Mapping of Fitchburg Watershed Trails—A Crocker Center Civic Engagement Project (Jane Huang)
  - Seawater Salinity Calibration in Relation to Oxygen Isotopes for the Northern Gulf of Mexico (Elizabeth Gordon)
  - Internship in Public School Systems (Lawrence Guth)

## 2.7 Post graduation status

The survey for this self-study may be found in Appendix C; as of this writing three alumni have taken the survey. However, of graduates of the past decade with whom we are in contact 100% are employed or in graduate school. Six of the 27 graduates since 2009 enrolled in graduate school. The few alumni of previous years about whom we know are also employed or choose not to be in the labor force (*e.g.*, full-time parent). We recognize that this is a self-selecting group, but we feel it is representative of the alumni as a whole. Of those employed the jobs run from the pedestrian (almost literally: waitress) to those more fully engaging their education in our department, including laboratory technician, teachers, civil servants and businessmen.

The department takes the view that we train our students in critical thinking, data analysis, problem solving and other aspects of the mental life and work habits of scientists. We do not pretend that our alumni will find employment explicitly in Earth Systems Science or Geographic Science & Technology. We do expect that the education our students achieve here will enable them to succeed in whatever careers emerge in the future.



## Chapter 3

# Faculty.

### 3.1 Faculty data

There are six full-time faculty: three earth systems scientists (Drs. Guth, Gordon and Parsons), one geographer (Dr. Huang) and two physicists (Drs. Yu and Duncan). The *curriculum vitae* for each may be found in Appendix D.

As of September 1, 2014, the department comprises one tenured full professor, four tenured associate professors and one untenured assistant professor. The department is 50% female and 50% male.

In addition to the full-time faculty a few other persons have led classes within the department. In recent years Joseph Dignam has taught physical science (and in the summer general physics) and has taken a General Physics I laboratory section. From the Mathematics Department Mark Snyder, another physicist by training, has taught two independent studies in intermediate physics (Classical Mechanics and Electrodynamics) and took the lecture component of General Physics I in the fall of 2012 when Jiang Yu was on sabbatical. He has also taught PHYS 2600 Calculus-based Physics I. Susan O'Connor, an alumna, started teaching GEOG 1000 in the spring of 2010 and has taught GEOG 3200 U.S. & Canada. Through DGCE and the day school Phil Grandin has taught astronomy and physics, and through DGCE Chaitanya Hiremath has taught physics during the summer terms. Peter Olszak taught General Physics II during the summer of 2014. Joseph Whitley, a retiree from the United States Geological Survey, has taught GEOG 2100 Geology and PHYS 2000 Astronomy.

Through June 30, 2014, the department had depended on the administrative services of Anne Burrill, whom we shared with the Business Department. Beginning July 1 Melissa Barrette became our administrative assistant, shared with the Biology & Chemistry Department. Our laboratory technician is Ian Murray, whom we share with the chemistry part of the Biology & Chemistry Department and with the campus Environmental Health & Safety Officer.

### 3.2 Description

Professors are listed in the order they joined the faculty.

### 3.2.1 Lawrence Guth (1993)

Dr. Guth concentrates his teaching and scholarly activities on the geological sciences; although in the past he has also taught physics. Since his arrival on campus he worked on upgrading the department's instructional capabilities using computer technology and Global Positioning Systems (GPS). He also has developed a capstone field methods course in geophysical sciences that was taught for the first time spring of 1998, although it has since fallen into abeyance. Dr. Guth has served as GEO Club advisor, and as departmental representative to the college's Learning and Technology Roundtable, Subcommittee on Distance Learning, and Disability Services Committee. Dr. Guth has been very active in attending workshops and conferences throughout the country, and has completed three on-line courses dealing with relativity and quantum mechanics.

### 3.2.2 Jiang Yu (1996)

Jiang Yu has been a professor of physics in the department since 1996. Her specialty is in nuclear and particle physics as well as physics education in the area of conceptual learning and conceptual change at the college level. She regularly teaches Introductory Physics and Physical Science courses. In recent years, Jiang has been actively involved in the College Board AP Physics programs for which she served as the Chief Reader for the annual AP Physics Exam Reading (2009-2013) and is now a Chief Reader Associate (2013-2015). She attends the AP Physics Exam Development Committee meetings and final-approves the exam forms before printing. She assists on hiring college physics faculty members and high school AP Physics teachers to serve as Readers, and assists on managing the entire Reading operation. Jiang is a College Board certified physics workshop consultant and has given more than twenty week-long Summer Institutes and numerous one- or two-day in-service workshops since 2007 to physics teachers in China and UAE internationally as well as more than ten States in the US. When the AP Physics was finishing a course redesign in recent years, Jiang joined the Physics 1 and Physics 2 Syllabi Audit Standard Setting Committee charged by the College Board and the Center for Educational Policy Research at the Univ. of Oregon (2012-2014) until the standards were finalized; she currently functions as a curriculum adviser assisting course auditors evaluating the AP Physics 1 and Physics 2 syllabi worldwide as well as supporting teachers who teach these courses on curricular matters. In addition, Jiang is a juror for the annual United States Invitational Young Physicist Tournament which encourages high school students' engagement of experimental physics research worldwide. She has also worked with the National Math and Science Initiatives, Mass Insight Education, Los Angeles Unified School District, Alabama's A-plus College Ready, and Advance Kentucky programs on efforts to improve STEMS education in the United States. In teaching practice Jiang has been selected as a STEMS curriculum scholar at FSU (2014), for which she is researching and redesigning her algebra-based introductory physics courses based on the results of physics education research done mostly in the United States in the last 20 years.

### 3.2.3 Bruce Duncan (2005)

Bruce Duncan is currently a physicist, trained in Atomic, Molecular and Optical Physics. His PhD from the University of Connecticut in 2001 was on the production of ultra-cold ( $\sim 10\mu\text{K}$ ) rubidium atoms in the  $5D_{5/2}$  state using a technique called "Stimulated Raman Adiabatic Passage" (STIRAP). After a one semester combined lectureship and post-doctoral appointment at Connecticut he was a visiting assistant professor at Union College (Schenectady, NY), whence he came to Fitchburg State University, where as an assistant professor he led classes in physics, physical science and astronomy. He has served on two successful search committees for the department, on the campus Safety Committee, on the advisory board



of the Faculty Teaching Center (now known as the Center for Teaching and Learning), and on the library advisory board. In 2010 he was called upon to provide expert commentary in facilitating a conversation during a three-part series dealing with the life and impact of Galileo. He also served on the committee for a new science building, a committee that went by more than one name. When that project again required faculty input he and Meg Hoey of Biology and Chemistry (as chairs of their respective departments) served as the representatives of their colleagues. In 2012 he was asked to join an *ad hoc* committee given the task to evaluate books for general campus reading, and in the fall of 2014 he was asked to join another *ad hoc* committee, this one supporting veterans on campus. In March 2013 he presented a talk in the Fitchburg State Faculty Speaker Series on the Higgs field and its boson, although particle physics is not his specialty. As of July 1, 2007, he was named the acting chair of the department; two years later he was named as chair. He was granted tenure and was promoted to Associate Professor effective September 1, 2010.

### 3.2.4 Jane Huang (2006)

Dr. Jane Huang is most actively involved in research and teaching activities focusing on geographic information science (GIS) and technology. She is the 2006 recipient of the Faculty Innovation Grant, and has utilized the grant to equip the Fitchburg State campus with the prevailing GIS software packages and to develop new GIS curriculum.

In a joint project with the City of Fitchburg, Dr. Huang received a \$30,000 Healthy Housing Project grant awarded by the Health Foundation of Central Mass in July 2007. In this project, Dr. Huang worked with a student to identify hot-spots and high-risk areas in Fitchburg for childhood lead poisoning using GIS technology. The successful results of the project led to two funding extensions till June 2009.

During winter 2009 to spring 2010, as a Crocker Center project grant recipient, Dr. Huang led a group of students who mapped the various and diverse trails in the Northern Fitchburg Watershed Area using GPS and GIS technology. In 2011, Dr. Huang received a Special Projects Grant in Faculty Scholarship of the Academic Affairs. The grant was used to purchase Garmin eTrex handheld GPS units and to cover the costs of surveying the community trails in Athol, Petersham, and Royalston using those GPS units by a group of students. In Fall 2012, Dr. Huang led the class of Geog2400: Computer Application in GeoScience in a GPS survey project which assisted MRPC, MassDOT, and the Federal Highway Administration in identifying and analyzing the most congested corridors in the Montachusett region.

Starting 2010, Dr. Huang conducted multiple research projects as a research fellow in the Regional Economic Development Institute (REDI), a research institute in Fitchburg State University. The research projects include: 2010 joint project with Prof. Michael Turk of Economics titled “North Central Massachusetts at a Crossroads: Housing Challenges;” 2011 joint project with Dr. Beverley Hollingsworth of Business “Bringing Broadband to North Central Massachusetts;” 2012 projects of “Data Driven GIS Approaches to Crime and Traffic Safety in Fitchburg” and “Community GIS Mapping for Regional Zoning, Transportation, Traffic, and Pedestrian Walkways;” 2013 joint project with Dr. Luis Rosero of Economics, “Trends in Regional Economic Development Across North Central Massachusetts;” 2013 projects of “Urban Structure Study of Fitchburg” and “Traffic Mapping and Analysis in North Central MA.” Multiple students, including GST and ESS majors, were involved in these research projects as Dr. Huang’s Research Assistants/REDI interns. Dr. Huang has presented her GIS research projects at both international and local conferences and workshops.

She was granted tenure and promoted to Associate Professor effective September 1, 2012.

### **3.2.5 Elizabeth Gordon (2007)**

Elizabeth Gordon, an oceanographer, joined the Geo/Physical Sciences faculty in September 2007. Her research activities have been focused on marine biogeochemistry and quaternary climate change. Her doctoral research at the University of South Carolina was examining the sources and transport of organic matter delivered to the Gulf of Mexico, both in modern and glacial periods. After a semester-long appointment as a Marine Science Instructor at USC, she became a Postdoctoral Researcher at the University of Massachusetts-Amherst. Her postdoctoral research efforts included understanding the impact of Hurricane Katrina on coastal Louisiana. Her primary teaching interests at Fitchburg State include oceanography, earth science, meteorology, and climatology. During her first three years at Fitchburg State, she continued her research activities in the Gulf of Mexico and brought three students on research trips to collect samples for later analyses. Her professional service activities include completing manuscript reviews for journals such as *Limnology and Oceanography*, *Marine Chemistry*, and *Continental Shelf Research*.

Recent professional development activities have focused on geoscience education, particularly on improving the quantitative skills of students enrolled in introductory geoscience courses. She has participated in several geoscience education workshops sponsored by the National Association of Geoscience Teachers, such as Teaching Oceanography and Teaching GeoEthics. During the summer of 2011, she participated in a workshop to train geoscience faculty in the use of The Math You Need When You Need It (TMYN), a program designed to support student success in introductory geoscience courses by engaging students in online math tutorials that are set in a geoscience context. She has since implemented TMYN into several of her courses, and has presented assessment data regarding the implementation at several conferences (American Geophysical Union 2011, Geological Society of America 2012, 2013, 2014, and Association of Sciences of Limnology and Oceanography 2013). She was also one of five workshop leaders for the TMYN workshop in July 2012, during which she assisted faculty new to the program on their implementation plans.

Prof. Gordon has engaged students in her “Geographic Perspectives on Conservation” (GEOG4700) in service learning projects. She first taught the course during spring semester of 2012, reviving this course from desuetude. The service learning projects included: for the Mt. Grace Land Conservation Trust to map vernal pools; with the Department of Conservation and Recreation and the Nashua River Watershed Association on water quality monitoring projects; with local school gardens and farms; and one student worked with Mary Beth McKenzie in Capital Planning to produce informational pieces for the Fitchburg State tour guides to highlight the environmental initiatives related to the Hammond renovation. Service learning projects during spring semester of 2014 included collecting signatures to include the bottle bill expansion legislation on the state ballot, participating in town meetings about the proposed natural gas pipeline through northcentral MA, assisting with local park and campus clean-up events, and participating in educational outreach activities on Earth Day.

Prof. Gordon was granted tenure in 2013 and promoted to associate professor as of September 1, 2014.

### **3.2.6 Reid Parsons (2013)**

Dr. Reid Parsons specializes in Planetary Science and has taught Earth Systems Science, Geology, and Planetary Atmospheres thus far at Fitchburg State. He began the first year of research as a co-investigator

with John Holt from the University of Texas, Austin on a 3-year NASA research grant entitled “A Coupled Geophysical and Modeling Analysis of Mid-Latitude Glaciers on Mars.” Through this grant, they are investigating large ice deposits located equator-ward of the polar caps which likely formed during a Martian ice age roughly 100 million years ago. Accomplishments thus far include:

- An oral presentation (given by Reid Parsons) at the international Lunar and Planetary Science Conference in Houston, TX in March of 2014. This meeting attracts nearly 2000 international specialists and is the premiere conference for planetary scientists.
- A poster presentation (given by his collaborator’s graduate student) at the 8th Mars Conference in Pasadena, CA in July of 2014.
- Hiring two Fitchburg State alumni as research assistants during the summer of 2014. One of these assistants was tasked with surveying large regions of Mars to locate ice deposits and the associated datasets that they will analyze throughout the execution of the NASA grant. The other assistant helped develop methods for analyzing these datasets using a software package known as ArcGIS (for which FSU has a university-wide license).
- A manuscript that is in preparation that will be submitted to a peer-reviewed, international scientific journal (likely Geophysical Research Letters) in the coming year.

In addition, he has been a part of a research project in collaboration with colleagues at Stanford University addressing the potential for storing renewable wind energy by pumping water up a topographic gradient in order to provide electricity using a hydroelectric generator when demand is high. He has lent his skill with Geographic Information Systems (GIS) to identify potential locations along coastal regions where this method of energy storage has the greatest potential. The abstract they submitted was accepted for presentation (given by his colleague) to the American Geophysical Union Conference held in San Francisco in December of 2013.

### 3.3 Development

Professional training sessions Jane Huang has attended in the past several years include: “Building Custom Maps for Your Classroom with ArcGIS Online;” “Connecting GIS to Core Curriculum and STEM;” “Problem-Based Learning with GIS;” “An Exploration of Free and Open Sources of GIS Software;” “The App World—The Power of Mapping with Your Phone;” “Improving Spatial Literacy in Education;” “What’s new in ArcGIS Desktop 10;” “What’s new in the Geodatabase at ArcGIS 10;” “Working with and managing 3D data in ArcGIS 10;” “Map Compilation and Page Layout with ArcGIS 10.” Training at conferences includes Annual Conferences of the Northeast Arc Users Group and Geological Society of America Northeastern Section Meeting. The online training sessions are mainly through the website of ESRI’s training courses.

During 2010, Elizabeth Gordon was invited to participate in the 2010 Early Career Geosciences Faculty Workshop, sponsored by the National Association of Geoscience Teachers (NAGT). The program is aimed at improving research and teaching in the geosciences through a weeklong intensive workshop for untenured faculty. Participants are required to submit teaching materials that become publicly available after revision.

The following academic year (AY10-11), she participated in six workshops and seminars related to teaching geoscience, all sponsored in-part by the National Association of Geoscience Teachers. One of these was an online workshop about incorporating climate data and models into the undergraduate classroom, which is particularly applicable to Climatology (GEOG3110), an elective ESS and GST course offered every other spring. Participation in the workshop required development and submission of a climate teaching activity, which has since been made publicly available. She attended several webinars (Nov 2010, Jan 2011, and Feb 2011) that were devoted to the broad topic of ‘Climate and Energy,’ which is relevant to the theme of the Honors Earth Science Seminar (GEOG/HON2250). These webinars provided overviews of recent research about climate, as well as ideas for incorporating energy topics into the classroom. The final online workshop, held in April 2011 and sponsored by the Climate Literacy and Energy Awareness Network (CLEAN), was entirely dedicated to teaching about energy in geosciences courses. This was again applicable to the Honors seminar, and also required development of a publicly shared teaching activity.

During July, 2011, Prof Gordon participated in “The Math You Need, When You Need It” (TMYN) workshop. The National Science Foundation provided funding for participants to be trained in the online math tutorials, which are designed to improve quantitative skills that are relevant to student coursework in the geosciences. Participants are required to develop and publish implementation plans for including these modules in at least one course. Given the success of the implementation at Fitchburg State, she was then invited to serve as a workshop leader in July 2012. Assessment results from these implementations have been presented at several national meetings.

During June 2013, Prof. Gordon attended, and facilitated sessions during, a Teaching Oceanography workshop, which brought together geoscience faculty to revise learning outcomes and assignments for Introductory Oceanography courses. During June 2014 she attended a workshop entitled, “Teaching GeoEthics Across the Geoscience Curriculum.” The workshop highlighted the emerging field of GeoEthics and generated collaborative discussion regarding strategies to incorporate GeoEthics topics and courses into undergraduate programs. Prof. Gordon developed a teaching module with ethics at its focus; this module will be publicly available in Spring 2015.

Reid Parsons was also invited to attend the 2014 Early Career Geoscience Faculty Workshop, sponsored by the NAGT, held in College Park, MD (June 22 - 26, 2014) and later took Exploring ENVI: Training course on the ENVI Software package for Remote Sensing image analysis hosted by the developer, Exelis Vis in Boulder, CO (Oct. 14 - 16, 2014).

### 3.4 Involvement

Physics faculty and adjuncts have taught all the introductory physics courses every semester: Physical Science I & II, General Physics I & II and Astronomy; Calculus-based Physics I & II have been offered when needed, usually as directed studies. However, as of 2014 Physical Science I will be offered every other year, at best, due to scheduling changes involved with the instructional switch to studio physics. Bruce Duncan has taught independent studies in modern physics (General Physics III), Optics, Quantum Mechanics, Thermodynamics & Statistical Mechanics and the Physics of Music. Mark Snyder, a physicist in the Mathematics Department, has offered independent studies in Intermediate Classical Mechanics and in Electrodynamics. All of these independent studies are new. Earth Systems Science; Human Geography; Earth, Sea & Air; Oceanography; Meteorology; Climatology; the Honors Program Seminar in Earth

Science; Climate Change & Human History; Planetary Atmospheres; Geology; Map Use & Interpretation; Computer Applications; Structural Geology (most recently only as a Directed Study); Environmental Hydrogeology; Computer Cartography; Population Geography; Urban Geography; Geographic Perspectives on Conservation; and Geographic Information Systems have been offered by the geo faculty.

In recent years our faculty have served on the following committees: All University Committee (AUC), AUC Curriculum, Liberal Arts & Sciences, Leadership Academy (now Honors Program) Curriculum, Undergraduate Research Conference, Promotion, Academic Policies, Equity & Diversity, Technology Advisory, Sustainability, Ruth Butler Grant, Harrod Lecture, International Advisory, Safety, and Common Community Read Committees, plus the Advisory Board of the Center for Teaching and Learning, the Student Conduct Board and the Library Advisory Board. In addition the two physicists have served on committees concerning the new science building.

Jiang Yu annually takes part in College Board AP physics test writing and grading. She became the Chief Reader Designate effective the summer of 2009. After serving one year as the Designate she became the Chief Reader, a position she held until 2014. This position entails working with the test development committee to set future exams, overseeing the hiring of the physics readers and managing the grading operation, including setting the standards.

Prof. Huang was engaged in the planning phase of an economic revitalization program for the city of Fitchburg. This led to her being named as a Research Fellow in what became the Regional Economic Development Institute.

In collaboration with scientists at the US Geological Survey (USGS), Prof. Gordon participated in four sampling trips to the Gulf of Mexico, with student participation funded in part by President's Initiative and a Ruth Butler Grant. Water samples collected as part of this project were analyzed at UMass-Amherst and the results interpreted by Jessica Durette, one of our ESS students, for an independent study Spring 2010. She presented the results of her study during the first of Fitchburg State's Undergraduate Research Conference.

During her post-doctoral appointment at UMass-Amherst (2005-07), Prof. Gordon was part of a research team that examined coastal marine sediments mobilized as a result of the record hurricane activity during 2005. In continuation of this research, three Earth System Science students performed complementary analyses on the samples in 2005. Students were supported through Special Projects Funding to travel to UMass-Amherst, where they conducted analyses; data interpretation was completed at Fitchburg State during Spring 2011. All three students individually presented the results of their research projects during the Fitchburg State Undergraduate Research Conference.

Prof. Gordon has served as Vice President #2 (Dec 2012 through Dec 2013) and Vice President #1 (Dec 2013 through Dec 2014) to the New England section of the National Association of Geoscience Teachers (NAGT), an organization devoted to improving Earth Science education from graduate schools down through kindergarten. NAGT organizes several professional development workshops each year, publishes the primary peer-reviewed journal for geoscience education, and sponsors sessions at several national annual meetings. She currently serves as President of this chapter.

As part of her Oceanography class Prof. Gordon led field trips to Plum Island (MA), and for her Meteorology course she led field trips to the Blue Hills Meteorological Observatory and to the Mount Washington Observatory. In her capacity as co-advisor to the Geo Club she led a trip to climb Mount Watatic.

## **Chapter 4**

# **Curriculum**

### **4.1 Objectives for the Program in Geo/Physical Sciences**

The Geo/Physical Sciences department encompasses the disciplines of Earth Systems Science, Geographic Science & Technology and Physics. A major track of study may be chosen in Earth Systems Science or Geographic Science & Technology. In both fields successful students pursue courses of instruction and are supported in undertaking internship experiences which prepare them for entry into the job market or for acceptance to graduate school. Both fields also offer a minor. In addition, all three disciplines which make up the Geo/Physical Sciences offer courses which satisfy various requirements of the Liberal Arts and Sciences Program, as well as those of majors in other departments.

Our goals for our majors are manifest in our mission statement (cf. §1.2.7). We hope that our students have acquired scientific skills and techniques, and have begun to think in a manner conducive to the scientific enterprise.

### **4.2 Relationship of courses and curriculum to objectives**

All of our courses exercise a student's problem solving ability, although some courses have a more mathematical bent than others, and some require a more physical participation (i.e, laboratories) than do others. All courses require at least a modicum of perspicuous expository writing, and a few demand oral presentations; thus, a student's communication skills are developed. One of our objectives is to develop our students' spatial analysis skills, especially through utilizing geospatial technologies, such as GIS. We encourage but do not require internships and intern-like experience, but a student who takes advantage of this will then have been exposed to a professional earth systems science or geographic science situation.

The explicit connection between our goals and our curriculum is described in our assessment plans found in Appendices F and G.

### 4.3 Requirements for the Major in GST and ESS

The degrees of Bachelor of Science and Bachelor of Arts in Geographic Science & Technology (GST) or Earth Systems Science (ESS) each require a minimum of 36 semester hours of coursework. The required courses and the electives may be found at §4.5. The required courses may be found in Table 4.2. Course descriptions in the catalog may be found in Appendix E.

### 4.4 Electives for the majors

#### 4.4.1 For the GST major

GST students take an additional six major elective courses beyond the required courses:

GEOG 2400 - Computer Applications in Geoscience 3 cr.  
GEOG 3000 - Geographic Economic System 3 cr.  
GEOG 3100 - Political Geography 3 cr.  
GEOG 3110 - Climatology 3 cr.  
GEOG 3200 - U.S. and Canada 3 cr.  
GEOG 3400 - Population Geography 3 cr.  
GEOG 4200 - Geomorphology 3 cr.  
GEOG 4400 - Urban Geography 3 cr.  
GEOG 4700 - Geographic Perspectives on Conservation 3 cr.  
GEOG 4940 - Internship in Geography 3 cr. or  
GEOG 4950 - Internship in Geography 6 cr. or  
GEOG 4960 - Internship in Geography 12 cr.  
(maximum 12 credits of internship counting toward major)

ECON 1200 - Principles of Economics: Microeconomics 3 cr. \*  
ECON 2550 - Urban Economics 3 cr. \*  
POLS 1500 - State and Urban Government 3 cr. \*  
POLS 1300 - Introduction to International Relations 3 cr. \*  
\*Maximum two courses among the four counting toward the major.

#### 4.4.2 For the ESS major

ESS students take an additional six major elective courses beyond the required courses:

GEOG 2000 - Astronomy 3 cr. or PHYS 2000 - Astronomy 3 cr.  
GEOG 3110 - Climatology 3 cr.  
GEOG 2400 - Computer Applications in Geoscience 3 cr.  
GEOG 3250 - Introduction to Historical Geology 3 cr.  
GEOG 3270 - Common Rocks and Minerals 3 cr.  
GEOG 4110 - Planetary Atmospheres 3 cr.  
GEOG 4200 - Geomorphology 3 cr.  
GEOG 4220 - Structural Geology 3 cr.  
GEOG 4500 - Remote Sensing of the Environment 3 cr.



#### 4.4. *ELECTIVES FOR THE MAJORS*

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GEOG 4600 - Environmental Hydrogeology 3 cr.  
GEOG 4700 - Geographic Perspectives on Conservation 3 cr.  
GEOG 3120 - Computer Cartography 3 cr.  
GEOG 4900 - Independent Study in Geography 1, 2, 3 cr.  
GEOG 4940 - Internship in Geography 3 cr. or  
GEOG 4950 - Internship in Geography 6 cr. or  
GEOG 4960 - Internship in Geography 12 cr.  
(maximum 12 credits of internship counting toward major)

Table 4.1: Geographic Science &amp; Technology and Earth Systems Science Required Courses for Majors

Geographic Science & Technology		Earth Systems Science	
GEOG 1000	Earth Systems Science	GEOG 1000	Earth Systems Science
GEOG 1100	Principles of Human Geography	GEOG 2100	Geology
GEOG 2800	Map Use	GEOG 2200	Meteorology
GEOG 3120	Computer Cartography	GEOG 2500	Oceanography
GEOG 4000	Geographic Information System	GEOG 2800	Map Use
GEOG 4500	Remote Sensing	GEOG 4000	Geographic Information System
CSC 1500	Computer Science I	MATH 1300	Pre-Calculus
MATH $\geq 1300$	Pre-Calculus or higher	MATH > 1300	above Pre-Calculus
		PHYS 2300	General Physics I
		PHYS 2400	General Physics II
		BIOL 2300	Ecology
		CHEM 1300	General Chemistry I
		CHEM 1400	General Chemistry II

The General Physics courses may be replaced by their Calculus-based equivalents.

Table 4.2: Geographic Science &amp; Technology and Earth Systems Science Required Courses for Minors

Geographic Science & Technology		Earth Systems Science	
GEOG 1000	Earth Systems Science	GEOG 1000 GEOG 1300	Earth Systems Science <b>OR</b> Earth, Sea & Air
GEOG 1100	Principles of Human Geography	GEOG 2100	Geology
GEOG 3120	Computer Cartography	GEOG 2500	Oceanography

For each minor an additional three courses are to be chosen with the approval of an advisor within the department.

Table 4.3: Two Year Rotation of Courses for Geo/Physical Sciences by Course Number.

Courses listed in **bold face** apply to both majors.

Courses listed in **red font** apply only to the GST major.

Courses listed in **blue font** apply only to the ESS major.

Regular black font applies to those courses that  
as of this writing do not count as electives toward either major.

course number	title	schedule
<b>GEOG 1000</b>	<b>Earth Systems Science</b>	<b>every semester</b>
<b>GEOG 1100</b>	<b>Principles of Human Geography</b>	<b>every semester</b>
<b>GEOG 1300</b>	<b>Earth, Sea &amp; Air</b>	<b>every semester</b>
GEOG 2056	Climate Change & Human History	fall of even years
<b>GEOG 2100</b>	<b>Geology</b>	<b>every semester</b>
<b>GEOG 2200</b>	<b>Meteorology</b>	<b>every fall</b>
GEOG 2250	Honors Seminar in Earth Science	spring of even years
<b>GEOG 2400</b>	<b>Computer Applications</b>	<b>every spring</b>
<b>GEOG 2500</b>	<b>Oceanography</b>	<b>every semester</b>
<b>GEOG 2800</b>	<b>Map Use</b>	<b>every fall</b>
<b>GEOG 3000</b>	<b>Geographic Economic System</b>	<b>as needed</b>
<b>GEOG 3100</b>	<b>Political Geography</b>	<b>as needed</b>
<b>GEOG 3110</b>	<b>Climatology</b>	<b>spring of odd years</b>
<b>GEOG 3120</b>	<b>Computer Cartography</b>	<b>every fall</b>
<b>GEOG 3200</b>	<b>U.S. and Canada</b>	<b>spring of odd years</b>
<b>GEOG 3250</b>	<b>Historical Geology</b>	<b>fall of even years</b>
<b>GEOG 3270</b>	<b>Common Rocks &amp; Minerals</b>	<b>spring of odd years</b>
<b>GEOG 3400</b>	<b>Population Geography</b>	<b>fall of odd years</b>
<b>GEOG 4000</b>	<b>Geographic Information System</b>	<b>every spring</b>
<b>GEOG 4110</b>	<b>Planetary Atmospheres</b>	<b>spring of even years</b>
<b>GEOG 4200</b>	<b>Geomorphology</b>	<b>fall of odd years</b>
<b>GEOG 4220</b>	<b>Structural Geology</b>	<b>fall of odd years</b>
<b>GEOG 4400</b>	<b>Urban Geography</b>	<b>every fall</b>
<b>GEOG 4500</b>	<b>Remote Sensing</b>	<b>spring of odd years</b>
<b>GEOG 4600</b>	<b>Environmental Hydrogeology</b>	<b>spring of even years</b>
<b>GEOG 4700</b>	<b>Geographic Perspectives on Conservation</b>	<b>spring of even years</b>
PHYS 1100	Physical Science I	spring of even years
PHYS 1200	Physical Science II	every semester
<b>PHYS 2000</b>	<b>Astronomy</b>	<b>every semester</b>
<b>PHYS 2300</b>	<b>General Physics I</b>	<b>every semester</b>
<b>PHYS 2400</b>	<b>General Physics II</b>	<b>every semester</b>
PHYS 3000	General Physics III	as needed
PHYS 2600	Calculus-based Physics I	as needed
PHYS 2700	Calculus-based Physics II	as needed

Table 4.4: Intended Schedule of Department Courses by Term

	<b>Courses expected to be taught every semester</b>		
GEOG 1000	Earth Systems Science	PHYS 1200	Physical Science II
GEOG 1100	Principles of Human Geography	PHYS 2000	Astronomy
GEOG 2100	Geology	PHYS 2300	General Physics I
GEOG 2500	Oceanography	PHYS 2400	General Physics II
	<b>Courses expected to be taught every year</b>		
GEOG 2200	Meteorology (fall)	GEOG 4000	Geographic Information System (spring)
GEOG 4400	Urban Geography (fall)	GEOG 2400	Computer Applications (spring)
GEOG 3120	Computer Cartography (fall)		
GEOG 2800	Map Use (fall)		
	<b>Courses expected to be taught every two years</b>	<b>red: fall of odd years black: fall of even years</b>	<b>magenta: spring of even years blue: spring of odd years</b>
GEOG 3400	Population Geography	GEOG 4220	Structural Geology
GEOG 4200	Geomorphology	GEOG 4200	Geomorphology
GEOG 4600	Environmental Hydrogeology	GEOG 4700	Geographic Perspectives on Conservation
GEOG 4110	Planetary Atmospheres	GEOG 2250	Honors Seminar in Earth Sci.
GEOG 2056	Climate Change & Human History	GEOG 3250	Historical Geology
GEOG 2300	Climatology	GEOG 3200	U.S. and Canada
GEOG 3270	Common Rocks & Minerals	GEOG 4500	Remote Sensing
		PHYS 1100	Physical Science I

## 4.5 Four Year Plans

Four Year Plans are established by departments to show students what is expected of them in order to complete the major within four years. The following two documents describe the advising plan for our majors.

## Suggested Four-Year Plan of Study GEO/PHYSICAL SCIENCES



### Earth Systems Science

FRESHMAN YEAR		SOPHOMORE YEAR	
<b>Fall Semester</b>	<b>15 Credits</b>	<b>Fall Semester</b>	<b>16 Credits</b>
ENGL1100	Writing I.....(3)	GEOG 2200	Meteorology*.....(3)
GEOG 1000	Earth Systems Science.....(3)	GEOG 2800	Map Use and Interpretation*.....(3)
MATH 1300	Precalculus.....(3)	CHEM 1300	General Chemistry I*.....(4)
	LA&S Elective.....(6)		LA&S Elective.....(6)
<b>Spring Semester</b>	<b>15 Credits</b>	<b>Spring Semester</b>	<b>16 Credits</b>
ENGL 1200	Writing II.....(3)	GEOG 2500	Oceanography.....(3)
GEOG 2100	Geology.....(3)	CHEM 1400	General Chemistry II*.....(4)
MATH > 1300	Math Elective above 1300.....(3)		LA&S Elective.....(3)
	LA&S Elective.....(6)		LA&S OR Free Elective.....(3)
EVEN-ODD YEARS		ODD-EVEN YEARS	
<b>Fall Semester</b>	<b>16 Credits</b>	<b>Fall Semester</b>	<b>16 Credits</b>
PHYS 2300	General Physics I.....(4)	BIOL 2300	Ecology.....(4)
Electives chosen from the following three:**		Electives chosen from the following three:***	
GEOG 2400	Computer Applications in GeoSciences**.....(3)	GEOG 4220	Structural Geology**.....(3)
GEOG 3250	Historical Geology**.....(3)	GEOG 4200	Geomorphology **.....(3)
PHYS 2000	Astronomy.....(3)	GEOG 3120	Computer Cartography**.....(3)
	LA&S OR Free Elective.....(var)		LA&S OR Free Elective.....(var)
<b>Spring Semester</b>	<b>16 Credits</b>	<b>Spring Semester</b>	<b>15 Credits</b>
PHYS 2400	General Physics II.....(4)	GEOG 4000	Geographic Information Systems*.....(3)
Electives chosen from the following four:***		Electives chosen from the following four:***	
GEOG 3270	Common Rocks and Minerals**.....(3)	GEOG 4600	Environmental Hydrogeology**.....(3)
GEOG 4500	Remote Sensing of the Environment**.....(3)	GEOG 4110	Atmospheres III: Planetary Atmospheres**.....(3)
GEOG 3110	Climatology**.....(3)	GEOG 49x0	Internship in Geography.....(var)
GEOG 49x0	Internship in Geography***.....(var)	GEOG 4700	Geographic Perspectives on Conservation**.....(3)
	LA&S OR Free Elective.....(var)		LA&S OR Free Elective.....(var)

\*Offered once per year \*\*Offered every fourth semester \*\*\*Six GEOG electives will be chosen in consultation with an advisor.

General Physics I & II should be completed before the senior year.

#### LA&S Elective List

1 AOM attribute (Art or Music)  
1 ART attribute (the Arts)  
1 CTW attribute (Citizenship & The World)  
3 credits HAF attribute (Health/Fitness)  
1 HIST subject (History)  
1 HMN attribute (Human Behavior)  
1 LIT attribute (Literature)

#### Advanced LA&S Options Area

Review the three options with your advisor and submit your decision to the Registrar's Office by completion of 60 credits.

Foreign language proficiency at the intermediate level required for Bachelor of Arts candidates.

Completion of 120 credits required for graduation.

#### Global Diversity Area

Two courses taken must meet the Global Diversity requirement: GDAN course + (GDC or GDCN course) OR GDCN course + (GDA or GDAN course). These courses are allowed to satisfy this requirement and another requirement at the same time.

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## Suggested Four-Year Plan of Study GEO/PHYSICAL SCIENCES



### Geographic Science & Technology

FRESHMAN YEAR		SOPHOMORE YEAR	
<b>Fall Semester</b>	<b>15 Credits</b>	<b>Fall Semester</b>	<b>15 Credits</b>
ENGL 1100	Writing I.....(3)	GEOG 2800	Map Use and Interpretation.....(3)
GEOG 1000	Earth Systems Science.....(3)	GEOG 3120	Computer Cartography.....(3)
MATH 1300	Precalculus.....(3)		LA&S Elective.....(9)
	LA&S Elective.....(6)		
<b>Spring Semester</b>	<b>15 Credits</b>	<b>Spring Semester</b>	<b>15 Credits</b>
ENGL 1200	Writing II.....(3)	GEOG 4000	Geographic Information System.....(3)
GEOG 1100	Principles of Human Geography.....(3)	GEOG xxxx	GST Elective.....(3)
CSC 1500	Computer Science I.....(3)		LA&S Elective.....(6)
	LA&S Elective.....(6)		LA&S OR Free Elective.....(3)
EVEN-ODD YEARS		ODD-EVEN YEARS	
<b>Fall Semester</b>	<b>15 Credits</b>	<b>Fall Semester</b>	<b>15 Credits</b>
Electives chosen from:		Electives chosen from:	
GEOG 3000	Geographic Economic System.....(3)	GEOG 3100	Political Geography.....(3)
GEOG 4400	Urban Geography.....(3)	GEOG 3400	Population Geography.....(3)
	LA&S OR Free Elective.....(var)		LA&S OR Free Elective.....(var)
<b>Spring Semester</b>	<b>15 Credits</b>	<b>Spring Semester</b>	<b>15 Credits</b>
GEOG 4500	Remote Sensing of the Environment.....(3)	Electives chosen from:	
Electives chosen from:		GEOG 4700	Geographic Perspectives on Conservation.....(3)
GEOG 2400	Computer Applications in GeoSciences.....(3)	GEOG 4200	Geomorphology.....(3)
GEOG 3110	Climatology.....(3)	GEOG 49x0	Internship in Geography.....(var)
GEOG 3200	U.S. & Canada.....(3)		LA&S OR Free Elective.....(var)
GEOG 49x0	Internship in Geography.....(var)		
	LA&S OR Free Elective.....(var)		

**Six electives will be chosen in consultation with an advisor from the following:**

Computer Applications in GeoSciences, Population Geography, Urban Geography, Geographic Economic Systems, Political Geography, U.S. & Canada, Climatology, Geomorphology, Geographic Perspectives on Conservation, Internship in Geography

**Non GEOG courses:**

Microeconomics (ECON), Urban Economics (ECON), Contemporary International Relations (POLS), State and Urban Government (POLS)

**LA&S Elective List**

- 1 AOM attribute (Art or Music)
- 1 ART attribute (the Arts)
- 1 CTW attribute (Citizenship & The World)
- 3 credits HAF attribute (Health/Fitness)
- 1 HIST subject (History)
- 1 HMN attribute (Human Behavior)
- 1 LAB attribute (Lab Science)
- 1 LIT attribute (Literature)

**Advanced LA&S Options Area**

Review the three options with your advisor and submit your decision to the Registrar's Office by completion of 60 credits.

Foreign language proficiency at the intermediate level required for Bachelor of Arts candidates.

**Completion of 120 credits required for graduation.**

**Global Diversity Area**

Two courses taken must meet the Global Diversity requirement: GDAN course + (GDC or GDCN course) **OR** GDCN course + (GDA or GDAN course). These courses are allowed to satisfy this requirement and another requirement at the same time.

Rev. 10-2014

## **4.6 Outcomes assessment plan**

The detailed assessment plan for ESS may be found in Appendix F and for GST in Appendix G. A recent report given to the university assessment officer may be found at Appendix H.





## Chapter 5

# Resources

### 5.1 Budget

The following data are from Banner, giving the adjusted budget for each year. The accounts are assigned thus: B00 is for travel and professional development, E00 for office and administrative supplies, F00 for lab supplies, K00 for equipment, L00 for maintenance and repair, M00 for field trips and U00 for computer equipment.

Table 5.1: Department budget

Year	B00	E00	F00	K00	L00	M00	U00	total
2014	2400	750.00	500.00	7,250.00		200.00	800.00	9,500.00
2013	2000	1400.00	500.00	6,250.00		250.00	1200.00	9,600.00
2012	1000	1,150.00	650.00	6,250.00		100.00	1,200.00	9,350.00
2011	1000	1,400.00	700.00	5,600.00		500.00	1,600.00	9,800.00
2010	1000	1,700.00	4,400.00	2,450.00		750.00	500.00	9,800.00
2009	1000	1,700.00	4,400.00	2,450.00		750.00	500.00	9,800.00
2008	1000	1,200.00	4,137.00	1,000.00	300.00		2,500.00	9,137.00
2007	1000	675.99	5,024.01	1,500.00	300.00		1,437.00	8,937.00
2006	800	1,226.23	3,249.23	4,461.54	0.00			8,937.00
2005	600	181.50	8,184.31	294.25	0.00			8,660.06

The B00 column was \$200 per faculty member until 2012, when it was doubled to \$400; this number is determined by the administration. The number of faculty increased from five to six in the fall of 2013, so the total for B00 went from \$2000 to \$2400. This number is not included in the department total. In recent years we have moved funds from other categories into B00 to facilitate faculty participation in conferences and workshops.

## 5.2 Library

The library's liaison with the department had been Jennifer Fielding until her departure in 2014. At present we have no one person delegated to us, so we work directly with Nancy Turnbull for any acquisition needs.

Given the limited demand for physics instruction on campus the holdings of the library are appropriate. Bruce Duncan uses his annual professional development funds in part to subscribe to physics journals that would be prohibitively expensive to the university, especially considering their small readership. Likewise, he buys physics books that would appeal only to a particular few and thus would not be appropriate for university funding. The library has been quite obliging in what requests he has made.

The Geographic Science & Technology and Earth Systems Science faculty place media on reserve for teaching purposes. Examples include course textbooks/supplementary texts. Jane Huang reserves audio docs, including DVDs for students who want to learn more or want to make up missed assignments. She also requires of her students to find the latitude and longitude of various sites, which can be done with the good, large atlases of the library (as well as the internet).

Prof. Huang has sent research assistants to the library for literature readings, including journals and books. She has requested the library to subscribe to the premier journal in GIS; nothing yet has come of that request. Prof. Guth, Prof. Gordon and Prof. Parsons have also had students attend training sessions led by library staff (formerly taught by Jenn Fielding, now Linda LeBlanc) on how to acquire articles from online journals using online databases such as GeoRef and the library's inter-library loan program. The library staff has also supported students in writing research papers using the appropriate scientific writing formats and citations. These papers are required in Profs. Guth's, Gordon's and Parsons's courses at the 3000 level and above.

The report of the dean of the library on the school's holdings for our disciplines may be found in Appendix I.

## 5.3 Space

**Staff** The office of Melissa Barrette, the departmental administrative assistant, is Condike 220, and the office of Ian Murray, our laboratory technician, is Condike 236.

**Physics** Physics instruction takes place in Condike 350, 339 and 242. Laboratory and demonstration equipment is stored in the prep rooms adjoining the classrooms (348, 337 and 240, respectively) and in the physics storage room, 316. Jiang Yu's office is 340 and Bruce Duncan's 220A.

**Earth Systems Science and Geographic Science & Technology** In the Condike Science Building the geo faculty are in the following offices: Lawrence Guth in 232, Jane Huang in 328, Elizabeth Gordon in 327 and Reid Parsons in 329. Earth Systems Science instruction takes place in 133 (a generic classroom), 120 (the "wet" lab) and 124 (the "dry" lab). Room 122, between 120 and 124, is the preparation area for those labs. Instruction requiring computers (*e.g.*, GIS and Computer Applications) takes place in 127. Additional storage space is in 125, B04 and part of 123.

**Research spaces** The department has three, rather small research spaces in 129, 317 and 319.

## **5.4 Equipment**

A list of equipment in the department is in Appendix J.



## Chapter 6

# Strengths and Weaknesses

### 6.1 Weaknesses

While in recent years the annual number of graduates has stabilized, it is not a large enough number to ensure that our advanced courses will always be allowed to run. To address this situation we have contacted the Admissions Department to explore the possibility of sending out the department flyer to high schools and community colleges, with the hope that this will increase the number of majors. Refer to Section §1.2.4.

For several years now we have had—and for the foreseeable future will continue to have—only one geographer on staff. Even though it is the view of some that a program with only a single professor to teach the upper level courses is not meet or appropriate, that has not stopped this understaffed program to do the work given it to do. Just as Dr. Guth singlehandedly had to carry the three Geography tracks between 2003 and 2006, we now rely on the sterling performance of Prof. Jane Huang to cover all of the upper-level GST courses so students can complete their GST degree programs.

In contrast to the GST major the ESS major is rather lacking in internship opportunities for its students. The view of our ESS faculty is that they do not have the connections with local institutions that could provide internships. A second problem in this regard is that our ESS majors sometimes are reluctant to pursue those (unpaid) internships that are available, *e.g.*, clearing hiking trails. In general the paucity of internships is regrettable, as there is evidence that students are more likely to graduate if they take advantage of such options. We think that if more openings were present, we might be able to recruit more students.

### 6.2 Strengths

We now have three earth scientists. This is enough faculty to sustain the ESS program in its current state, and perhaps to maintain the major even if it were to double in the number of majors.

We are still a small department, and while that presents some challenges, it also creates an intimate environment, one that we think enhances student retention.

In 2014 the renovated Condike Science Building reopened, a renovation that we hope will provide the infrastructure for up-to-date instructional formats and faculty-student collaborations. Such a learning environment should be an excellent draw for expanding the number of majors as well as improving the education of all students who take our courses. These are indeed better facilities than we used to have, but they are not exactly what we asked for, and they do have their limitations.

We do interact with other departments, as is noted in earlier chapters. To reiterate: Prof. Gordon teaching in the Honors Program and co-teaching a course with a history professor, and Prof. Huang collaborating with faculty in economics, business administration, and criminal justice. Prof. Huang has also developed collaborating relationships with local government agencies such as Montachusett Regional Planning Commission (MRPC), Fitchburg Police Department (FPD), and North County Land Trust (NCLT), and thus has secured multiple student internship opportunities.

Research in the department is largely the work of the younger faculty. Prof. Gordon has frequently presented her work on educational effectiveness and assessment. Prof. Huang has worked with several local government agencies, some of which work has been submitted for publication. Prof. Parsons continues to research the effect of liquid water on the ancient Martian landscape.

We present the opportunity for some out-of-state students to get a regional tuition discount for ESS majors.

# Appendices





## **Appendix A**

# **Department Policies and Procedures**

### **A.1 Selection process for department chair nominees.**

- A. Self-nomination by any tenured member. This should occur no later than the meeting prior to the election.
- B. If no tenured member is nominated, then non-tenured faculty may self-nominate, with the understanding that the election will be for an “acting chair.”
- C. If there are still no self-nominees, the current chair shall use suitable inducements on all faculty until someone volunteers.

### **A.2 Membership and selection process for the Departmental Undergraduate Curriculum Committee.**

#### **A. Faculty members**

- 1. This is open to all faculty for self-nomination.
- 2. If there are more nominees than positions, then the chair shall try to forge a consensus on who should be on the committee.
- 3. Failing that, a blind ballot shall be conducted by the chair.
- 4. If there are an inadequate number of nominees, the chair shall use suitable inducements to get enough faculty to volunteer, especially among those who have not recently served.

#### **B. Student members**

- 1. Student members should be either ESS majors or GST majors.
- 2. Having considered the potential members and under open discussion, the faculty shall name the student members.
- 3. Should those students so named decline the honor, then the faculty shall pursue other students.

### **A.3 Membership and selection process for all departmental *ad hoc* committees.**

- A. All such committees shall be open to all faculty for self-nomination.
- B. If there are more nominees than positions, then the chair shall try to forge a consensus on who should be the committee
- C. Failing that, a blind ballot shall be conducted by the chair.
- D. If there are an inadequate number of nominees, the department shall first consider the necessity of having such a committee. Should that discussion decide in favor of the committee, the chair shall use suitable inducements to garner the appropriate number of volunteers.

### **A.4 Membership and selection process for establishing search committees and conducting searches.**

- A. Search committees shall be open to all faculty for self-nomination.
- B. If more than needed volunteer, then the chair shall try to forge a consensus on who should be the committee, including but not limited to a consideration of how long prospective committee members would serve as colleagues to the newly hired.

## Appendix B

# Internship Program Policies, Procedures & Standards

### B.1 Geo/Physical Sciences Internship Overview

The Fitchburg State University Geo/Physical Sciences Department Internship Program provides students with an opportunity to gain practical experience in their major field of study. Any student may apply for an internship assignment. Acceptance into the program may depend on the availability of positions, the student's qualifications and the department's ability to monitor the assignment. The Internship Director, a member of the Geo/Physical Sciences department faculty, is responsible for the planning, organization, and implementation of the Internship Program.

Interested students from every concentration in the Geo/Physical Sciences program are welcome to apply. Certain qualifications are required (see §B.1.2). It is highly recommended that students begin planning for internships early in their academic careers. The process of company or organization selection, interviewing, course selection, and other academic requirements should be properly planned in order to graduate on time.

The Internship Program strives to create a positive experience for both the host company or organization and the student intern. The departmental Internship Director, in consultation with the student and other faculty, is responsible for approving host organizations. Internship sites located at considerable distances from the college are not recommended. A student who is aware of a company or organization that wishes to participate in the program should have that company submit a detailed job description to the director for approval one semester in advance of the internship assignment.

**Objective** The Internship Program is structured to give the participant an opportunity to apply knowledge and skills acquired in the classroom to the activities of the corporation. Considerable care is taken to ensure that the intern's work experience is clearly related to his or her course work and major field of study. It is hoped that the internship experience will enhance the student's total college experience by forging a link between conceptual and applied knowledge of the major field of study.

Ideally, training and experience that a student gains will be of considerable value when searching for a permanent position. In some cases, internships can lead to full-time employment. Many employers seek college-educated students who have acquired some on-the-job training via intern-related experiences prior to graduation. Students should plan well in advance for internships. The type of company or organization and the requirements of the host should be closely coordinated for maximum effectiveness.

### **B.1.1 Application Process**

For an Internship Application Form (Exhibit 1) and additional information regarding the program, Geo/Physical Science majors should contact their advisor in the Geo/Physical Sciences Department. Candidates must complete the application form and submit it along with a copy of their resume to their advisor. Following a review of the student's file, the Internship Director and interested faculty will conduct an interview with the prospective intern. Selection for an internship will be based upon academic achievement, maturity, and desire to participate in the program.

The internship application process should be completed at least one semester prior to placement. Students are encouraged to discuss the program and application process with their advisor. Timely submission of all required documents will maximize the possibility of securing an internship.

The first step is to contact your advisor in the Geo/Physical Sciences Department for a full review of your academic records.

### **B.1.2 Qualifications**

Student qualifications for the Internship Program are as follows:

- (a) Applicant should be preferably a second semester junior or a first semester senior. Exceptions to this criterion are permitted but only on a selective basis.
- (b) An overall grade point average of 2.5 or better is required along with a 3.0 minimum in Geo/Physical Sciences. However, the GPA is a guideline and not meant to disqualify a student who exhibits other qualifications.
- (c) Receive the recommendation of Geo/Physical Sciences Department faculty.
- (d) Receive the approval of their advisor and department chairperson.

### **B.1.3 Selection Process**

Candidates are required to submit a completed application form and resume to their advisor. After reviewing these documents, an interview will be conducted by the Internship Director and interested faculty. During the interview, the program requirements will be discussed thoroughly including a complete explanation of internship assignments, procedures, administration and grading. All internship candidates must agree to these requirements in advance of placement. Following approval for internship, a letter of introduction and a copy of the student's resume will be sent to the host company or organization selected. It is then the student's responsibility to secure an appointment for a job interview with the company. The host company selects the student of its choice for the internship position. All companies selected to participate

in the Internship Program must meet predetermined requirements deemed necessary by the college and the Geo/Physical Sciences Department.

Following the selection of tile student by the host organization, a contract letter will be sent to both the student and the company for review (Exhibit 3 and 4). Once agreed upon, the student must sign the contract and return it to the internship supervisor. These documents will become a part of the intern's permanent file.

Internship job descriptions are posted on the Geo/Physical Sciences Department bulletin board.

Companies selected to participate in the program are pre-screened and meet the criteria as a host company. Keep in mind that companies and organizations should be located within a reasonable distance of the college in order to facilitate faculty visitations.

#### B.1.4 Assignment

Each intern will be under the overall supervision of the Director and the faculty member(s) who are most familiar with the subject matter involved in the internship. Regular communication between the Intern, host company, and Internship Director will be required. The ultimate responsibility to complete the program and properly communicate with the Internship Office rests with the student.

Table B.1: Internship requirements

Mid-Term Evaluation	33%
Final Evaluation	33%
Internship Report	33%
15 minute oral presentation	

A performance evaluation (66.6% of grade), must be conducted by the employer at the mid-term and end of the semester (Exhibits 2 and 3). At least one site visitation by the Internship Director will take place during the internship period. Grading of the internship report and the performance evaluations will be consistent with the standards set forth in a regular classroom. In addition, such evaluations will reflect the academic policies of Fitchburg State University and the Geo/Physical Sciences Department. A 15 - 20 minute oral presentation summarizing the results of your internship shall be presented to a meeting of departmental faculty and your peers. Time and date will be arranged at a mutually convenient time. This oral, *though ungraded*, is a *formal requirement* of the internship and must be completed before a grade is reported to the registrar.

**Grading Policy** The grading scale used for the Internship Program is the same grading at Fitchburg State University.

### **B.1.5 Report Outline**

Student interns will prepare a 10-12 page report (footnotes or citations as needed). The document will be typed, double-spaced with appropriate margins. The paper should serve as an example of the internship experience and reflect the student's best effort of all work completed during the semester. The report should also include tangible evidence (tables, maps, charts, field notes, etc.) which serve as examples of the specific types of professional experiences in which the student was engaged.

I Cover Page

II Table of Contents

III A Introduction and Purpose of Paper

B Describe Internship Experience

IV Report on Specific Position Held and Job Profile Report on Overall Industry and Opportunities for a Career.

V Weekly Time Sheets Signed by Supervisor (See Exhibit 6)

VI Summary and Conclusions

VII References

VIII Updated Resume, Including Internship Activities

## B.2 Procedures

- 1 Complete an Internship Application Form obtainable in the Geo/Physical Sciences Department Office, McKay C289.
- 2 Submit the completed application form along with a curriculum check sheet and a resume to the Internship Director. If you need assistance with writing a resume, contact the Career Services Office. Examples of resumes can also be reviewed in the Geo/Physical Sciences Department Office.
- 3 Review the listing and descriptions of available internships prior to your interview with the Internship Director or Identify the company or organization if it is one that you have approached on your own.
- 4 When your internship file is complete, you should arrange for an interview with the Geo/Physical Sciences Department's Internship Director.
- 5 If you are approved for an internship, the Director will send a letter of introduction and a copy of your resume to the company or organization you are apply to for internship.
- 6 You should arrange to meet with the appropriate supervisor at the company or organization you have applied to.
- 7 If selected for internship by the company or organization, a "contract" letter will be sent to both the student and the company or organization involved.
- 8 Communicate with your advisor and ensure your course scheduling provides for timely graduation.
- 9 Arrange to meet with the Internship Director prior to the start of your internship to review the requirements of the internship and to answer any questions you might have.
- 10 You will be required to communicate with the Internship Office at least once every two weeks, by telephone or in person.
- 11 Schedule at least one visit for the Director to meet with your immediate supervisor.
- 12 Submit your internship report to the Internship Director at least one week before the last day of regularly scheduled classes of the semester.
- 13 Oral presentation - 15 minutes - to department and peers.

Note: The success of any internship rests *primarily with the intern*. It is expected that the intern will demonstrate good judgment and keep the Director informed on a regular basis.

## B.3 Exhibits

### B.3.1 Application form

Table B.2: FSC Geo/Physical SCIENCES INTERNSHIP APPLICATION FORM

Date:			
Name:		SS#	
Home Address:		Tel. #	
University Address:		Tel. #	
		Mail Box #	
Major Concentration		Advisor	
Full Time ( )	Part Time ( )	Transfer ( )	
Applying For:	6 credit internship ( ) (18 hours per week)		12 credit internship ( ) (36 hours per week)
Overall GPA:		Major Cum.	
During What Semester/Year?			

List all Geo/Physical sciences faculty you have taken courses with.

For Office Use Only:		
Resume:	Audit:	Curriculum
	Sheet:	Check Sheet:
Interview	Internship	Internship
Date:	Approved:	Not Approved:

Additional Comments:



**B.3.2 (Mid-Term Evaluation)**

Date:

Student Intern:

Company, Institution or Agency:

Address:

Position Title:

Dates of Assignment:

Description of Duties:

From

To

Performance Evaluation (If applicable, consider such criteria as productivity, quality of work, willingness to accept assignments, and the ability to get along with others.)

Attendance/Punctuality (check one):

Superior ( )	Excellent ( )	Very Good ( )	Satisfactory ( )	Unsatisfactory ( )
4.0	3.5	3.0	2.5	2.0

Overall Performance Evaluation(check one):

Superior ( )	Excellent ( )	Very Good ( )	Satisfactory ( )	Unsatisfactory ( )
4.0	3.5	3.0	2.5	2.0

Additional comments:

Note to Supervisor on Overall Performance:

The grade of 4.0 is to be awarded *only* to those students that have demonstrated skills and performance found in personnel with far greater work experience and performance. Your best judgement should be used when evaluating the intern. The Internship Director has the right to adjust a grade he may not agree with.

Supervisor's Name

Supervisor's Signature

Date

Reviewing Supervisor's Name

Supervisor's Signature

Date

Geo/Physical Sciences Department

Fitchburg State University

160 Pearl St.

Fitchburg, MA 01420

**B.3.3 (Final Evaluation)**

Date:

Student Intern:

Company, Institution or Agency:

Address:

Position Title:

Dates of Assignment:

Description of Duties:

From

To

Performance Evaluation (If applicable, consider such criteria as productivity, quality of work, willingness to accept assignments, and the ability to get along with others.)

Attendance/Punctuality (check one):

Superior ( )	Excellent ( )	Very Good ( )	Satisfactory ( )	Unsatisfactory ( )
4.0	3.5	3.0	2.5	2.0

Overall Performance Evaluation(check one):

Superior ( )	Excellent ( )	Very Good ( )	Satisfactory ( )	Unsatisfactory ( )
4.0	3.5	3.0	2.5	2.0

Additional comments:

Note to Supervisor on Overall Performance:

The grade of 4.0 is to be awarded *only* to those students that have demonstrated skills and performance found in personnel with far greater work experience and performance. Your best judgement should be used when evaluating the intern. The Internship Director has the right to adjust a grade he may not agree with.

Supervisor's Name

Supervisor's Signature

Date

Reviewing Supervisor's Name

Supervisor's Signature

Date

Geo/Physical Sciences Department

Fitchburg State University

160 Pearl St.

Fitchburg, MA 01420

**B.3.4 Student contract letter**

Date

Student's Name

Student's Address

Dear

This is to confirm your appointment as a \_\_\_\_ time intern at \_\_\_\_\_ during the \_\_\_\_ semester. Congratulations! As a part of the program we will need to agree on specific requirements as requested by Fitchburg State University and the Geo/Physical Sciences department. They are as follows:

1. You will be required to communicate with the Internship Office at least once every two weeks, by telephone or in person for the express purpose of determining if the internship meets your needs and follows the job description.
2. Discuss the internship report requirements with the Internship Director.
3. Schedule an end of the semester meeting for the Internship Director to meet with your immediate supervisor.
4. Meet with the Internship Director during the first two weeks of the semester.
5. Communicate with your advisor to ensure your course scheduling provides for a timely graduation.

The Internship Program and its success rest primarily with the intern. It is expected that the intern will demonstrate good judgement and keep the Director *informed* on a *regular* basis. We will assist you in any way to ensure that a mutually rewarding experience occurs between you and the host organization. Please sign below and return it to the Internship Office as soon as possible.

Sincerely,

Internship Director  
Geo/Physical Sciences Department

Student's Signature

Date

**B.3.5 Company contract letter**

Date  
Name  
Company address

Dear

This letter will confirm the appointment of \_\_\_\_\_ as an intern at \_\_\_\_\_ during the \_\_\_\_ semester. The length of the internship period shall reflect the academic calendar at Fitchburg State University and shall extend from (date) to (date). During this period the intern is expected to devote \_\_\_\_\_ hours per week in performing the duties required by the host organization.

The administration of the program is under the supervision of the Geo/Physical Sciences department at Fitchburg State University. If you should have any questions, please do not hesitate to call us. Specifically, our requests are few in terms of paperwork. However, we will require the following:

A mid-term evaluation completed by the supervisor is required. Your intern will notify you when it is due. This evaluation should be mailed or faxed to me at 978/665-3081.

A final evaluation must also be completed by the internship supervisor and I will collect it at the time of my visitation at the end of the semester.

The student is required to follow the job description supplied by your organization. Any significant deviation should be communicated to us.

We welcome and value good communication. Please feel free to talk with us on the progress of your student intern.

Thank you for providing an internship opportunity for one of our students during the \_\_\_\_ semester. Please don't hesitate to contact me if you have any questions or concerns.

Sincerely,

Internship Director  
Geo/Physical Sciences Department

**B.3.6 Weekly time sheet**

Student Intern:

Company, Institution or Agency:

Supervisor:

Week #	From	To	# Hours Worked	Supervisor's Signature
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

**B.3.7 Internships suggested by Reid Parsons for his Planetary Atmospheres class**

Reid Parsons provided students with a list of internship opportunities during his Planetary Atmospheres class, and also sent out updates of new opportunities when they are announced. Attached is an example of one of those lists for the Spring of 2014.

**USA Jobs:**

Government/Seasonal jobs which include the park service and the Bureau of Land Management.

[www.usajobs.gov](http://www.usajobs.gov)

**1. National Science Foundation supported Research Experiences for Undergraduates**

The National Science Foundation supports many research opportunities for undergraduates. To search for one in your field of interest, please go to:

<http://www.nsf.gov/crssprgm/reu/index.jsp>

**For Example:****Lamont-Doherty Earth Observatory Summer Internship Program for Undergraduates**

2014 program dates: May 29th - August 5th, 2014

Sponsored by the National Science Foundation Ocean and Earth Sciences REU Sites Program

Theme: Analyzing Global Databases

The Lamont-Doherty Summer Intern Program offers the chance to experience scientific research as an undergraduate. The program is open to US citizens or permanent residents who have completed their junior or sophomore year in college with majors in earth science, environmental science, chemistry, biology, physics, mathematics, or engineering. Neither graduating seniors nor international students are eligible for this internship. Minorities and women are encouraged to apply.

Applicants should have an interest in conducting research in the Earth or ocean sciences. Two previous Earth- or ocean-science courses are desirable if they are available to the student. All students are required to have at least one year of calculus. Students choosing research in geochemistry and chemical oceanography are required to have at least two semesters of college-level chemistry. Students choosing research in marine biology are required to have at least two semesters of college-level biology. Students choosing research in geophysics should have at least three semesters of college-level physics.

The Marine Geoscience Data System group at Lamont provides a freely-available tool called GeoMapApp that allows the exploration and visualization of global data sets ([www.geomapapp.org](http://www.geomapapp.org)). With GeoMapApp, users can create custom maps and

grids, import their own data sets and grids, and explore and visualize a wide range of global data sets. These include a multi-resolutional digital elevation model of the oceans and continents; plate tectonic information; undersea feature names; shipboard topography, gravity and magnetics data; earthquake catalogues; deep sea core data; Alvin submersible photos around hydrothermal vents; rock sample geochemistry; satellite-derived gravity and geoid grids; seismic reflection profiles, and more. GeoMapApp is written in Java and works on any type of computer. All interns will be instructed in the use of GeoMapApp during the second week of the intern program. Interns will be encouraged to use GeoMapApp during their research projects, as well as after they have returned to their undergraduate institutions. However, both the student and the supervisor will design the research program, and therefore individual projects may contain variable amounts of data collection and data analysis.

The program features:

- \* A hands-on research project under the supervision of a Columbia-affiliated scientist;
- \* special lectures, workshops and fieldtrips;
- \* free housing in an air-conditioned Columbia dormitory;
- \* and a 10-week stipend of \$5000.

For more information and to view the listing of advisors and projects please visit:

<http://www.ldeo.columbia.edu/education/programs/summer-internship/lamont-summer-intern-program>

## **2. Research Internship in Seismology and Geophysics - IRIS Undergraduate Internship Program**

Are you a physics, geoscience or math major interested in working in on an exciting Earth science project? If so, consider applying to the IRIS Undergraduate Internship Program. Research projects vary annually but include the full spectrum of seismological specialties. earthquakes and hazards at the crust, to deep Earth studies of the core. Projects may also involve the deployment of seismic instruments in the field (within the US or internationally) and/or analyses of seismic data in a lab setting. The ultimate goal of each project is to produce results for presentation at a national scientific meeting. Participants receive high-quality mentoring, experience communicating their research to a broad audience, the development of a rich peer community, and opportunities to explore career paths in seismology.

Benefits include assistance locating housing, a competitive weekly stipend, travel and lodging at the orientation week, travel to and from your summer research location, funding for all field costs, and full funding to present your research at the 2014 Fall AGU meeting.

Apply your knowledge. Explore your future. Contribute to science.

Application Deadline - February 1

To apply or get more info [www.iris.edu/hq/internship](http://www.iris.edu/hq/internship)

### **3. Research Experiences in Solid Earth Science for Students (RESESS) Internship Program**

RESESS is an 11-week paid internship program based in Boulder, Colorado, in which interns do summer research on a project of interest to them with a scientist at UNAVCO [[www.unavco.org](http://www.unavco.org)], the University of Colorado, the U. S. Geological Survey, or from other scientific institutions in the Boulder/Foothills area. Topics include geology, geomorphology, hydrology, seismology, paleoclimatology, glaciology, geophysics, geodesy, volcanology, and more. The program includes a communications and professional development workshop, mentoring, field trips, and a supportive community. RESESS provides extensive support to interns, including travel to and from Boulder, housing, a competitive salary, funding support for presenting science at a national science conference, and a partial scholarship for the following academic year.

This program is intended to increase diversity in the geoscience workforce by supporting students from underrepresented groups on their path to graduate school and the technical workforce, and encourages applications from Native Americans, African Americans, Hispanic Americans, and disabled Americans. Please visit the RESESS website and go to our APPLY and FAQ web pages for more information.

Application Deadline: February 1, 2014.

To apply, please go to: [resess.unavco.org](http://resess.unavco.org)

Questions: [resess@unavco.org](mailto:resess@unavco.org)

### **4. The Southern California Earthquake Center (SCEC) is offering two summer research internship programs:**

Undergraduate Studies in Earthquake Information Technology (UseIT):

An 8-week team-based undergraduate research program that allows students to work in multi-disciplinary collaborative teams to tackle a scientific "Grand Challenge" where they use the advanced tools of information technology to solve important problems in interdisciplinary earthquake research. Learn more about the UseIT program and Grand Challenges at: <http://scec.usc.edu/internships/useit>

Summer Undergraduate Research Experience (SCEC-SURE):



An 8-10 week program that pairs a student, one-on-one, to conduct research with an earthquake scientist or specialist. Many SURE interns also have the opportunity to work alongside graduate students and post-doctoral researchers and thus gain the special perspective of these early career professionals.

Priority application deadline for both programs is 24 February 2014

Apply to UseIT and SURE at: <http://www.scec.org/internships>

Questions? Send a message to: [internships@scec.org](mailto:internships@scec.org)

## **5. Research Internship in Climate and Weather - SOARS Program**

SOARS is a summer research internship for students interested in the atmospheric and related sciences at the National Center for Atmospheric Research (Boulder, CO). The program provides summer research, strong mentoring and community support.

Students from many disciplines, including meteorology, geography, chemistry, physics, engineering, mathematics, ecology, and the social sciences are invited to apply their expertise to understanding the Earth's Atmosphere and to use that understanding to improve life on Earth. In particular, SOARS seeks to involve students from groups that are historically under-represented in the sciences, including Black or African-American, American Indian or Alaska Native, Hispanic or Latino, female, first-generation college students and students with disabilities. SOARS welcomes lesbian, gay, bisexual and transgender students; students who have experienced, and worked to overcome, educational or economic disadvantage and/or have personal or family circumstances that may complicate their continued progress in research careers.

Benefits in the summer include a competitive wage, housing, and travel to/from Boulder; as well as funding for conferences, undergraduate and graduate education throughout the year. Application deadline: Feb 1. To apply, please go to [www.soars.ucar.edu](http://www.soars.ucar.edu)

## **6. NASA's Planetary Geology and Geophysics Undergraduate Research Program** pairs

undergraduates and NASA-funded researchers for 8 weeks during the summer, and is accepting applications for the summer of 2014.

Applications are due on February 3, 2014, and require:

- the online application (see [http://www.acsu.buffalo.edu/~tgregg/pggurp\\_application.html](http://www.acsu.buffalo.edu/~tgregg/pggurp_application.html))

- 2 letters of recommendation
- official transcripts.

Please see the website

([http://www.acsu.buffalo.edu/~tgregg/pggurp\\_homepage.html](http://www.acsu.buffalo.edu/~tgregg/pggurp_homepage.html)) for more details, and please email us ([PGGURP@buffalo.edu](mailto:PGGURP@buffalo.edu)) with any questions.

### **7. Clark University's Human-Environment Regional Observatory (HERO) Program 2014 Research Experiences for Undergraduates (REU)**

Program: Clark University's Human-Environment Regional Observatory (HERO) Program seeks applicants for an NSF-funded summer Research Experience for Undergraduates (REU) program in 2014. Ten students who have completed their freshman year of college and who have not yet graduated can participate fully in the HERO Program activities and work on a research project under the direction of a faculty mentor.

The HERO information brochure and application are available at this site:<http://www.clarku.edu/departments/hero/fellowship.cfm>

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\2014\herobrochure2014.pdf

Applications are due February 14th 2014

Eligibility: Undergraduate student participants must have completed their freshmen year of college but not yet graduated, and must be citizens or permanent residents of the United States. Underrepresented groups in science are strongly encouraged to apply.

For more information, including research projects and how to apply, see <http://www.clarku.edu/departments/hero/fellowship.cfm> or contact program director Dr. John Rogan at [jrogan@clarku.edu](mailto:jrogan@clarku.edu)

## Appendix C

### 2014 Survey of Alumni

The addition of new faculty members has revitalized the department as they have initiated significant changes. We need to know something about you and where you fit on the timeline of changes so we can evaluate if these changes have improved student experiences in the department and at Fitchburg State.

Gender:

- female
- male

You entered Fitchburg State as a . .

- freshman.
- transfer student.

You entered Fitchburg State as a . .

- major in Geo/Physical Sciences department.
- major in another department.
- Premajor / Undeclared student.

You entered Fitchburg State in what year? [pull down menu] [By using the year they entered instead of the year they graduated, it would reflect the Catalog they came in under and therefore the degree requirements while not revealing the year of graduation that might more easily compromise the survey anonymity]

You graduated from Fitchburg State with a BA/BS in . .

- Geography / Earth Science Track.
- Geography / Geography Track.
- Geography / Education Track.
- Earth Systems Science.
- Geography.
- Geographic Sciences and Technology.

Since graduating from Fitchburg State, you have (click all that apply)?

- ☐ returned to school in a different undergraduate program.
- ☐ gone on to graduate school.
- ☐ worked in a field related to the Earth and Geographic sciences.
- ☐ worked in a field outside of the Earth and Geographic sciences.
- ☐ been looking for work.
- ☐ been out of the workforce by choice.

1. In the spaces below, evaluate the usefulness of each course as it has influenced your professional activities or any advanced studies that you have undertaken since graduation. The courses that are shown are those listed in the current college catalog. Several spaces are provided so that you can fill in any Geography or Earth Science courses that you may have taken, but which are no longer shown in the catalog. (Note: If while you were in the department there was just one Cartography course, it is identified below as Computer Cartography.)

Course	Very Useful	Somewhat Useful	Not Useful	Did not Take
Introduction to Geography				
Earth Systems Science				
Principles of Human Geo				
Earth, Sea and Air				
Astronomy				
Climate Change & Human History				
Geology				
Meteorology				
Honors Seminar in Earth Science				
Computer Applications in Geoscience				
Oceanography				
Map Use				
Geographic Economic System				
Political Geography				
Climatology				
Computer Cartography				
U.S. & Canada				
Historical Geology				
Common Rocks & Minerals				

Course	Very Useful	Somewhat Useful	Not Useful	Did not Take
Population Geography				
Geographic Information Systems				
Planetary Atmospheres				
Geomorphology				
Structural Geology				
Urban Geography				
Remote Sensing of the Environment				
Environmental Hydrogeology				
Geographic Perspectives on Conservation				
Independent Study				
Internship				

We also had required cognate courses to give you the background in the basic sciences that are integrated into the Earth & Geographic Sciences. In the spaces below, evaluate the usefulness of each course as it has influenced your professional activities or any advanced studies that you have undertaken since graduation.

Course	Very Useful	Somewhat Useful	Not Useful	Did not Take
Ecology				
2 Math courses at PreCalculus or above				
1 year of general chemistry				
1 year of general physics				

Taken as a whole, the 12-19 courses that were required in your degree program have specific objectives considered important for success in graduate school and/or employment. How well did we meet those objectives? In the spaces below, evaluate how well the curriculum developed your...

OBJECTIVE	Maximum development	Some development	Minimal development
oral communication skills			
written communication skills			
problem solving skills			
quantitative computational skills			
computer literacy/GIS skills			
collaborative skills			

2. As precisely as possible, identify any courses, topics, or types of training that you feel our current Geography/Earth Science majors should be exposed to in order that they may compete successfully for employment opportunities or to experience success in postgraduate studies.

OPEN RESPONSE

3a. With respect to only the courses in the Geography/Earth Science major, evaluate the overall quality of instruction which you experienced while an undergraduate at FSU.

- Excellent (A)
- Very Good (B)
- Average (C)
- Fair (D)
- Poor (E/F)

3b. With respect to the breadth of your entire degree program at FSU, evaluate your confidence that you can take the skills you learned and apply them to the jobs of the future, whatever they might be.

- Excellent (A)
- Very Good (B)
- Average (C)
- Fair (D)
- Poor (E/F)

3c. With respect to your total experience at FSU, evaluate its influence on your overall personal and intellectual growth.

- Excellent (A)
- Very Good (B)
- Average (C)
- Fair (D)
- Poor (E/F)

4a. Assess the general level and effectiveness of academic advising that you received from the Geo/Physical Sciences faculty to keep you on target for graduation and to tailor your degree program for your individual interests..

- Excellent (A)
- Very Good (B)
- Average (C)
- Fair (D)
- Poor (E/F)

4b. Assess the availability of the courses you needed or wanted to take so you could graduate on your planned schedule.

- Excellent (A)
- Very Good (B)
- Average (C)
- Fair (D)
- Poor (E/F)

4c. If you found that the availability of the courses you needed or wanted to take was an issue in keeping your degree program on schedule, this was because. . .

- the course(s) were never offered by the department.
- the course(s) were offered by the department too infrequently to fit your degree program.
- the course(s) were offered by the department but later cancelled due to low enrollment.

5. Use the space below for any additional comments that you may wish to share.

OPEN RESPONSE

Thank you for taking the time to improve the programs offered by the Department of Geo/Physical Sciences at Fitchburg State.





# Appendix D

## Curricula Vitarum

### D.1 Bruce Duncan

#### D.1.1 Education

- 2015 NYU Polytechnic School of Engineerings/Scientific American Professional Learning Program: Mysteries of the Universe, presented by Dr. Don Lincoln, Fermi Labs & CERN; online course.
- 2006 National Science Foundation Chautauqua Short Course for College Teachers: Using Research Based Curricula & Tools to Promote Active Learning in Introductory Courses II.
- 2001 PhD in physics, University of Connecticut, Storrs CT. Dissertation: “Laser Cooled Rubidium Atoms in the  $5D_{5/2}$  Level: Excitation, Photoionization and Collisions,” advisor: Phillip L. Gould.
- 1992 MS in physics, University of Connecticut.
- 1990 BS with high distinction in physics, Worcester Polytechnic Institute, Worcester MA.
- 1978 *Artium Magister Religionem* in religion and education, Yale University, New Haven CT.
- 1974 BA in history and music, *magna cum laude*, Wesleyan University, Middletown CT.

#### D.1.2 Teaching

- 2005-: Fitchburg State University:
  - Physical Science I & II
  - Astronomy
  - Planetary Atmospheres (as a directed study)
  - General Physics I & II
  - Calculus-based Physics I & II (as directed studies)
  - directed study in modern physics (General Physics III) (twice)
  - independent study in optics
  - independent study in quantum mechanics (twice)

- independent study in thermodynamics & statistical mechanics
- independent study in the physics of music (twice)
- advisor to a student for the Undergraduate Conference on Research & Creative Practice
- 2010-: associate professor of physics; granted tenure.
- 2006: With Joseph Dignam ran a Summer Content Institute for the Winchendon (MA) school district, teaching physical science to elementary school teachers in the region.
- 2005-2010: assistant professor of physics in the Geo/Physical Sciences Department, Fitchburg State University.
- 2002-2005: visiting assistant professor in the Physics Department, Union College, Schenectady NY (Physics for the Life Sciences [algebra-based], calculus-based Physics, Science of Sound & Music). 2004 to 2005 taking part in an experimental “Supplemental Learning” program, in which at-risk engineering students are taught how to study mathematics, physics and various engineering disciplines.
- 2002: lecturer in the Physics Department, University of Connecticut (Physics for Engineers).

### D.1.3 Research

- 2003: continued research on Rb 5D collisions.
- 2002: helped prepare an apparatus in which to form ultracold Rb<sub>2</sub> molecules, and began preliminary investigations.
- 1995 - 2001: conducted investigations into two-color, two-photon, counter-intuitive excitations of Rb to the 5D level in a cell trap magneto-optical trap (MOT).
- 1993-1994: investigation of rectified forces in a cell trap MOT.

### D.1.4 Selected Publications

- B.C.Duncan, V. Sanchez-Villicana, P.L.Gould and H.R. Sadeghpour, “Measurement of the Rb(5D<sub>5/2</sub>) photoionization cross section using trapped atoms,” *PhysRevA*, 63, 043411, 2001
- W.Süptitz, B.C.Duncan and P.L.Gould, “Efficient 5D Excitation of Trapped Rb Atoms Using Pulses of Diode Laser Light in the Counterintuitive Order,” *JOSA B*, 14, 5:1001-8, 1997
- T.T.Grove, B.C.Duncan, V. Sanchez-Villicana and P.L.Gould, “Observation of three-level rectified dipole forces acting on trapped atoms,” *PhysRevA* 51, 6:R4325-R4328, 1995
- T.T.Grove, V. Sanchez-Villicana, B.C.Duncan, S.Maleki and P.L.Gould, “Two-Photon Two-Color Diode Laser Spectroscopy of the Rb 5D<sub>5/2</sub> State,” *Physica Scripta* 52, 271-276, 1995

### D.1.5 Campus Presentations

- The Higgs Field and Its Boson. FSU Faculty Speaker Speaker series, Center for Teaching and Learning. March, 2013.
- “Remembering Galileo.” Following a performance of some scenes from Brecht’s “Life of Galileo,” enacted by Richard McElvain (Theater), John Paul (Economics, History & Political Science) and I co-led a discussion on the importance of Galileo. October 5, 2010.
- FSC’s Third Annual Assessment Day: Spotlight on Program Assessment. Updated Learning Outcomes in Geosciences. Co-presenting with Elizabeth Gordon. May 25, 2010.
- Really Cold Atoms. FSC Faculty Speaker series, Center for Teaching and Learning. May, 2006.

### D.1.6 Conference Presentations

- “Measurement of the Rb  $5D_{5/2}$  Photoionization Cross Section Using Trapped Atoms,” poster session at DAMOP 2000, June 13-17, 2000, Storrs CT.
- “Photoionization of Laser-Cooled Rb  $5D_{5/2}$  Atoms,” poster session at Gordon Conference, July 4-9, 1999, Plymouth State College, NH.
- “Photoionization of Laser-Cooled Rb  $5D_{5/2}$  Atoms,” poster session at DAMOP '98, May 27-30, 1998, Santa Fe NM.
- “Observation of rectified forces in a three-level cascade system,” poster session at QELS '95, May 21-26, 1995, Baltimore MD.
- “The mechanisms of laser cooling and trapping,” American Physical Society/American Association of Physics Teachers (New England Section) joint meeting, April 7-8, 1995, Storrs CT.

### D.1.7 Professional Memberships

- American Association of Physics Teachers.
- American Physical Society.
- Optical Society of America.
- American Association for the Advancement of Science.

### D.1.8 Service

- Fitchburg State University committees:
  - Safety (2005 to date),
  - Center for Teaching & Learning Advisory Board (2006 to 2011)
  - Library Advisory Committee (2010 to date).
- 2006 and 2007: departmental search committees.
- 2005: department representative on the new science building committee.
- 2008: department web master
- 2008-2009: editor of 2009 Self Study
- 2007-2009: Acting Chair of the department
- 2009-: Chair. In addition to the usual chair duties:
  - 2010-2011: Academic Planning chairs sub-group
  - 2008 to 2014 (completion): new science building committee.
  - 2013-14: overseeing the department's role in moving into swing space and thence into the new building.
- 2012-2013: “Common Community Read,” an *ad hoc* committee advising the VP of Academic Affairs on books that would be suggested reading for the entire university.
- 2013-2015: editor of 2015 Self Study
- 2014-: Veterans' Support Committee, an *ad hoc* committee to support veterans at Fitchburg State.
- 2015: Science, Mathematics, And Research for Transformation Defense Scholarship for Service Program (SMART), for the American Society for Engineering Education (ASEE) on behalf of the Department of Defense; serving as a reviewer of applicants.

## D.2 Elizabeth Gordon

### D.2.1 Education

- 2004: Ph.D., Marine Science, University of South Carolina, Aiken, SC.
- 1995: B.S., *cum laude*, ΦBK. Chemical Oceanography, University of Washington

### D.2.2 Teaching

- 2014-: Fitchburg State University, Associate Professor
- 2007-2014: Assistant Professor
- 2007-2010: University of Massachusetts, Amherst, Adjunct Assistant Professor

Undergraduate courses taught at Fitchburg State:

- Earth Systems Science (GEOG 1000)
- Earth, Sea & Air (GEOG 1300)
- Climate Change and Human History (GEOG/HIST 2056 )
- Meteorology (GEOG 2200)
- Honors Seminar GeoPhysical Science (LEAD/GEOG 2250)
- Climatology (GEOG 2300)
- Oceanography (GEOG 2500)
- Environmental Geology (GEOG 3001)
- Climatology (GEOG 3110)
- Planetary Atmospheres (GEOG 4110)
- Geographic Perspectives on Conservation (GEOG 4700)

Graduate courses taught at Fitchburg State:

- Meteorology (ESCI 7300)
- Oceanography (ESCI 7400)
- Environmental Geology (ESCI 8100)
- Physical Science of Environmental Change (BIOL 7021)
- 2004: Marine Science Lecturer, “Oceans and Man” (introductory, non-majors course), University of South Carolina
- 2000-2004: Guest lecturer, teaching week-long sections in undergraduate and graduate courses: “Earth Resources” (undergraduate geology course for non-majors); “Organic Geochemistry” (graduate level), “Chemical & Physical Oceanography” (upper-division majors course), University of South Carolina

### D.2.3 Research

- 2007: Research Fellow, Department of Geosciences, University of Massachusetts-Amherst.
- 2005-2007: Postdoctoral Research Associate, Biogeochemistry Laboratory, University of Massachusetts, Amherst, MA
- 1997-2004: Graduate Research Fellow, Organic Geochemistry Laboratory, University of South Carolina
- 1996-1997: Research Technician, Aquatic Geochemistry Laboratory, School of Oceanography, University of Washington

### D.2.4 Research Funding

- Special Projects Fund, Fitchburg State University, 2011
- Ruth Butler Grant, Fitchburg State College, 2009
- President's Initiative Funds Fitchburg State College, 2008
- National Science Foundation Small Grants for Exploratory Research (SGER), 2005
- European Association for Organic Geochemists Travel Scholarship, 2005
- Environmental Protection Agency Science to Achieve Results Fellowship, 2001-2004
- National Science Foundation Graduate Research Fellowship, 1998-2001
- University of South Carolina Graduate School Fellowship, 1997

### D.2.5 Selected Publications

- Allison M.A., Dellapena T.S., Gordon E.S., Mitra S., Petsch S., 2010. Impact of Hurricane Katrina (2005) on shelf organic carbon burial and deltaic evolution. *Geophysical Research Letters* 37, L21605, doi:10.1029/2010GL044547
- Goñi M.A., Alleau Y., Corbett R., Walsh J.P., Mallison D., Allison M.A., Gordon E.S., Petsch S., Dellapena T.S., 2007 (invited manuscript). The Effects of Hurricanes Katrina and Rita on the Seabed of the Louisiana Shelf. *The Sedimentary Record*.
- Goñi M.A., Gordon E.S., Monacci N.M., Clinton R., Gishewwhite R., Allison M., Kineke G., 2006. The effect of Hurricane Lili on the distribution of organic matter along the Inner Louisiana Shelf (Gulf of Mexico, USA). *Continental Shelf Research* 26, 2260-2280.

### D.2.6 Selected Conference Presentations

- Gordon E.S., 2014. Supporting student success in geoscience courses with The Math You Need When You Need It. Geological Society of America Annual Meeting, Vancouver, BC.
- Gordon E.S., 2013. Implementing The Math You Need, When You Need It: An effective strategy to support underprepared students in introductory geoscience courses. Geological Society of America Annual Meeting, Denver, CO.
- Gordon E.S., 2013. Implementation of "The Math You Need When You Need It" to support student learning in Introductory Oceanography. American Society of Limnology and Oceanography Aquatic Sciences Meeting, New Orleans, LA.
- Gordon E.S., 2012. Supporting student success in introductory geoscience at Fitchburg State University using The Math You Need When You Need It. Geological Society of America Annual Meeting, Charlotte, NC.
- Gordon E.S., 2011. Improving quantitative skills in introductory geoscience courses at a four-year public

institution using online math modules. American Geophysical Union Annual Fall Meeting, San Francisco, CA

- Gordon E.S., Schillaski S.E., Petrik C. and Petsch S.T., 2008. Spatial and temporal variability in molecular composition of riverine organic matter delivered to the US Atlantic coast. American Geophysical Union, Ocean Sciences Meeting.
- Gordon E.S., Allison, M.A., and Petsch S.T., 2006. Offshore mobilization and microbial uptake of aged floodplain organic matter in response to Hurricane Katrina. American Geophysical Union, Ocean Sciences Meeting.
- Gordon E.S. and Goñi M.A., 2005. Sedimentary controls on the distribution of terrigenous organic matter across the Mississippi-Atchafalaya River Margin. American Society of Limnology and Oceanography, A Pilgrimage through Global Aquatic Sciences Meeting.

### D.2.7 Professional Memberships

- American Geophysical Union
- National Association of Geoscience Teachers
- Geological Society of America
- The Oceanography Society
- The American Society of Limnology and Oceanography

### D.2.8 Service

- Fitchburg State University Committees:
  - ACC Policies (AY08,09);
  - ACC Curriculum (AY10, 11);
  - LAS Council (AY11-15);
  - NEASC Student Subcommittee (AY11,12);
  - Sustainability Advisory (AY08-13);
  - Safety (AY08,09);
  - Undergraduate Research Conference (AY11,12);
  - Leadership Academy Curriculum (AY09-13)
- Proposal reviewer:
  - National Oceanic and Atmospheric Administration (panelist),
  - National Science Foundation,
  - American Chemical Society.
- Manuscript reviewer. Journals:
  - Limnol Ocean,
  - Marine Chemistry,
  - Continental Shelf Research,
  - Geochimica et Cosmochimica Acta,
  - Deep Sea Research;
  - Science of the Total Environment.
- Vice President #1, National Association of Geoscience Teachers New England Section, 2014
- Vice President #2, National Association of Geoscience Teachers New England Section, 2013
- Workshop Leader, The Math You Need When You Need It, 2012

- Conservation Committee Chair, Appalachian Mountain Club Berkshire Chapter, 2005-06.
- Invited participant, Preparing for an Academic Career in the Geosciences Workshop, 2004.
- Volunteer, National Ocean Sciences Bowl, 1999; 2004.
- Invited panelist, Center for Ocean Sciences Education Excellence (COSEE) Workshop, 2000. Established priorities for and recommended strategies to NSF by which the Ocean Sciences community can achieve excellence in Ocean Sciences education.
- Student representative, Marine Science Graduate Studies Committee, 1999-2000.
- Science mentor, Science-by-Mail Program, Boston Museum of Science, 1996-97.
- Science mentor, 1996. Teacher and Scientist Know-how (TASK).
- Science mentor, 1995. Washington Initiative for Science Education - Science Teacher Enhancement Project (WISE-STEP).

### **D.2.9 Academic Distinctions**

- European Association for Organic Geochemists Travel Scholarship, 2005
- University of South Carolina Vernberg Award for Outstanding Peer-reviewed publication, 2004
- University of South Carolina Deans Award for Excellence in Graduate Study, 2003
- American Geophysical Union Outstanding Student Poster Award, 2002
- University of South Carolina Graduate School Professional Travel Grant, 1999, 2001
- Invited Participant, National Academy of Sciences Symposium on Fifty Years of Ocean Discovery, 1998
- Phi Beta Kappa Honor Society, 1995

## D.3 Lawrence Guth

### D.3.1 Education

- 2007 NSF GeoScience Education Directorate workshop *Community Research and Service Learning using GeoSpatial Tools*, Worcester State College.
- 2006 National Science Foundation Chautauqua Short Course for College Teachers: Using Research Based Curricula & Tools to Promote Active Learning in Introductory Courses II.
- 1999 Nov. 05-06: NES-AAPT Fall Section Meeting and Teaching Physics using the World Wide Web follow-up activity: Just-in-Time Teaching (JiT): Blending Web Technology and Active Learner Pedagogy (Norwich University)
- 1998 Spring Semester: Montana State University NTEN distance learning course in Quantum Mechanics; March 18-21: Geological Society of America NE regional meeting (Portland, ME); April 03-04: NSF Regional conference: Educational Reform: Issues & Obstacles for the 21st Century (Northeastern University, Boston)
- 1996 June 02-14 NSF Undergraduate Faculty Enhancement Workshop: Teaching Physics using the World Wide Web (Concord, NH); Fall Semester: Montana State University National Teachers Enhancement Network (NTEN) distance learning course in Special Relativity
- 1991 Ph.D. in Geology, Rice University, Houston, TX. Dissertation: “Kinematic analysis of the deformational structures on eastern Isla de Margarita, Venezuela”
- 1983 M.S. in Geological Engineering, the University of Utah, Salt Lake City, UT. Thesis: “Theories and applications of calcite and quartz paleopiezometers”
- 1977 B.S. in Geological Engineering, Michigan Technological University, Houghton, MI. Senior Thesis: Snowpack geochemistry

### D.3.2 Teaching

1993-: Fitchburg State University

- Earth Systems Science (GEOG 1000)
- Earth, Sea and Air (GEOG 1300)
- Geology (GEOG 2100)
- Map Use (GEOG 2800)
- Introduction to Historical Geology (GEOG 3250)
- Common Rocks and Minerals (GEOG 3270)
- Geomorphology (GEOG 4200)
- Structural Geology (GEOG 4220)
- Remote Sensing of the Environment (GEOG 4500)
- Environmental Hydrogeology (GEOG 4600)
- Topics – Field Methods (GEOG 5000)
- Physical Science (PHYS 1010)
- General Physics 1 (PHYS 2300)
- General Physics 2 (PHYS 2400)
- Environmental Geology (DGCE ESCI – SCED 8100)

### D.3.3 Service at Fitchburg State University

- 2004-Present, GeoClub Advisor & Co-Advisor
- 2003 Spring, co-leader of GeoClub field trip to Shenandoah, Luray Caverns, and Mammoth Cave



- 2002 Spring, co-leader of GeoClub field trip to S. Utah (Arches & Canyonlands)
- 1999 Spring, co-leader of GeoClub field trip to S. Utah (Arches & Canyonlands)
- 1998 Spring, co-leader of GeoClub field trip to the Grand Canyon
- 1997 Spring, co-leader of GeoClub field trip to Washington, D.C., Shenandoah, Luray Caverns and Gettysburg
- 1994-1996, GeoClub Advisor
- 2009 June 08 Summer Orientation, Advising & Registration (SOAR)
- 2007-2009 Departmental Curriculum Committee
- 2007-2009 Campus-wide Promotions Committee
- 2007 Summer, Department of Geophysical Sciences self study & strategic plan
- 2007 June 12-15 Summer Orientation, Advising & Registration (SOAR)
- 2007 Spring, member of Search Committee to replace retired faculty member
- 2006 Spring, Tenure committee for Dr. Glenda Ouellette
- 2005 Spring, member of Search Committees to replace 2 retired faculty members
- 2004 Spring, Chairman of Search Committee to replace retired faculty member
- 2003 Fall to 2005 Spring, Chairman, Department of Geophysical Sciences
- 2003 Spring, Chairman of Search Committee to replace retiring faculty member
- 2002 Spring, Chairman of Search Committee to replace retiring faculty member
- 2001 July 01-2002 August 31, Chairman, Master of Arts in Teaching Earth Science Program
- 2000-2001, Tenure committee for Dr. Jiang Yu
- 1999-2001, Graduate Committee Master of Arts in Teaching Earth Science Program
- 1998-1999, Department of Geophysical Sciences self study
- 1996-1997, Fitchburg State University Teaching, Learning and Technology Roundtable
- 1996-1997, Distance Learning Committee
- 1996, member of Search Committee to replace retiring faculty member
- 1996, Governance approval of new course in Structural Geology (GEOG 4220)
- 1995-1997, All College Curriculum Committee
- 1995, Task Force on Academic Programs Subcommittee A: Distance Learning /Innovation and Instructional Technology
- 1993-1996, Disability Services Committee

### **D.3.4 Research**

- structural geology
- geophysics
- geological engineering

### **D.3.5 Selected Publications**

- Sisson, V.B., Avé Lallemant, H.G., Ostos, M., Blythe, A.E., Snee, L.W., Copeland, P., Wright, J.E., Donelick, R.A., and Guth, L.R., "Overview of radiometric ages in three allochthonous belts of northern Venezuela: old ones, new ones, and their impact on regional geology", in, Avé Lallemant, H.G. and Sisson, V.B., eds., Caribbean-South American Plate Interactions, Venezuela, Geological Society of America Special Paper 394, p. 91-118. 2005.
- Burger, H. R., Bykerk-Kauffman, A., Guth, L.R., Hurst, S.D., Moore, A.M., Onasch, C.M., Reynolds, S.J., and San Juan, F.C., "Effective use of computers in teaching structural geology": Geological Society of America Abstracts with Programs, v. 36, No. 5, p. 438. 2004.
- Guth, Lawrence R., "Role of extensional tectonics in exhumation of eclogites and blueschists in an oblique

subduction setting: northeastern Venezuela;" *Geology*, v. 18, p. 950-953. 1990.

- Guth, Lawrence R., "A kinematic history for eastern Margarita Island, Venezuela," *Transactions, Caribbean Geological Conference*, 12th, St. Croix USVI, August 1989: South Miami, Miami Geological Society, p. 472-480. 1990.
- Avé Lallemant, H.G. and Guth, L.R., "Blueschists, eclogites, oblique subduction, and extensional tectonics in Northeastern Venezuela [abs.];" *EOS (American Geophysical Union Transactions)*, v. 70, p. 1373. 1989.
- Guth, Lawrence R., "Extensional tectonics in an accretionary complex: Margarita Island, Venezuela;" *Geological Society of America Abstracts with Programs*, v. 20, No. 7, p. A61. 1989.
- Guth, Lawrence R. and Avé Lallemant, H.G., "Kinematic analysis for the deformation of Margarita Island, Venezuela;" *Geological Society of America Abstracts with Programs*, v. 18, No. 6, p. 623. 1986.
- Guth, Lawrence R., Bruhn, R. L., and Beck, S. L., "Fault and joint geometry at Raft River Geothermal Area, Idaho;" *DOE/DGE Report 12079-4*, Contract DOE-ACo7-80ID12079, Salt Lake City, Department of Geology and Geophysics, University of Utah, 19 p. 1981
- Guth, Lawrence R., "Estimating the gravitationally induced component of in-situ stress [abs.];" *EOS (American Geophysical Union Transactions)*, v. 62, p. 1026. 1981.

### **D.3.6 Conference Presentations**

- "Kinematic history for eastern Margarita Island, Venezuela;" *Caribbean Geological Conference*, 12th, St. Croix USVI, Abstracts, p. 69. 1989.

### **D.3.7 Professional Memberships**

- Geological Society of America (Fitchburg State University Campus Representative)
- American Geophysical Union
- American Geological Institute
- American Association of Petroleum Geologists
- Computer Oriented Geological Society
- National Association of Geoscience Teachers
- American Association of Physics Teachers
- Council on Undergraduate Research
- U.S. Metric Association

### **D.3.8 Honors and Awards**

- 1985, Kary Data Scholarship (Geophysical Society of Houston)
- 1985, Geological Society of America Research Grant
- 1984, Geological Society of America Research Grant (Outstanding mention)
- 1983-1986, Gulf Research Fellowship, Rice University
- 1979, University of Utah Department of Geology Outstanding Teaching Fellow Award
- 1977-1979, Teaching Assistantship, University of Utah
- 1976, Tau Beta Pi, Engineering Honor Society, (MI B, Michigan Tech)
- 1974-1975, Spiroff Book Award, MTU Dept. of Geo. Engineering, Geology & Geophysics
- 1974, Phi Eta Sigma, Freshman Honor Society, Michigan Tech Chapter
- 1973-1977, Michigan Technological University Fund Scholarship
- 1973, Bausch & Lomb Honorary Science Award
- 1972, The Rensselaer Mathematics and Science Medal

## D.4 Jane Huang (Xinxin Zhang)

### D.4.1 Education

- 2005-2006 Postdoctoral Researcher, Department of Biological Systems Engineering, Washington State University, Pullman, WA.
- 2005 PhD in Geography, University of Idaho, Moscow, ID. Dissertation Title: “Effects of DEM Resolution on the WEPP Runoff and Erosion Predictions: a Case Study of Forest Areas in Northern Idaho,” Advisor: Kang-tsung Chang
- 2001 Master of Regional Planning, Program in Environmental Science and Regional Planning, Washington State University. Thesis Title: Simulating the Cyclical Behavior in Metropolitan Housing Markets
- 1998 Bachelor of Engineering, Department of Architecture, Xi’an Jiaotong University, China. Minor in Chinese/English Studies Program

### D.4.2 Teaching

- 2012-: Associate Professor, Fitchburg State University:
  - Earth Systems Science (GEOG 1000)
  - Principles of Human Geography (GEOG 1100)
  - Computer Applications in Geoscience (GEOG 2400)
  - Computer Cartography (GEOG 3120)
  - Population Geography (GEOG 3400)
  - Geographic Information Systems (GEOG 4000)
  - Urban Geography (GEOG 4400)
  - Independent Study in Geography (GEOG 4900)
  - Directed Study (GEOG 4975)
  - Internship in Geography (GEOG 4940)
- 2006-2012: Assistant Professor, Fitchburg State University • 2006: Instructor, Department of Geography, University of Idaho
- 1998-1999: Department of Architecture, Xi’an Jiaotong University, China

### D.4.3 Research

#### Grants:

- 2013-2014: REDI (Regional Economic Development Institute) Research Grant. One three-credit-hour course release. “*Traffic Mapping and Analysis in North Central MA.*” Conducted spatial and cartographical analysis of traffic accident patterns in the North Central MA area using GIS (Geographic Information System) technology.
- 2012-2013: REDI Research Grants (four research projects). \$4,000 and two three-credit-hour course release. In joint collaboration with MRPC (Montachusett Regional Planning Commission) “*Community*

*GIS Mapping for Regional Zoning, Transportation, Traffic, and Pedestrian Walkways;*” In joint collaboration with FPD (Fitchburg Police Department) “*Data Driven GIS Approaches to Crime and Traffic Safety in Fitchburg;*” “*Urban Structure Study of Fitchburg;*” and in joint research coordination with Dr. Luis Rosero of Economics “*Trends in Regional Economic Development Across North Central Massachusetts.*”

- 2012: Special Projects Grant in Travel of the Academic Affairs. \$700. Oral Presentation titled “*Involving Undergrad Students in GIS Research—the Bringing Broadband to North Central Massachusetts Project*”. Presented at the 27th Annual Conference of the Northeast Arc Users Group in Rockland Maine on November 11, 2012.

- 2010-2012: REDI Research Grant. \$2,500. In joint research coordination with Dr. Beverley Hollingsworth of Business. *Bringing Broadband to North Central Massachusetts*. REDI–Massachusetts Broadband Institute (MBI)–Montachusett Regional Planning Commission (MRPC) joint project. Conducted spatial and demographic analysis of the accessibility of the broadband high-speed Internet to residents, businesses, and public institutions across the North Central Massachusetts area using GIS technology.

- 2011: Special Projects Grant in Faculty Scholarship of the Academic Affairs. \$1,500. Purchased eight Garmin eTrex handheld GPS units; Supervised eight Geography or Earth Systems Science students on the GPS Survey of Community Trails Project to assist the MRPC in their Trail Inventory Project in communities of Athol, Petersham, and Royalston.

- 2010 Crocker Center Civic Engagement Grant. \$750. *Trail Mapping Using GPS in Northern Fitchburg Watershed Area*. Assisting the MRPC and the North County Land Trust (NCLT) in their trail inventory study by supervising students mapping the trails in the local watershed area using Global Positioning System (GPS) technology.

- 2010: REDI Research Grant. Three-credit-hour course release. In joint research coordination with Prof. Michael Turk of Economics. GIS Spatial & Trend Analysis–North Central Massachusetts at a Crossroads: Housing Challenges. Constructing a GIS database of the economic parameters of North-Central Massachusetts with a focus on the housing market, conducting spatial and trend analysis of the foreclosure pattern.

- 2009 Second extension of the *Healthy Housing Initiative/Community De-Leading Project*. \$3,000. Updating the geo-database with additional lead inspection data provided by the Mass Department of Public Health.

- 2008: First extension of the *Healthy Housing Initiative/Community De-Leading Project*. \$4,600. Conducting extended spatial analysis of distributions of properties with high lead poisoning risk and of properties foreclosed in Fitchburg.

- 2007-2008: *Healthy Housing Initiative/Community De-Leading Project Grant*. \$30,000. In joint with Montachusett Opportunity Council, Fitchburg Lead Action Group, Cleghorn Neighborhood Center, Twin Cities Community Development Corporation, and the City of Fitchburg’s Department of Community Development. Using GIS technology to identify hot-spots and high-risk properties for childhood lead poisoning in Fitchburg.

- 2006: Faculty Innovation Grant. \$2,500. Purchasing a campus-wide site license of ArcGIS®, the prevailing GIS software program.

Research Positions:

- 2005-2006: Postdoctoral Researcher, Washington State University, Pullman, WA

- 2000: Research Assistant, Washington State University, Pullman, WA (part-time)

#### D.4.4 Selected Publications

- Carmen Bordonaro and Jane Huang. *Mapping Hotspots of Crime and Traffic Violation in Fitchburg, MA*. In review for publication in the journal *Police Chief*.

- Jane X. Zhang, Joan Q. Wu, K.-T. Chang, William Elliot, Shuhui Dun. *Effects of DEM Source and Resolution on WEPP Hydrologic and Erosion Simulation: a Case Study of Two Forest Watersheds in Northern Idaho*. Transactions of the ASABE, Vol. 52(2), 447-457. 2009.
- Jane X. Zhang, K.-T. Chang, Joan Q. Wu. *Effects of DEM Resolution and Source on Soil Erosion Modeling: a Case Study Using the WEPP Model*. International Journal of Geographical Information Science, Vol. 22(8), 925-942. 2008.
- Jane X. Zhang, Joan Q. Wu, K.-T. Chang. *Effects of DEM Resolution and Source on Soil Erosion Modeling: a Case Study Using the WEPP Model*. In press by International Journal of Geographic Information Science. 2007.
- Jane X. Zhang, Joan Q. Wu, K.-T. Chang, William Elliot, Shuhui Dun. *Effects of DEM Resolution on WEPP Hydrologic and Erosion Prediction: a Case Study of Two Forest Watersheds in Northern Idaho*. In review by Hydrological Processes. 2007.

#### D.4.5 Conference Presentations

- Jane Huang, *Mapping Hotspots of Crime and Traffic Violation in Fitchburg, MA*. Oct 5-8, 2014. The 29th Annual Conference of the Northeast Arc Users Group, Groton, CT.
- Jane X. Zhang, *Teaching and Learning beyond Classroom—Leading Students on Local Projects Using GIS and GPS Technologies*. Mar 18-20. Geological Society of America (GSA) 2013 Northeastern Section Meeting, Bretton Wood, NH
- Jane X. Zhang, *Involving Undergrad Students in GIS Research—the Bringing Broadband to North Central Massachusetts Project*, Nov 11-14, 2012. The 27th Annual Conference of the Northeast Arc Users Group, Rockland, ME.
- Jane X. Zhang, K.-T. Chang, Joan Q. Wu. 2007. Effects of DEM Resolution and Source on Soil Erosion Modeling. June 18-22, 2007. 2007 ESRI (Environmental Systems Research Institute) International User Conference, San Diego, CA.
- Jane X. Zhang. 2007. Using GIS for De-Leading Housing in Fitchburg. June 8, 2007. NSF GeoScience Education Directorate Workshop of Community Research and Service Learning Using Geospatial Tools, Worcester State College, Worcester, MA.
- Jane X. Zhang, K.-T. Chang, Joan Q. Wu. 2007. Effects of DEM Resolution and Source on Soil Erosion Modeling Using the WEPP Model. April 17-21, 2007. 2007 AAG (Association of American Geographers) Annual Meeting, San Francisco, CA.
- Jane X. Zhang. “Effects of DEM Resolution and Accuracy on WEPP Prediction: a Case Study of Two Forest Watersheds in Northern Idaho.” July 9-12, 2006, the 2006 ASABE (American Society of Agricultural and Biological Engineers) Annual International Meeting. Portland, Oregon. 2006.
- Jane X. Zhang. Effects of DEM Resolution and Source on WEPP Hydrologic and Erosion Prediction: A Case Study of Two Forest Watersheds in Northern Idaho. March 23-25, 2006. The 2006 Idaho Academy of Science Meeting and Symposium. Moscow, Idaho. 2006.
- Jane X. Zhang. “Effects of DEM Resolution on Soil Erosion Predictions in Paradise Creek Watershed.” November 19, 2003. University of Idaho GIS Day 03. Moscow, Idaho. 2003.

#### D.4.6 Professional Memberships

- Association of American Geographers
- Cartography and Geographic Information Society

#### **D.4.7 Service**

##### Departmental:

- 2014-2015 Departmental Self Study, Interim Chair in Spring 2015
- 2012-2013 Search Committee (brought in Dr. Reid Parsons)
- 2010-2014 Departmental Assessment Committee
- 2008-2010 Departmental Curriculum Committee
- 2007-2008 Departmental Curriculum Committee and Self Study
- 2006-2007 Search Committee (brought in Dr. Elizabeth Gordon)

##### College-wide:

- 2014-2015 Ruth Butler Grant Committee
- 2014-2015 Academic Policies Committee
- 2013-2014 Student Conduct Board
- 2012-2013 Harrod Lecture Committee
- 2010-2011 Ruth Butler Committee
- 2009-2012 International Advisory Committee
- 2009-2010 Library Advisory Committee
- 2008-2009 Student Affair Committee
- 2007-2008 Equity and Diversity Committee
- 2007-2008 Technology Advisory Committee (Educational Enhancement Subcommittee)
- 2006-2007 Technology Advisory Committee
- 2006- Annual services at events of Open House, Winter Faculty Advising, President's Reception for Accepted Students, and Summer Orientation Advising & Registration (SOAR)

## D.5 Reid Parsons

### D.5.1 Education

- 2014: Exploring ENVI : Training course on the ENVI Software package for Remote Sensing image analysis hosted by the developer, Exelis Vis in Boulder, CO.
- 2014: Workshop of Early Career Geoscience Faculty, Sponsors: On the Cutting Edge. National Association of Geoscience Teachers, held in College Park, MD
- 2010: Ph.D., Earth Science (Planetary Science), University of California, Santa Cruz  
Thesis Topic: Recent climate change on Mars (advisor: F. Nimmo)
- 2005: B.S., Science of Earth Systems, *magna cum laude*, Cornell University, Ithaca, NY  
study abroad: Earth and Environmental Science Hawai'i Field Program.

### D.5.2 Teaching

- 2013-: Assistant Professor, Fitchburg State University
  - Earth Systems Science (GEOG 1000)
  - Geology (GEOG 2100)
  - Planetary Atmospheres (GEOG 4110)
- 2010 (Winter) Instructor, Planetary Discovery, UCSC
- 2008 - 2009 Instructor, Teaching Seminar, UCSC
- 2008 (Spring) Teaching Assistant, Geomorphology, UCSC
- 2005 - 2006 Teaching Assistant, Planetary Discovery, UCSC
- 2004 (Spring) GIS Volunteer, Natural Resource Conservation Service, Waimea, HI
- 2003 (Summer) GIS Technician, Bureau of Land Management, Meeker, CO

### D.5.3 Research

- 2011 - 2013 Post-doc Researcher, NASA Ames Research Center
- 2011 Post-doc Researcher, UCSC
- 2004 (Summer) Research Assistant, University of Minnesota, Minneapolis, MN

### D.5.4 Selected Publications

- Parsons, R.A. and J. W. Holt (in prep) A New Method for Analyzing Debris-covered Glaciers on Mars using High Resolution Topography, SHARAD Radar, and a Numerical Ice Flow Model: A case study from Euripus Mons. *Geophysical Research Letters*.
- Parsons, R. A., J. M. Moore, and A. D. Howard, Evidence for a short period of hydrologic activity in Newton crater, Mars, near the Hesperian-Amazonian transition. *Journal of Geophysical Research: Planets*, Vol. 118, 1-12, doi:10.1002/jgre.20088, 2013.
- Parsons, R. A., F. Nimmo, and H. Miyamoto, Constraints on the timing of lobate debris apron emplacement at Martian mid-latitudes using a numerical model of ice flow, *Icarus*, 214, pp. 246-257, doi:10.1016/j.icarus.2011.04.014, 2011.

- Parsons, R. A. and F. Nimmo, Numerical modeling of Martian gully sediment transport: Testing the fluvial hypothesis, *Journal of Geophysical Research*, 115, doi:10.1029/2009JE003517, 2010.
- Parsons, R. A. and F. Nimmo, North-south asymmetry in martian crater slopes, *Journal of Geophysical Research*, 114, doi:10.1029/2007JE003006, 2009.
- Parsons, R. A., F. Nimmo, J. W. Hustoft, B. K. Holtzman, D. L. Kohlstedt, An experimental and numerical study of surface tension-driven melt flow, *Earth and Planetary Science Letters*, 267, pp. 548-557, 2008.

### D.5.5 Selected Conference Presentations

- Petersen, E. I.; Holt, J. W.; Levy, J. S.; Parsons, R. A. A Synthesis of Radar Sounding, Geomorphic Characterization, and Ice Flow Modeling to Understand Regional Differences between Lobate Debris Aprons in Deuteronilus Mensae. 8th Mars Conference, Pasadena, CA, July 2014; Abstract #1451. 2014
- Determining the Age and Physical Properties of Martian Lobate Debris Aprons using High-resolution Topography, SHARAD Observations, and Numerical Ice Flow Modeling: A case study at Euripus Mons. Lunar and Planetary Science Conference, Houston TX. 2014
- Water in the Middle of Martian History: Evidence from glaciers and stream-cut valleys (*Invited*). University of California, Santa Cruz, CA, 2013.
- Glaciation at Euripus Mons, Mars: Insights from combining numerical ice flow modeling, SHARAD observations and high-resolution topography. Lunar and Planetary Science Conference, Houston, TX, 2013.
- Young fluvial valleys on Mars: constraining the water source using quantitative geomorphology (*Invited*), California Institute of Technology, Pasadena, 2012
- Constraints on lobate debris apron evolution and rheology from numerical modeling of ice flow, American Geophysical Union Fall Meeting, San Francisco, CA, 2010
- Numerical modeling of Martian gully sediment transport: Testing the fluvial hypothesis (*Invited*), American Geophysical Union Fall Meeting, San Francisco, CA, 2009
- Numerical modeling of Martian gully sediment transport: Testing the fluvial hypothesis (*Invited*), American Geophysical Union Fall Meeting, San Francisco, CA, 2009
- Mid-latitude ice deposits on Mars (*Invited*), Search for Extra-Terrestrial Intelligence, Mountain View, CA, 2009
- Thick ice deposits at mid-latitudes on Mars (*Invited*), Earthquake Research Institute, University of Tokyo, Japan, 2009
- Fluvial discharge rates of Martian gullies: Slope measurements from stereo HiRISE images and numerical modeling of sediment transport, Lunar and Planetary Science Conference, Houston, TX, 2009
- Martian gully slope measurements made using HiRISE stereo pairs, Lunar and Planetary Science Conference, Houston, TX, 2008
- North-south asymmetry in Martian crater slopes, Lunar and Planetary Science Conference, Houston, TX, 2007
- Surface Tension-Driven Melt Flow in the Upper Mantle: An Experimental and Modeling Approach to Studying Capillary Flow of Silicate Melt through an Olivine Matrix, American Geophysical Union Fall Meeting, San Francisco, CA, 2005

### D.5.6 Professional Memberships

- American Geophysical Union
- Geological Society of America



### **D.5.7 Service**

- Academic Policies Committee, Fitchburg State University, 2013-

### **D.5.8 Academic Distinctions**

- NASA Mars Data Analysis Program Grant (Co-I), 2013
- Session Chair: Lunar and Planetary Science Conference, Houston, TX, 2013
- Reviewer for journals: Icarus & Geophysical Research Letters, 2009
- NSF Doctoral Dissertation Enhancement Program Grant, 2009
- Center for the Origin, Dynamics, and Evolution of Planets Travel Grant, 2009
- Water's Award (for best yearly Ph.D. thesis proposal within dept.), 2008
- Distinguished Undergraduate Researcher, Cornell University, 2005

## D.6 Jiang Yu

### D.6.1 Education

- College Board, “AP Physics 1 & 2: Guided Inquiry Labs ,” Chicago, IL, April 5-6, 2014
- College Board, “AP Physics 1 & 2: Building Students’ Reasoning Skills,” Las Vegas, NV, Aug. 3-4, 2013
- College Board, “AP Physics 1 & 2: Framework & Course Description,” Chicago, IL, April 19-21, 2013
- College Board 2009-2010 Mentor Initiative, Henderson, NV, Aug. 6-9, 2009
- 2005: College Board Consultant Training, Charlotte, NC, April 8-10
- 2001: The Commonwealth Information Technology Initiative (CITI) workshop, “OBJECT ORIENTED DESIGN & ANALYSIS,” Worcester State College, MA, June 2, 3, 9, 10
- 1999: Certificate, AAPT/NSF workshop, “Just in Time Teaching,” AAPT/NES 1999 Fall Meeting at Norwich University, North Field, Vermont, November 5
- 1998: Certificate, NSF college faculty summer workshop, “Innovative Physics Experiments Workshop,” Winston-Salem State University, Winston-Salem, North Carolina, July 26-31
- 1998: Certificate, NSF Chautauqua short course, “Promoting Active Learning in Introductory Physics Courses I,” Honolulu, Hawaii, June 9-11
- 1998: Certificate, AAPT/NSF summer faculty enhancement workshop, “Powerful Ideas in Physical Science: A Model Course,” Louisiana State university, Baton Rouge, LA, May 24 - June 5
- 1995 PhD in Science Education (Physics), Western Michigan University, Kalamazoo, MI
- 1988 MS in Theoretical Nuclear Physics, Western Michigan University
- 1983 BS in Particle Physics, University of Science and Technology, Hefei, Anhui, China

### D.6.2 Teaching

- 2008-: Professor of Physics
- 2002-2008: Associate Professor of Physics
- 1996-2002: Assistant Professor of Physics, Geo/Physical Sciences Dept., Fitchburg State University:
  - Physical Science I
  - Physical Science II
  - General Physics I
  - General Physics II
- 1988-1996: Instructor, Physics Dept., Kalamazoo Valley Community college, Kalamazoo, MI
- 1986-1996: Instructor, Physics Dept. Western Michigan University, Kalamazoo, MI
- 1983-1986: Lecturer, Physics Dept., Tibetan University, Lhasa, Tibet

### D.6.3 Research

- Concept learning/conceptual change in physics learning, Global Science Literacy, Geo/Physical Science Dept., Fitchburg State University, 1996–present; Center for Science Education, Western Michigan University, 1988–1996
- Theoretical nuclear physics, shell model, Physics Department, Western Michigan University, 1986–1988
- Higher energy physics, cosmic-ray physics, High Energy Physics Institute, Chinese Academy of Sciences, Beijing, China & Physics and Mathematics Department, Tibetan University, 1984–1986

- Heavy-atomic experimental nuclear physics, Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou, China, 1983

#### **D.6.4 Selected Publications**

- Yu, J. “Examination of the Massachusetts Science and Technology/Engineering Curriculum Framework Using GSL Objectives,” in Proceedings of the 3rd Annual Hawaii International Conference on Education. Honolulu: CD Production 2005.
- Yu, J. “The application of GSL philosophy to science education in the People’s Republic of China,” in Mayer, V. (ed.), The Applications of Global Science Literacy. Columbus: The Ohio State University Press. 2003.
- Yu, J. “Conceptual oriented college introductory physics teaching: gains and recommendations,” in Pints, R., & Suriqach, S. (eds.), International Conference Physics Teacher Education Beyond 2000: Selected Contributions. Paris: Elsevier Editions. Also in Pints, R., & Suriqach, S. (eds.), Proceedings of the International Conference Physics Teacher Education Beyond 2000. Barcelona: CD Production Calidos. 2001.
- Halderson, D., Yu, M., and Yu, J. “Structure of the first excited state of He(4),” Physical Review C, vol. 39, no. 2. 1989.

#### **D.6.5 Service to the National AP Physics Program**

- June 2013–present, Chief Reader Associate, AP Physics Exam Reading Program, College Board/Educational Testing Services
- Member of the Physics 1 & Physics 2 Syllabi Review Standard Setting Committee, College Board, July 2012–May 2014
- Member of the AP Annual Conference Steering Committee, August 2010–July 2013
- July 2009–June 2013, Chief Reader for the AP Physics Exam Reading Program, College Board/Educational Testing Services
- July 2008–June 2009, Chief Reader Designate for the AP Physics Exam Reading program, CB/ETS.
- Curriculum Adviser & Senior Reviewer for the AP Physics Syllabi Audit Program, Educational Policy Improvement Center at the University of Oregon, June 2008–present
- January 2007–present, Certified Senior Reviewer for the AP Physics Syllabi Audit Program, College Board/Educational Policy Improvement Center at the University of Oregon.
- June 2006–June 2008, Question Leader for the AP Physics Exam Reading Program, CB/ETS.
- August 2005–present, AP Physics Workshop Consultant, College Board. • June 2003–June 2005, Table Leader for the AP Physics Exam Reading Program, CB/ETS.
- June 2000–June 2002, AP Physics Exam Reader for the AP Physics Exam Reading Program, CB/ETS.

#### **D.6.6 Workshops Given**

- AP Physics Summer Institutes (week-long): More than 20 summer physics institutes have been given since 1998 at multiple campuses, e.g., Bentley Univ., St. Joseph’s College of Maine, Univ. of Alabama, Auburn University, Nova Southeastern Univ., Univ. of South Florida, Univ. of West Virginia, Taft School, Bridgewater State Univ., Fitchburg State Univ., the National Emirate School in Abu Dhabi, UAE.
- AP Physics One- or two-day Workshops for teachers: More than 25 have been given since 2006 with organizations such as the College Board, Los Angeles Unified School District, National Math and Science

Initiative in Massachusetts, Alabama, and Kentucky

- Physics Teacher Focus Discussion: How Should Physics Be Taught & What Methods and Strategies Work? The Professional Development Annual Conference: Diversity on Common Ground–Best Practices V, Fitchburg State College, MA, March 17, 2000
- Powerful Ideas in Physical Science. The Professional Development Annual Conference: Diversity on Common Ground–Best Practices V, Fitchburg State College, MA, March 17, 2000; March 19, 1999.

### **D.6.7 Conference Presentations**

- Results of the AP Physics Exam Administration. AP Annual Conference, July, 2013 (Las Vegas, NV), 2012 (Orlando, FL), 2011 (San Francisco, CA), 2010 (Washington D.C.).
- AP Physics Programs and Examinations, AP Affair, Shenzhen, China, March 6-8, 2011
- Examination of the Massachusetts Science and Technology/Engineering Curriculum Framework Using GSL Objectives. The 3rd Annual Hawaii International Conference on Education, Honolulu, Hawaii, Jan. 3-7, 2005
- An Inventory of Algebra, Trigonometry, and Analytical Geometry for Algebra/Trig Based College Introductory Physics Course, Williamston, MA, April 11-12, 2003
- Conceptual oriented college introductory physics teaching: gains and recommendations. The XVIII GIREP Conference: PHYTEB2000, Barcelona, Spain, Aug. 27–Sept. 1, 2000.
- Teaching Physical Science To Pre-Service Elementary Teachers: An AAPT Model Course Developed Based On Physics Education Research. American Association of Colleges and Universities Conference: Rethinking Scientific Literacy in an Age Of Diversity And Specialization, Charleston, SC, April 13-15, 2000

### **D.6.8 Professional Memberships**

- Oversea Chinese Physics Association, 2008
- International Physics Education Research Group (GIREP), 2000
- American Association of Physics Teachers, New England Section, 1999
- National Association of Science Teachers, 1997
- Partnerships Advancing the Learning of Mathematics and Science, 1996
- American Association of Physics Teachers, 1996
- National Association of Research in Science Teaching, 1995

### **D.6.9 Professional Development**

- College Board Chief Reader Meeting, Boston, MA, Oct. 2-4, 2009
- College Board 2009-2010 Mentor Initiative, Henderson, NV, Aug. 6-9, 2009
- College Board Chief Reader Training, Sedona, AZ, Jan. 23-25, 2009
- TI-Nspire Conference for the College Board Consultants held by the Texas Instruments at Dallas, TX, Nov. 16-18, 2007.
- College Board Consultant Training, Charlotte, NC, April 8-10, 2005
- The Commonwealth Information Technology Initiative (CITI) workshop, “OBJECT ORIENTED DESIGN & ANALYSIS,” Worcester State College, MA, June 2, 3, 9, 10, 2001.
- Certificate, AAPT/NSF workshop, “Just in Time Teaching,” AAPT/NES 1999 Fall Meeting at Norwich University, North Field, Vermont, November 5, 1999.

- Certificate, NSF college faculty summer workshop, “Innovative Physics Experiments Workshop,” Winston-Salem State University, Winston-Salem, North Carolina, July 26-31, 1998.
- Certificate, NSF Chautauqua short course, “Promoting Active Learning in Introductory Physics Courses I,” Honolulu, Hawaii, June 9-11, 1998.
- Certificate, AAPT/NSF summer faculty enhancement workshop, “Powerful Ideas in Physical Science: A Model Course,” Louisiana State university, Baton Rouge, Louisiana, May 24-June 5, 1998



## Appendix E

# Courses offered by the department

### E.1 Course Descriptions from the Catalog

Independent studies and the like have been omitted.

**GEOG 1000 Earth Systems Science** Students receive a holistic view of Earth and the spatial relationships between its physical, chemical, geological, and biological systems. Students learn fundamental scientific principles of physical geography and discuss human-earth interactions. Topics include earth-sun relationships, atmospheric processes, physical geology, and water resources. Human impacts, such as ozone depletion, global warming, and water and air pollution, are discussed. Credit can not be earned for both GEOG 1000 and GEOG 1300.

**GEOG 1100 Principles of Human Geography** Introduction to geographical dimension in human behavior and how this is evident in population distribution, rural and urban land use, and social, economic and political attributes of societies.

**GEOG 1300 Earth, Sea and Air** The course is composed of selected topics from the Earth Sciences Learning Standards of the Massachusetts Science Curriculum Frameworks. Laboratory required. Credit can not be earned for both GEOG 1000 and GEOG 1300.

**GEOG 2100 Geology** The course is offered every semester for day students. The course is an introductory survey of the basic elements of physical and historical geology. The class is open to all students. A laboratory is required. GEOG 1000 is strongly suggested.

**GEOG 2200 Meteorology** Fundamental principles of atmospheric processes are discussed, with emphasis on mid-latitude phenomena. Tropical and severe weather are also explored. Weather forecasting techniques using real-time data are introduced.

**HON/GEOG 2250 Honors Seminar in Earth Science** This course will introduce students to the study of the natural world through a focus on a major topic in Earth Science.

**GEOG 2400 Computer Applications in Geoscience** Computer based applications to actual case studies and situations using Geographic Information Systems (GIS) as an investigation tool for geosciences. Lab exercises on PC-based GIS packages. Prerequisite: GEOG 1000.

**GEOG 2500 Oceanography** This course is designed to provide students with an overview of fundamental scientific concepts that describe ocean processes. Topics include marine geology (ocean basins, sediments), marine chemistry (properties of seawater), physical oceanography (waves, tides, currents), and biological oceanography. Marine environmental issues are also explored.

**GEOG 2800 Map Use** This course considers the nature and role of maps in communicating aspects of the Earth's natural and human environments. Skills learned include map reading, relating map symbols to real world features, map analysis, extracting information from maps and map interpretation.

**GEOG 2860 Introduction to Secondary School Teaching** This course is required of all students preparing for initial license at the secondary level. It is a sophomore level course for full-time undergraduates and the first course taken by transfer students. It is taught at the local high school and is a clinical laboratory experience. This course includes a 25-hour prepracticum requirement and is a prerequisite for other certification course requirements. Students become familiar with the complexities of secondary school teaching and its demands. The course gives faculty the opportunity to screen students and give students the opportunity to test their commitment to teaching.

**GEOG 3000 Geographic Economic System** The course analyzes factors underlying the spatial distribution of primary, secondary and tertiary economic activities, with emphasis on locational processes in commercial economies.

**GEOG 3100 Political Geography** The course examines dependent and independent, political units, boundary disputes, strategic areas, buffer zones and the function of international organizations.

**GEOG 3110 Climatology** This course includes an overview of the climate system and regional climate classification schemes, and examination of natural, long-term climate change. Recent and future climate change scenarios, including the role of human activity in altering Earth's climate chemistry, are also discussed. Prerequisite: GEOG 1000 or GEOG 2200 Meteorology or permission of the instructor.

**GEOG 3120 Computer Cartography** The course of Computer Cartography is focused on making thematic maps in a GIS environment. Taken into consideration are the nature and purpose of mappable information, elements of map design and method involved in map construction. Basic spatial analysis and GIS (geographic information system) skills are introduced and utilized as tools to facilitate map making.

**GEOG 3200 U.S. and Canada** The course includes U.S. and foreign area studies. Students conduct regional and systematic analysis based upon geographic elements influencing domestic evolution and international relations. Prerequisite: GEOG 1000 or GEOG 1100 or HIST 1400 or HIST 1500 or HIST 2140 or AMST 1800 or IDIS 1200 or IDIS 1800.



**GEOG 3250 Introduction to Historical Geology** Offered fall semester in even years for day students. This course studies the physical history of the Earth based on evidence from the rock and fossil records from Earth's formation through the present. The evolution of life forms, subjective and absolute dating methods, fossil identification and fossil evidence supporting plate tectonics theory are some of the topics studied. Laboratory is required. Prerequisite: GEOG 2100.

**GEOG 3270 Common Rocks and Minerals** Offered spring semester in odd years for day students. Major rock and mineral types are studied. Considerable time is spent on field and laboratory identification techniques. Mineral crystal systems and rock and mineral forming processes are also studied. Laboratory is required. Prerequisite: GEOG 2100.

**GEOG 3400 Population Geography** The course addresses population processes and characteristics relative to resources in both economically developed and underdeveloped countries and regions. Course material provides both a systematic and regional view of world population problems.

**GEOG 4000 Geographic Information Systems** Introduction to basic concepts and applications of geographic information systems (GIS). Lab exercises on PC-based GIS packages. Prerequisite: GEOG 2400 or GEOG 3120 or GEOG 4400 or CSC 1100.

**GEOG 4110 Planetary Atmospheres** This course seeks to explain the similarities and differences between the Earth's atmosphere and the atmospheres of the planets and moons in our solar system. Each atmosphere is studied to determine its chemical composition, thermal structure, energy budget, pressure, wind systems, clouds, precipitation and other pertinent meteorological phenomena. Prerequisite: GEOG 2200.

**GEOG 4200 Geomorphology** The course provides a comprehensive study of land forms and their origins. Laboratory is required. Prerequisite: GEOG 2100 Geology.

**GEOG 4220 Structural Geography** Offered in the fall semester in odd years for day students. This course studies rock structures developed by the application of deformational forces. Topics covered include the elementary concepts of stress and strain and the geometry of joints, faults, folds, foliations and lineations. Prerequisites: GEOG 2100, PHYS 2300, MATH 1300.

**GEOG 4400 Urban Geography** Theory and models of the functions, origin, development, structure, and distribution of cities; land-use classification; geographic aspects of city planning, with GIS (geographic information systems) based applications to actual cases studies.

**GEOG 4500 Remote Sensing of the Environment** Techniques in the use of satellite and aerial imagery as applied to landscape analysis and resource management are studied. Laboratory is required. Prerequisite: GEOG 1000 or GEOG 2100.

**GEOG 4600 Environmental Hydrogeology** Offered spring semester in even years for day students. A case study approach is used to apply basic principles of geology to environmental problems caused by flooding, groundwater contamination, pollution due to human activity and landslides, among other topics. Laboratory is required. Prerequisite: GEOG 2100, CHEM 1300, MATH 1300, PHYS 2300.

**GEOG 4700 Geographic Perspectives on Conservation** The course provides an analysis of natural resources problems arising from changes in technology, population pressure and concern with the quality of environment. Prerequisite: GEOG 1000.

**PHYS 1100 Physical Science I** This course is designed to help non-science students in developing a meaningful and functional understanding of key physical science concepts and methodology. Topics include light, color and electricity. The course is taught with a combination of lectures, group discussions and learning-by-doing activities. The emphasis is to provide students with open-ended problem solving environments that facilitate insight into the nature of science as an intellectual activity, and to encourage students to explore alternate conceptions of physical phenomena.

**PHYS 1200 Physical Science II** This course is designed to help non-science students in developing a meaningful and functional understanding of key physical science concepts and methodology. Topics include motion, force, heat, energy and nature of matter. The course is taught with a combination of lectures, group discussions and learning-by-doing activities. The emphasis is to provide students with open-ended problem solving environments that facilitate insight into the nature of science as an intellectual activity, and to encourage students to explore alternate conceptions of physical phenomena.

**PHYS 2000 Astronomy** After a brief introduction to the history of astronomy in Western civilization we discuss at an elementary level how light is produced and how telescopes work with light. In turn we then examine the solar system (comparative planetology) and the birth, evolution and death of stars and in the end consider the birth and death of the universe. This course is cross-listed as GEOG 2000. SMT, LAB

**PHYS 2300 General Physics I** This first-semester general college physics course consists of studies in the principle and application of classical mechanics, waves, sound and heat. Typical topics include description of motions, Newton's laws of motion, Kepler's law of planetary motion, universal gravitation, work and energy, conservation laws, temperature, heat, and laws of thermodynamics. Prerequisite: MATH 1300 or equivalent.

**PHYS 2400 General Physics II** This second-semester general college physics course consists of studies and applications of wave motions, sound, electricity, magnetism, light and optics. Typical topics include Coulomb's law, electric force and field, potential and capacitance, electric circuits, magnetic force and field, magnetic forces on moving charges, electric induction, laws of reflection and refraction, mirrors and lenses, optical instruments, interference and diffraction of light. Prerequisite: MATH 1300 or equivalent

**PHYS 2600 Calculus-based Physics I** The principles and applications of classical mechanics and heat are studied using the language of calculus.

**PHYS 2700 Calculus-based Physics II** The principles and applications of classical electricity, magnetism, and optics are studied using the language of calculus.

**PHYS 3000 General Physics III** This third-semester of general college physics course discusses the inadequacy of classical physics and introduces the theories and models of modern physics. Topics covered in class work include special relativity and the development of quantum theory as depicted in blackbody

radiation, photoelectric effect, and X-rays, the wave function and the uncertainty principle, atomic spectra, Bohr's model of hydrogen, electronic configuration of atoms, the exclusion principle and the periodic table, properties of nuclei, binding energy, radioactivity and the decay processes, radiation hazards, and nuclear reactions. Prerequisites: PHYS 2300 and PHYS 2400.



# **Appendix F**

## **Assessment Plan: ESS**

### **F.1 Geo/Physical Sciences Departmental Objectives and Expected Student Outcomes**

#### **F.1.1 Earth Systems Science: Introduction**

The Earth Systems Science track is designed to ensure that students will:

- Be effective communicators of scientific information in written, oral, graphical, and spatial forms.
- Understand the nature and ethical principles of scientific inquiry, including experimental design, implementation, and interpretation of scientific data in the context of earth science investigations.
- Apply principles from complementary disciplines (mathematics, physics, chemistry, and biology) to solve earth science problems.
- Understand the consideration of Earth as a system, including Earth-sun relations and relationships among Earth's subsystems.
- Be familiar with the overall structure and composition of the Earth system.
- Understand processes that form Earth materials and shape the landscape.
- Recognize the enormity of geological time and identify major evolutionary events since Earth's formation.
- Develop a scientific understanding of interactions between humans and Earth, including geological hazards, global environmental issues, and use and conservation of Earth's resources.

Students will achieve these objectives through developing essential skills and mastery of relevant content knowledge, as outlined below.

**F.1.2 Earth Systems Science: Skills**

## 1. Communication

Students will demonstrate effective communication via:

- a. oral presentations
- b. scientific manuscripts
- c. collaboration with other students.

## 2. Scientific Inquiry

Students will:

- a. Demonstrate an understanding of the scientific method and the role of observation and experimentation in science.
- b. Understand the processes of gathering, organizing, reporting, and interpreting scientific data in the context of earth science investigations.
- c. Integrate principles of physics, chemistry, and biology to answer geosciences questions.
- d. Understand the ethical principles related to scientific inquiry and demonstrate professional standards in reporting research results.
- e. Critically and logically analyze competing ideas, and distinguish between scientific and non-scientific approaches to solving problems.

## 3. Quantitative, analytical, and mapping skills

- a. Apply mathematical principles to quantitatively interpret geoscience data.
- b. Use common software (e.g., Excel) to organize and graphically present data.
- c. Construct and interpret geological maps.
- d. Conduct spatial analysis in a GIS environment

**F.1.3 Earth Systems Science: Content knowledge**

## 1. Earth as a system

Students will understand:

- a. Relationships among lithosphere, atmosphere, hydrosphere, and biosphere in shaping Earth
- b. Earth-sun relationships, including reasons for seasons
- c. Energy transfer in the Earth system, such as Earth's energy budget, atmospheric composition and circulation, and ocean circulation.

## 2. Earth Materials and Structure

Students will understand:

- a. Processes of mineral and rock formation
- b. Characteristics of different types of minerals and rocks
- c. Methods used to identify and classify minerals and rocks

- d. Structure and composition of Earth's interior, surface, and atmosphere

3. Earth System Processes

Students will understand:

- a. Constructional forces that have shaped Earth's surface (e.g., plate tectonics), theories and evidence of crustal movements, and the effects of crustal movements on Earth's landscape.
- b. Erosional-depositional processes that change Earth's surface (e.g., weathering, erosion) and the relationship between these processes and landscape development.
- c. Processes by which water moves on, above, and beneath Earth's surface.
- d. Ocean-atmosphere-lithosphere interactions, particularly related to climate.

4. Earth history

Students will understand:

- a. Geological time, including its subdivisions and its measurement
- b. Earth's physical evolution through geologic time, including formation of the solar system
- c. Evolution of life forms as evidenced from the fossil record
- d. Natural climate changes (e.g., glaciations) caused by Earth's orbital geometry

5. Societal significance and human stewardship

Students will:

- a. Recognize society's dependence on Earth resources (e.g., mineral, rock resources, soil, and water resources; fossil fuels)
- b. Understand natural hazards related to geological processes
- c. Develop a scientific understanding of the effect of human activity on Earth's natural processes (e.g., global warming, ozone depletion, air pollution, water pollution)

Table F.1: Courses concerning expected ESS content knowledge

Content	Course(s)
A.i. Relationship among spheres	1000, 2100, 2300, 2500, 4200, 4600
A.ii. Earth-sun relationships	1000, 2000, 2200, 2300,, 2500, 4110
A.iii. Energy transfer	1000, 2100, 2200, 2300, 2500, 4110
B.i. Mineral/rock origins	1000, 2100, 3270
B.ii. Types minerals/rocks	1000, 2100, 3270
B.iii. Methods of classification of minerals& rocks	1000, 2100, 3270
B.iv. Earth's structure/composition	1000, 2100, 2200, 2500
C.i. Plate tectonics	1000, 2100, 2500
C.ii. Erosion/weathering	1000, 2100
C.iii. Water cycle	1000, 2200, 2500, 4600
C.iv. Sphere interaction	1000, 2100, 2300, 2500
D.i. Geological time	2100, 3250
D.ii. Earth's evolution	2000, 2100, 2300, 3250
D.iii. Fossil record	2100, 3250
D.iv. Long-term climate	1000, 2300, 3250
E.i. Earth resources	1000, 2100, 2500
E.ii. Geological hazards	1000, 2100
E.iii. Human impacts	1000, 2200, 2300, 2500, 4110



Table F.2: Courses and assessment of ESS expected skills

Skill	Course(s)	Assessment tool
A.i. Oral presentations	2200, 2300, 3250, 4000, 4110, 4200, 4600	Faculty evaluation of student presentation
A.ii. Manuscripts	3250, 4110, 4200, 4600, 4900	Detailed manuscript
A.iii. Group work	2100, 2200, 2500, 3250, 4110, 4200, 4600	Faculty evaluation of student work in lab exercises or group projects
B.i. Scientific method	2100, 2200, 2500, 3250, 4110, 4200, 4600	Lab portion of course grade
B.ii. Geoscience data	1000, 2100, 2200, 2300, 2400, 2500, 3250, 4000, 4110, 4200, 4600	Lab reports and manuscripts
B.iii. Integrating sciences	1000, 2100, 2200, 2300, 2500, 3250, 4110, 4200, 4600	Competency evaluation
B.iv. Ethical principles	All courses	Competency evaluation
B.v. Competing ideas; science vs non-science	1000, 2100, 2200, 2300, 2500, 3250, 4110, 4200, 4600	Competency evaluation
C.i. Applying math	1000, 2100, 2200, 2300, 2500, 3250, 4110, 4200, 4600	Competency evaluation
C.ii. Organize/present data via computer software	1000, 2100, 2200, 2400, 2500, 3250, 4110, 4200, 4600	Projects and lab reports
C.iii. Geological maps	1000, 2100, 2800, 4800	Competency evaluation
C.iv. GIS skills	2400, 4000, 4500, 4800	Assignments and final project



# Appendix G

## Assessment Plan: GST

### G.1 Geographic Science & Technology: Skills

The GeoPhysical Sciences Department expects that each Geographic Science and Technology graduate should have a well rounded understanding of geographic knowledge and skills. With this intent the program requires the students to take a series of courses which include the following essential elements of geography.

1. The use of maps to present and interpret patterns of physical and human characteristics on the Earth's surface;
2. The distinctiveness of places and regions with respect to the integration of physical and human characteristics;
3. Description and explanation of human characteristics and their spatial distribution on the Earth's surface, including composition of population, cultural complexes, economic interdependence, settlement and political patterns;
4. Human-environment interactions, including the perception, distribution and use of natural resources.

The program provides students with opportunities to develop the following skills and understandings with respect to the elements of Geography:

1. Analytical thinking
  - a. Students should be able apply geographic terms and concepts in both description and analysis of physical and human conditions on Earth's surface. Pertinent courses: GEOG 1000, 1100, 2400, 2800, 3110, 3120, 3200, 4000.
  - b. Students should be able to pose scientific questions and develop strategies using geographic data to answer them. Pertinent courses: GEOG 2800, 3110, 3120, 4000, 4400, 4500.
  - c. Students should be able to recognize geospatial patterns and make connections between geographic information and real-world scenarios. Pertinent courses: GEOG 2400, 3120, 4000, 4500.
2. Written and oral expression

- a. Students should be able to communicate via written and oral expression with clarity, logical organization, and with effective argument using geographic data and analysis. Pertinent courses: GEOG 2400, 3110, 3120, 3200, 3400, 4000, 4200, 4400, 4500, 4700.
3. Research
  - a. Students should be able to identify a research problem and use relevant data and other sources of information to conduct geographic research. Pertinent courses: GEOG 2400, 3110, 3120, 3200, 3400, 4000, 4200, 4400, 4500, 4700.
4. Graphic expression
  - a. Students should be able to acquire, interpret, and present spatial information by graphic means, including maps, graphs, images, and other means such as databases. Pertinent courses: GEOG 2400, 2800, 3110, 3120, 3200, 4000, 4200, 4400, 4500.
5. Geospatial technical skills
  - a. Students should be able to use geospatial technologies including GIS, Remote Sensing, and other relevant technology (e.g., GPS) for analyzing geographic phenomena, performing spatial analysis, and solving geographic problems. Pertinent courses: GEOG 2400, 3120, 4000, 4400, 4500.

## **Appendix H**

# **Department Assessment Report**

### **H.1 Geo/Physical Sciences Departmental 2013 Report**

We have for several years submitted reports to the university Assessment Officer. Although the reports are result of the work of the department's assessment committee, they have been written annually by Elizabeth Gordon. On the next pages is the report from AY 2012-13.

### **Annual Assessment Report: GeoPhysical Sciences**

#### **Narrative:**

Please summarize your department or program's assessment activities during the past academic year.

As outlined in our assessment report last year, we intended to assess spatial analysis skills and evaluate content knowledge in Climatology and Common Rocks and Minerals. The latter course did not run in AY12-13. Spatial analysis skills are assessed in Geographic Information Systems (GIS), and since only one of our majors enrolled in that course last year, we did not include those data in this report. We report on our majors' overall quantitative skills through time, based on scores on proficiency quizzes that students see in multiple courses.

#### **1. Annual Analysis of Data**

What is/are the most important thing(s) you learned from assessment in the past academic year, and how does knowing this benefit your program?

- a. The evaluation of students' basic quantitative skills revealed two important points: 1) students enter our courses deficient in basic quantitative skills - they do not know how to report quantitative answers to the correct number of significant figures and they are not proficient in the problem solving process; 2) with repeated exposure to these ideas in our courses, they show continual improvement as well as retention from course to course. This assessment result provides evidence that the strategy used in our courses, particularly those taught by Larry Guth, are improving quantitative skills of our majors as they move through the program.
- b. We assess students' mapping skills in the required course "Map Use", but realized that our assessment plan contains only one very specific objective regarding maps (geological maps), so we plan to generalize our map skills objective.

Please specify the following using the table that follows:

#### **Outcomes:**

What are the formal learning outcomes that your program has assessed, for which you have looked at data (*including data collected in prior years*), and for which you have made or proposed program changes in the past academic year? Please include the full outcome statement your program uses.

#### **Data:**

Other than GPA, what data/evidence was used to determine that graduates have achieved the stated outcomes for the degree? This can include data collected in prior years and analyzed this year (e.g., capstone course, portfolio review, licensure examination)

#### **Changes:**

What changes have been made or proposed as a result of using the data/evidence? Please specify clearly which changes have been proposed based on this year's data and which have been enacted this year based on either this year's or prior year's data. This can include changes to your program or changes to your assessment system.

## Using Data to Improve Student Learning Outcomes This Year.

Outcomes	Data	Changes
Apply mathematical principles to quantitatively interpret geoscience data.	Baseline (pre-instruction) data from several GEOG course through time. Our majors generally begin the program deficient in quantitative skills, but show improvement by repeated exposure to these principles and retain those skills from course to course (Figure 1).	No changes proposed – the data show that students are deficient in these skills when they enter our program but they become proficient as they move through the program.
Students will understand Earth-sun relationships, including reasons for seasons.	Exam question from Climatology: six students completed, with an average score of 92%.	No changes proposed.
Students will understand Energy transfer in the Earth system, such as Earth's energy budget, atmospheric composition and circulation, and ocean circulation	Exam question from Climatology: six students completed, with an average score of 80%.	No changes proposed.
Students will understand natural climate changes caused by Earth's orbital geometry.	Exam question from Climatology: Four of our majors completed this question, with an average score of 50%.	Changes in collection of data proposed. Collection of data for this objective was problematic – it appeared on a test that several majors opted not to take (lowest score dropped), so this likely skewed the results downward. This objective will be evaluated on a required exam in the future.
Students will understand the processes of gathering, organizing, reporting, and interpreting scientific data in the context of earth science investigations.	Final paper for Climatology: Four of our majors completed the assignment, with an average score of 65%.	No changes proposed at the departmental level (course level changes will be made by the instructor) - this metric serves as a 'baseline' of sorts as our majors enroll in their 4000 level courses, in which students receive more detailed instruction on writing scientific manuscripts.

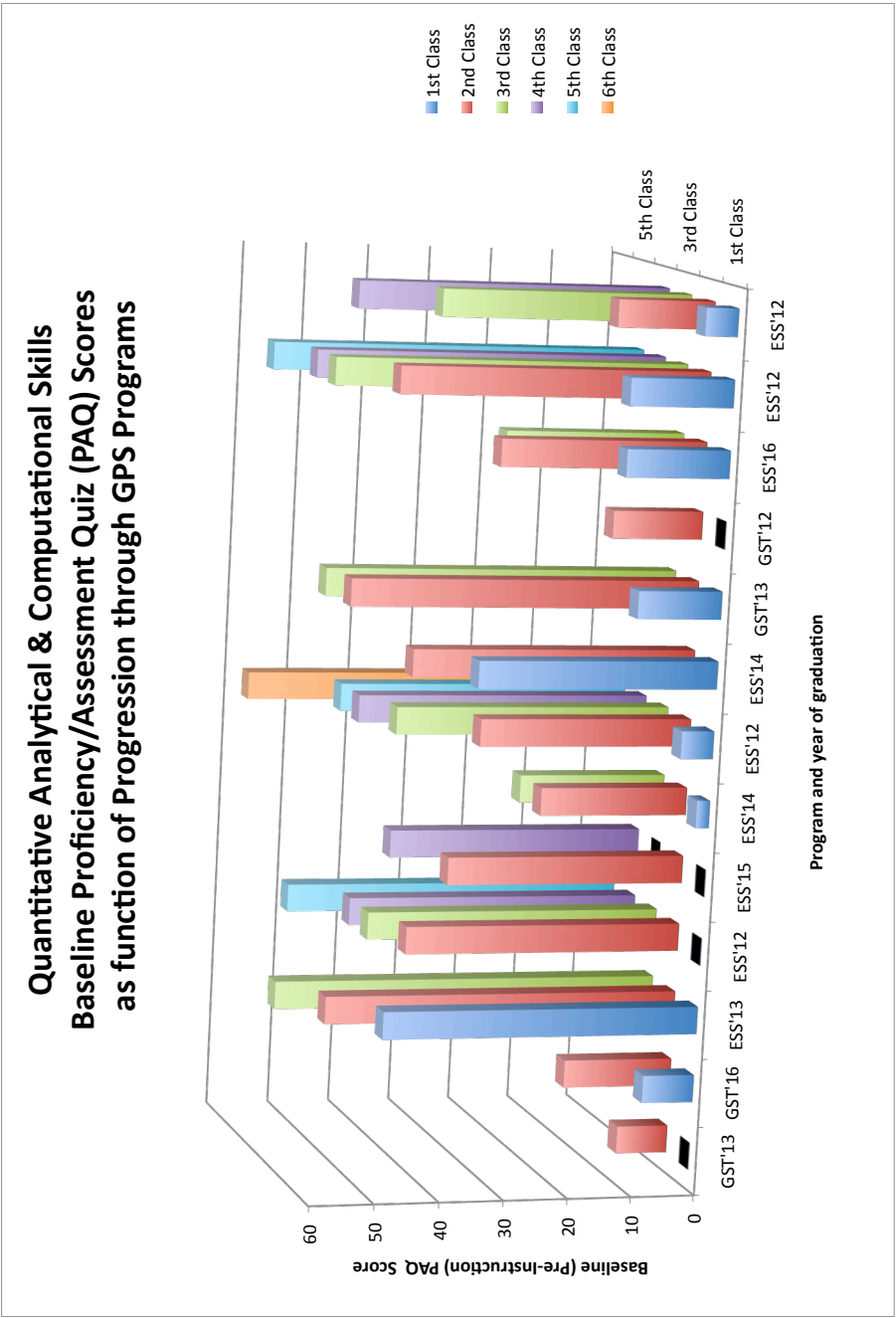
2. Future Assessment Plans:  
 What are your top assessment priorities for next year and what will assure that next year's assessment priorities are accomplished?  
 Please specify the following using the table that follows the outcomes to be assessed, data to be collected and who will collect and interpret the evidence? What is the process? (e.g. annually by the curriculum committee)

Plans for Collecting Data on Student Learning Outcomes Next Year

Outcomes	Data to be collected	Collection and interpretation
Students will conduct spatial analysis in a GIS environment.	Final project score, GIS	Student work will be collected for GIS during Fall 2013; evaluation completed by Assessment Committee
Students will demonstrate effective communication skills via scientific manuscripts.	Final manuscript, either from Geomorphology (Fall 2013) or Hydrogeology (Spring 2014)	Collection of manuscript during fall 2013 and spring 2014; Evaluation completed by Assessment Committee in May
Students will demonstrate effective communication skills via oral presentations.	Final oral presentation, either from Geomorphology (Fall 2013) or Hydrogeology (Spring 2014)	Oral presentations will be recorded during fall 2013 and spring 2014; Evaluation completed by Assessment Committee in May
Students will recognize society's dependence on Earth resources (e.g., mineral, rock resources, soil, and water resources; fossil fuels)	Exam question/essay, Geographic perspectives on Conservation	Students work will be collected for during Spring 2014; evaluation completed by Assessment Committee



To "build the workers we need in this state" (BHE Chairman Stephen Tocco, 1999)  
MA and NEASC mandated assessment for Quality Assurance in Production and Installation (ISO 9002)



Lawrence R. Guth, Associate Professor of Geophysical Sciences  
Documenting continuity, sequential progression and retention  
of Analytical and Computational Skills throughout GPS degree programs



## **Appendix I**

# **Report from the Library 2014**

On the following pages may be found the detailed report from the Dean of the Library, Sean Goodlett.

## **Geophysical Sciences AY14/15 Library Program Review**

The Geophysical Sciences department offers both Bachelor of Arts and Bachelor of Science degrees in earth systems science and geographic science and technology. In addition, there are minors for both programs, as well as a smattering of physics courses, and the catalogue continues to list courses that contribute to secondary education licensure in earth systems science. Each of these programs is offered in the Day unit, although many individual courses are offered in the Evening unit.

The geophysical sciences programs also play a sizable service role. For instance, the secondary education program in history must satisfy the requirements of the National Council on Social Studies, whose standards call for literacy in human and physical geography. Moreover, courses like GEOG 1300, 2000, 2100, 2200, and 2500 and PHYS 1100, 1200, 2000, 2300, and 2400 play an integral role in the general education curriculum by providing alternative lab classes.

Neither the Library of Congress classification system, nor the traditional benchmarks systems in serials, have a single, unified category called “geophysical sciences.” Thus, we examined discrete disciplines: in monographs, these included geography, environmental sciences and technology, ecology and human ecology, astronomy, physics, geology, and mining; in serials, these included atmospheric sciences, cartography GIS and imagery, earth sciences and geology, geography, physics, and population studies.

### **Monograph Collection Description**

Fitchburg State University is, by Carnegie classification, a Master’s granting institution. The geophysical sciences programs, however, do not have graduate offerings, and therefore the University must meet only the standard of 3b, “intermediate study”; as the analysis below demonstrates, however, the size of the monograph collection rises only to the level of 2b, “basic advanced level.” The University would need to increase its holdings by roughly 150% in order to reach 3b, which may not be tenable given that the department has only 21 students, as measured by full-time equivalency (FTE).

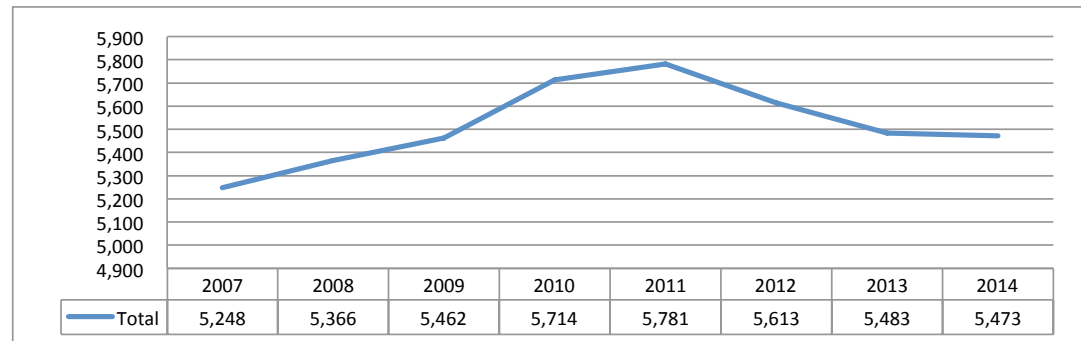
#### *General Guidelines for Monograph Collection Depth*

- |    |  |
|----|--|
| 1  | Minimal – A level that consists mostly of basic works.   |
| 2  | Basic Information.   |
| 2a | A level that introduces and defines the subject and that indicates the varieties of information available elsewhere.   |
| 2b | Basic Instructional Support – A level that introduces course work and research for undergraduate courses, including a wide range of basic monographs and reference tools pertaining to the subject and targeted to undergraduate students. |
| 3  | Study or Instructional Support.  |
| 3a | Basic Study – A level that supports undergraduate courses.   |
| 3b | Intermediate Study – A level that supports upper division undergraduate courses.   |
| 3c | Advanced instructional Support – A level that supports course work and research for graduate and undergraduate courses, including a wide range of basic monographs and reference tools pertaining to the subject.                          |
| 4  | Research – A level that supports independent research and preparation of doctoral dissertations.   |
| 5  | Comprehensive Inclusion – Comprised of all significant works for a defined topic.  |

*Specific Definitions for Monograph Holdings*

- 1b (or less) Minimal level = less than 2,500.
- 2a Basic introductory level = 2,500 - 5,000 titles.
- 2b Basic advanced level (Community College) = 5,000 - 8,000 titles.
- 3a Instructional support (lower-level undergraduate) = 8,000-12,000 titles representing a range of monographs.
- 3b Intermediate support level (advanced undergraduate) = more than 12,000 titles representing a wider range than 3a.
- 3c Advanced support level (Master's degree level).

In the period of time since the last program review, the monograph collections in the geophysical sciences have experienced two trends, and these are in keeping with most other collections in the library. Steady growth that put us on a path to 3a, "instructional support" for lower-level undergraduate education, was followed by a period of intense weeding that returned the institution solidly to 2b, "basic advanced level." The goal of the weeding was primarily to render the collection more current and more relevant. The trends in total disciplinary holdings (by volume) since the last review are reflected below:

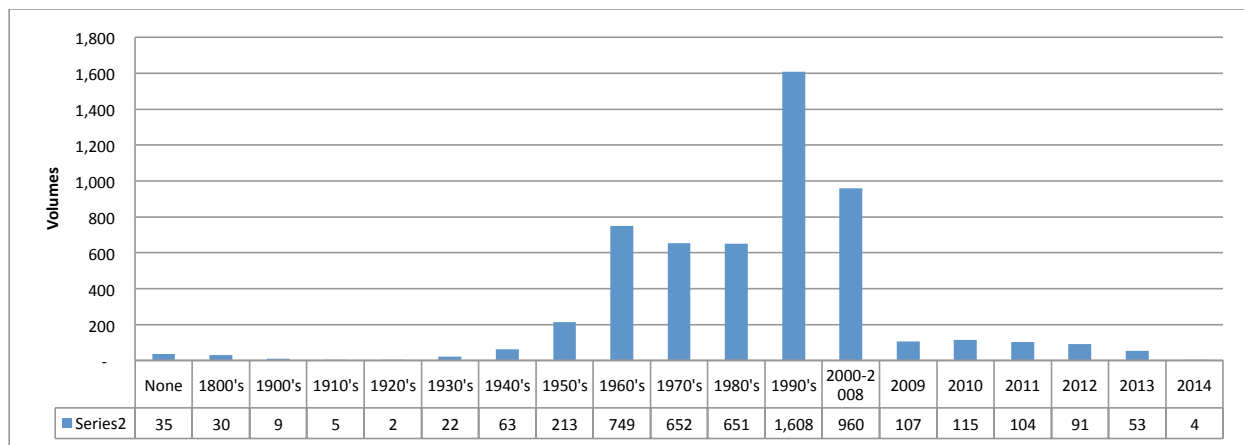


Holdings in each of the Library of Congress call letter categories in the same period are as follows:

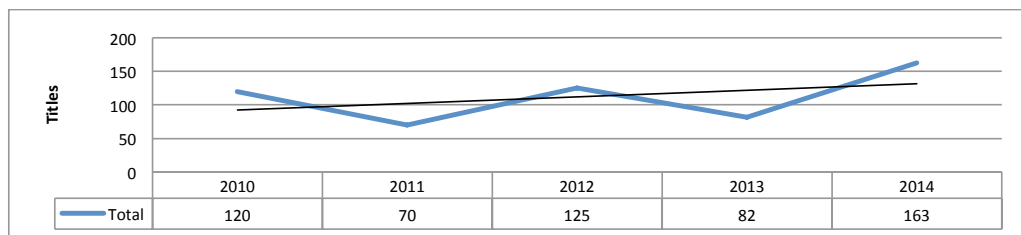
Subject Area-Holdings	LC	2007	2008	2009	2010	2011	2012	2013	2014
Geography	G	679	688	695	714	723	657	658	709
Mathematical geography	GA	83	83	86	91	97	85	82	82
Physical geography	GB	234	238	246	252	253	260	252	249
Oceanography	GC	188	189	192	210	214	218	210	215
Environmental sciences	GE	360	374	378	382	386	390	388	393
Human ecology	GF	310	315	319	327	328	343	346	338
Population in geography	HB 1951-HB 3697	106	106	106	109	110	112	80	80
Economic geography	HF 1021-HF 1027	16	16	18	18	18	19	9	9
Political geography	JC 319-JC 322	20	20	20	20	20	21	23	23
Science study and teaching	Q 181-Q 222	43	80	80	83	83	76	73	75
Astronomy	QB	459	465	474	524	538	523	519	528
Physics	QC	1,073	1,100	1,131	1,201	1,218	1,196	1,174	1,178
Geology	QE	700	701	716	769	770	768	754	708
Ecology	QH 414-QH 535	461	471	476	480	484	484	468	458
Environmental technology	TD	426	430	432	441	445	368	365	354
Mining	TN	90	90	93	93	94	93	82	74

Given the size of the student population served here (again, only 21 FTE as of the AY13/14), it is unsurprising that the collections for the department have consistently made up only a small proportion of the library's overall holdings. At the conclusion of the AY13/14, titles in the various geophysical sciences comprised only 2.6% of the overall holdings, or 5,473 volumes out of 207,742; seven years prior, at the conclusion of the AY07/08, the collection made up only 2.7% of the overall holdings. Again, it would take just over 2,500 new volumes to reach the level of 3a, "instructional support," and another 4,000 volumes for the collection to reach the level of 3b, "intermediate support."

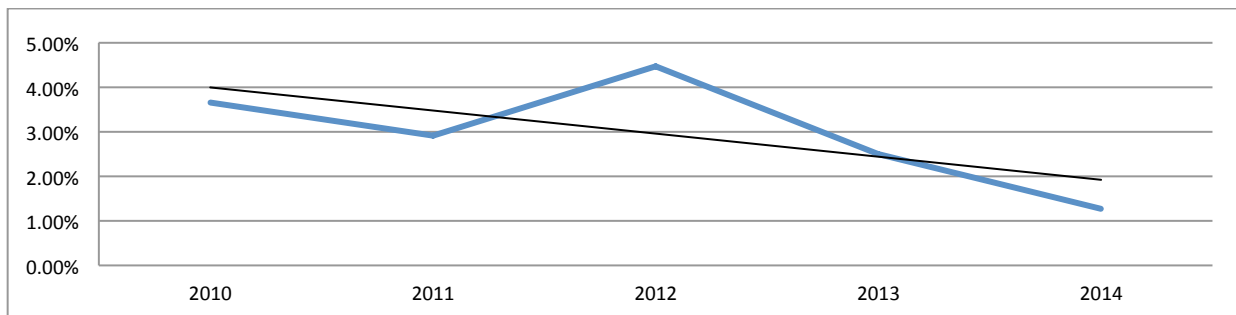
A significant degree of "crowding" exists in the various geophysical sciences collections. Just under a third of the holdings were published in the 1990s, while roughly 47% derive from the period between 1990 and 2008. The result of the culling efforts has thus been to make the collection much more current, even while rendering it small in comparison to the standards for institutions of our type. The mean holding derives from 1986, but the volume most commonly encountered (the mode) is from 2000; the overall median age of the collection is 1992, which is on a par with other programs at the University and which makes sense given the number of acquisitions made in this era. Moreover, we easily exceed the Washington Library Network's *Collection Assessment Manual* recommendation of having 10% of holdings published within the last 10 years and 5% within the last 5 years: roughly 15% of the holdings are 10 years or younger, and nearly 7% of holdings are 5 years or younger. The distribution by decade and in the most recent years for which we have reliable data is as follows:



Acquisitions have trended upward in the years since the last program review. In the last 5 years, in particular, the average annual number of acquisitions has risen by nearly 50%. The per annum breakdown in this period appears as follows:



Nevertheless, acquisitions in the geophysical sciences have not kept pace with the overall purchases made by the library. Indeed, acquisitions in the various geophysics disciplines have declined as a percentage of the overall purchases most every year for the last five years, as is seen in the graph below:



The breakdown of acquisitions in each of the LC call letter areas in that period is as follows:

Subject Area-Holdings	LC	2010	2011	2012	2013	2014
Geography	G	10	12	18	17	87
Mathematical geography	GA	3	6	1	1	2
Physical geography	GB	3	2	7	3	2
Oceanography	GC	12	4	2	2	6
Environmental sciences	GE	2	4	3	2	5
Human ecology	GF	5	2	14	4	0
Population in geography	HB 1951-HB 3697	1	2	1	0	1
Economic geography	HF 1021-HF 1027	0	0	1	0	0
Political geography	JC 319-JC 322	0	0	1	2	0
Science study and teaching	Q 181-Q 222	2	0	2	0	1
Astronomy	QB	33	10	17	18	18
Physics	QC	33	17	33	22	29
Geology	QE	9	3	15	5	8
Ecology	QH 414-QH 535	3	3	8	2	2
Environmental technology	TD	4	4	1	4	1
Mining	TN	0	1	1	0	1

### *eBooks Collection*

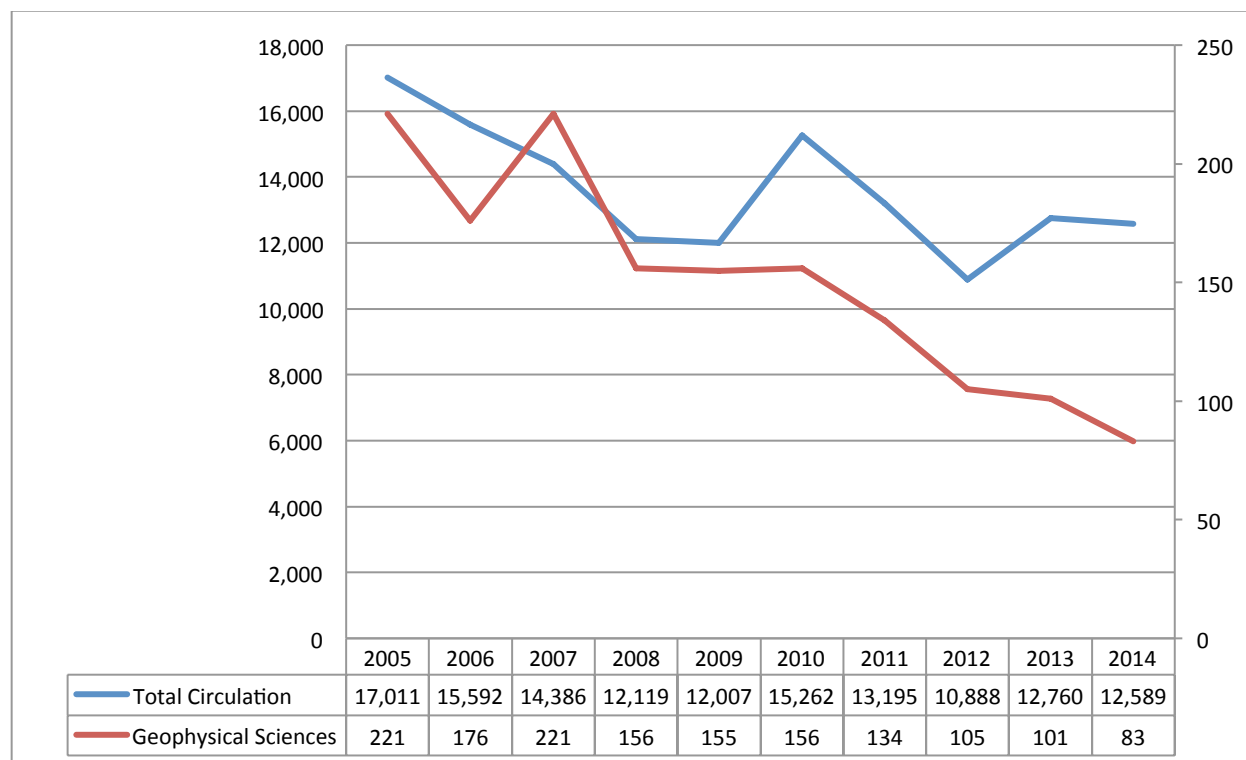
A growing category of materials not listed in the chart above is eBooks. Although they constitute only 1% of the holdings in the various geophysics disciplines, a slight 58 volumes, in other disciplines they are a much more substantial and growing proportion; indeed, very large collections of eBooks are now being assembled by consortia like the Massachusetts Library System, and the expectation is that more such collections will be coming online every year.

### *Reference Collection*

The geophysical sciences Reference collection contains 137 volumes, 65% of which are in geography and geology, while another 18% are in physics and astronomy. Since the last program review, the librarians have weeded more than 55% of 309 volumes held in 2008; almost half of the weeded volumes were outdated atlases. Again, the goal here was to achieve a more current and relevant collection.

## Circulation

The trends in overall and discipline-specific circulation moved roughly in tandem between 2005 and 2009, but since the last program review the circulation rates have grown apart at an increasing rate. Indeed, the gap between the overall circulation rate for monographs grew slightly, by just under 4%, while the geophysical sciences circulation rate has fallen by more than 47%. These trends are reflected in the graph below:

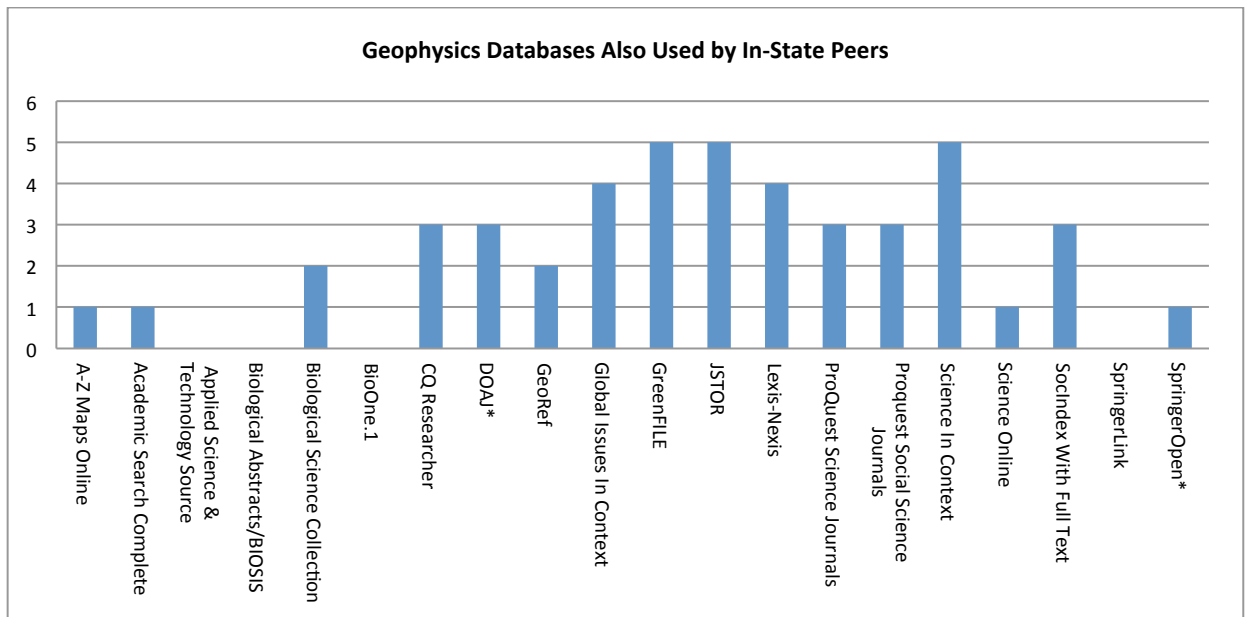


## Serials Collection Description

The databases treating the disparate disciplines within the geophysical sciences department are found on the FSU website (here: <http://www.fitchburgstate.edu/academics/library/find/research-databases/>). While the applicable databases number no more than two dozen, individual titles that treat the several disciplines and that are embedded within databases or that we subscribe to individually (and which are accessible through Serials Solutions) number in the thousands.

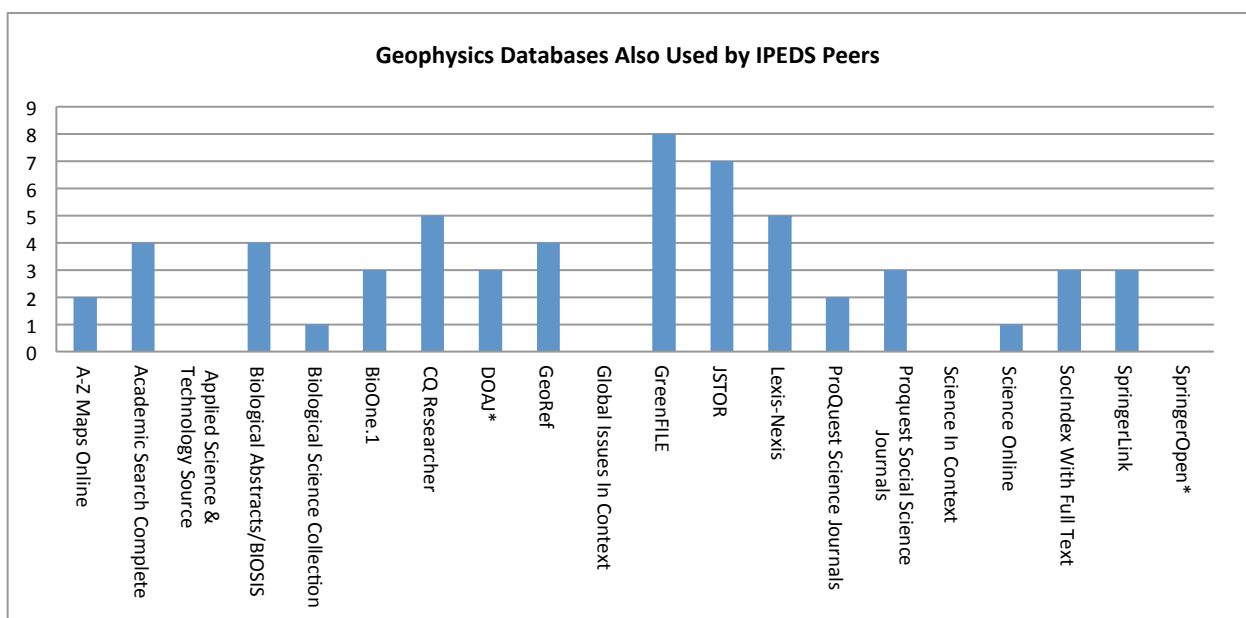
The majority of the databases to which we subscribe are generally held by our in-state peers, which for the purposes of this program review are five of the eight sister state universities (i.e., Bridgewater State University, Framingham State University, Salem State University, Westfield State University, and Worcester State University); only six of the databases are subscribed to by one or fewer in-state peers:



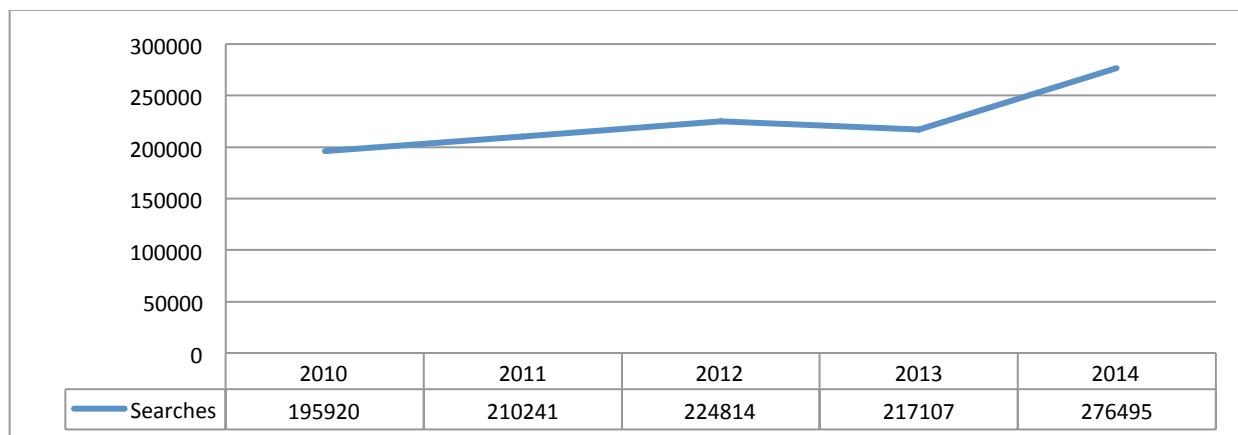


Our in-state peers have another roughly three dozen databases that we do not offer, but in the overwhelming majority of the cases only one or two libraries subscribe to them. (The full list of database options shared by in-state peer appears below in Addendum A.)

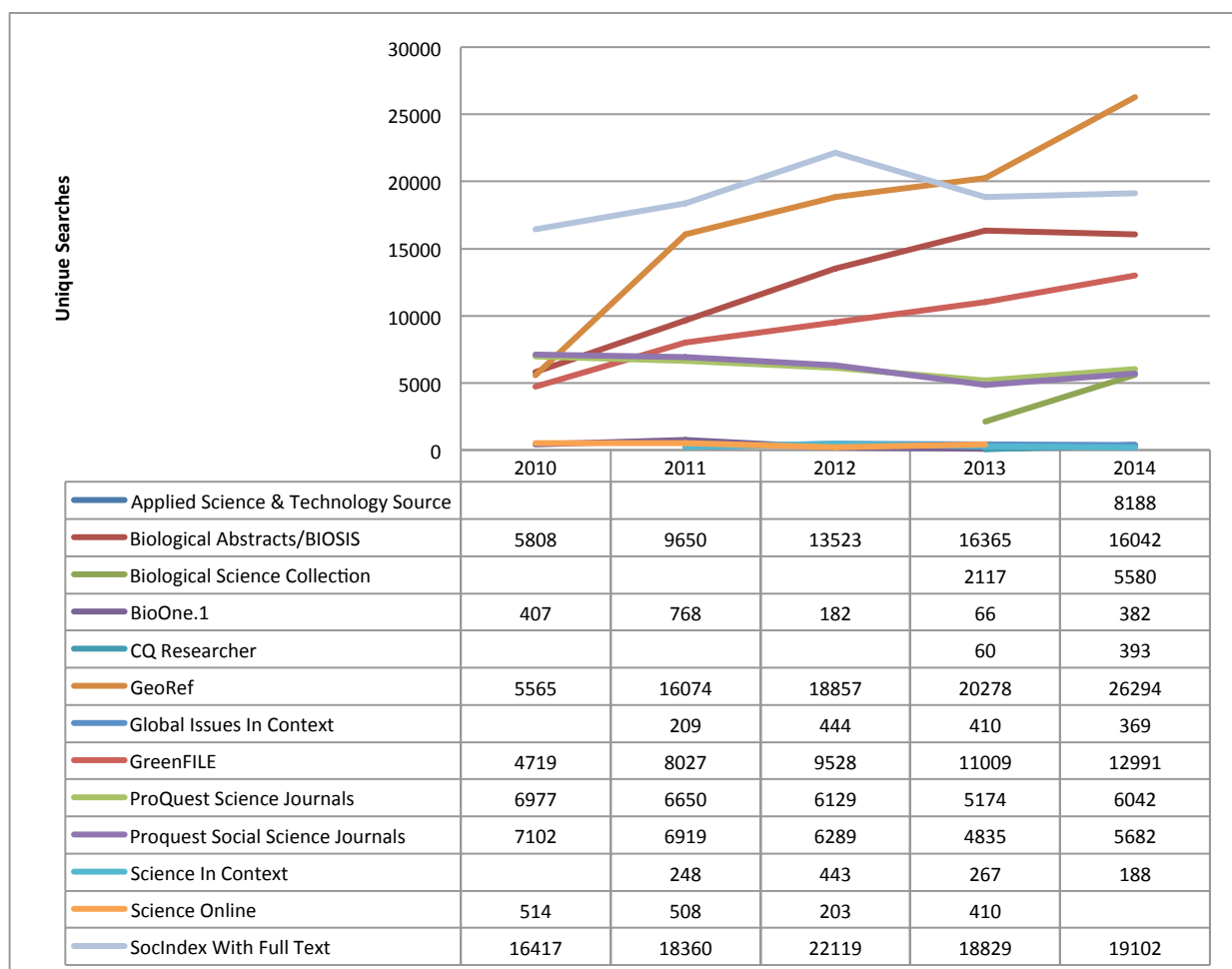
Fewer of our national peers, as measured by IPEDS and Carnegie classifications (i.e., Albany State; Auburn University, Montgomery; Chicago State; Fort Hays State; Georgia College and State University; Saginaw Valley State; University of Tennessee, Chattanooga; University of Michigan, Flint; Western Carolina University), subscribe to the same services as we and our in-state peers do, and yet as with our sister institutions there are dozens of other databases used. (The full list of these appears in Addendum B.) The number of IPEDS peers using our databases is as follows:



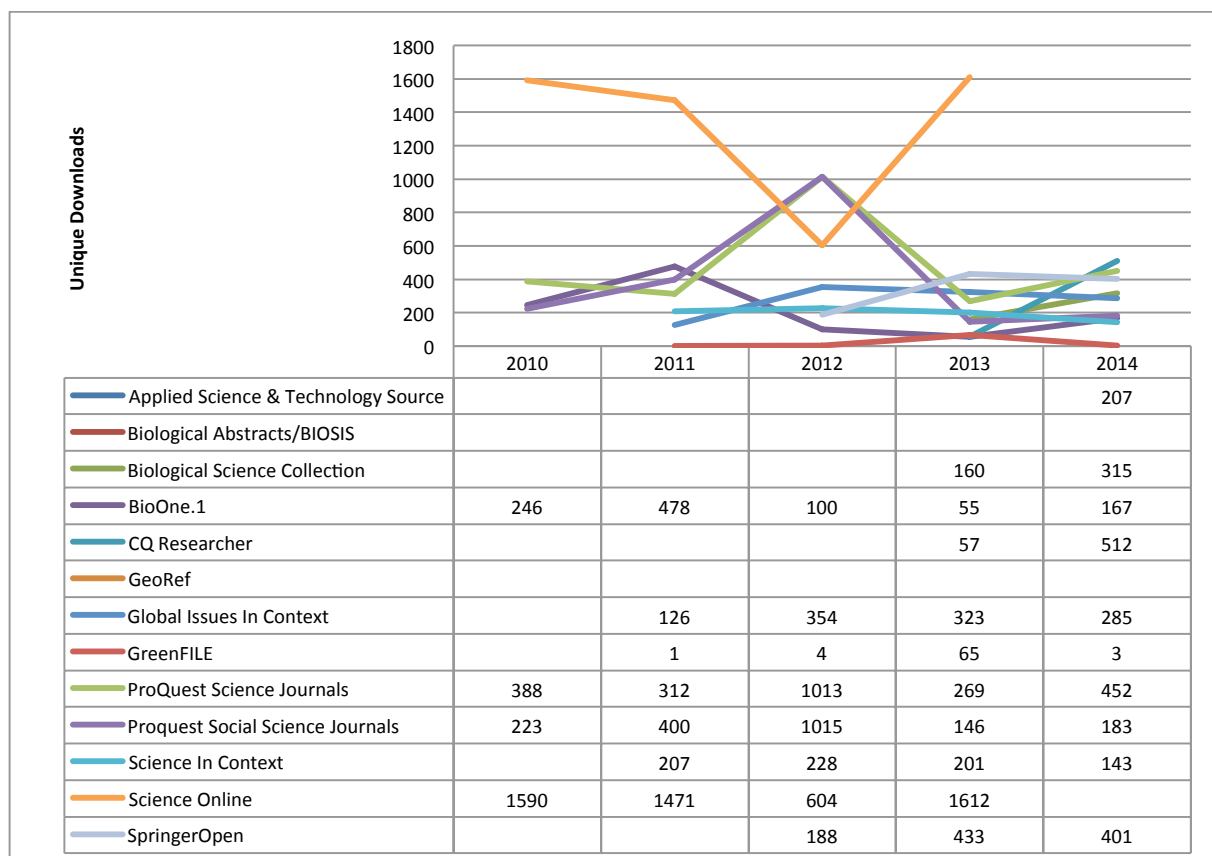
Overall database usage has risen in the last five years. Such a statement reflects usage in databases that offer more general coverage, including Academic Search Premier/Complete and JSTOR, as well as discipline-specific content. The trend in searches is as follows:



The picture for the discipline-specific databases is more complicated. For searches, the trend has been generally upward:



The trends for downloads are more mixed (N.B.: Socindex was removed because it distorted the data too greatly):



A comparative analysis of our journal holdings against national benchmarks shows mixed results. In the aggregate, we have just at 50% of the titles for various disciplines in the geophysical sciences indexed in the most recent edition of *Magazines for Libraries* (2013 ed.). Disaggregating the disciplines complicates the picture: for instance in atmospheric sciences, we have 59% of recommended titles; in cartography, GIS, and imagery, we have 48%; in earth sciences and geology, we have 46%; in geography, 66%; in physics, 41%; in population studies, 89%. Overall, then, our serials holdings rise to the level of 3a, which means that the library can support general undergraduate study; in various disciplines we reach 3b or 3c, which means that we can support advanced undergraduate and limited graduate study.

#### Definitions for the Quality of Serials Holdings

1 & 2a = some general periodicals and some major indexes

2b = 30% or more of the titles indexed in *Magazines for Libraries* and access to indexes

3a = 50% of the titles indexed in *Magazines for Libraries* and access to indexes

3b = 75% of the titles indexed in *Magazines for Libraries* and access to indexes and access to non-bibliographic databases

3c = 90% of the titles indexed in *Magazines for Libraries* and access to the major indexing and abstracting services in the field

### **Addendum A: Databases Used by In-State Peers**

A-Z Maps Online	JoVE
Academic Search Complete	JSTOR
Academic Search Premier	Kraus Map Collection
Access Science	Lexis-Nexis
AGRICOLA*	Massachusetts Real Estate Digitization Project*
AGRIS*	Old Maps Online*
ArXiv.org*	Open Science Directory*
Biological Abstracts/BIOSIS	Open Street Map
Biological Science Collection	Oxford Journals Online
BioOne.1	ProQuest Science Journals
Census Bureau Data*	Proquest Social Science Journals
Community Profiles (Mass)*	ProQuest Sociology
CQ Researcher	Sage Premier
Current Research Information System (CRIS)*	Science Direct
Data Planet	Science In Context
Digital Sanborn Maps for Massachusetts	Science Online
DOAJ*	SciFinder
Energy Citations Database*	Selected Water Resources Abstracts*
Environment Complete	Smithsonian/NASA Astrophysics Data System*
Environmental Studies and Policy Collection	SocIndex With Full Text
General Science Collection	Social Explorer
GeoBase	SpringerOpen*
GeoRef	USGS Publications Warehouse*
GeoScience World	Web of Science
Global Issues In Context	Wiley Online Library
GreenFILE	WorldWide Science*

\* Open-source materials or government document.

**Addendum B: Databases Used by IPEDS Peers**

A-Z Maps Online	Georgia Aerial Photographs
Academic Search Complete	Global Issues In Context
Academic Search Premier	Global Road Warrior
AGRICOLA*	Glossary of Geology
AFSA-3: Aquatic Pollution & Environmental Quality	GreenFILE
Agriculture Collection	GREENR
American Fact Finder*	ICMM: International Council on Mining & Materials*
American Geophysical Union Journals	JoVE
Applied Science & Technology Abstracts	JSTOR
Applied Science & Technology Source	Landscan Global Archives
Aqualine	Lexis-Nexis
Artic and Antarctic Regions	Material Flows*
ArXiv.org*	Mineral Resources Online Spatial Data*
Astrophysics Data System Abstract Service	Mineral Yearbooks*
Biological Abstracts/BIOSIS	Minerology Database*
Biological and Agriculture Index Plus	National Geospatial Intelligence Agency GEOnet*
Biological Science Collection	National Science Digital Library
BioOne.1	Natural Resources Conservation Service*
Bureau of Reclamation*	Office of Mining Reclamation and Enforcement*
Census Bureau Data*	Open Access Theses and Dissertations
Compendex	Oxford Journals Online
CQ Researcher	Pollution Abstracts
Data Planet	Population Index on the Web*
Dissertations Abstracts	PROLA (Physical Review Online Archive)
Dissertations and Theses (PQDT Open)*	ProQuest Dissertations & Theses
DOAJ*	ProQuest Environmental Science Package
DOE Green Energy	ProQuest Science Journals
Encyclopedia of Earth*	Proquest Social Science Journals
Environment Abstracts	ProQuest Sociology
Environment Complete	Public Library of Science*
Environmental Engineering Abstracts	Sage Journals
Environmental Impact Statements: Digests	Sanborn Maps
Environmental Sciences and Pollution Management	Science Direct
Environmental Studies and Policy Collection	Science In Context
EPA.gov*	Science Online
euromines*	Science Reference Center
General Science Abstracts	SciFinder
General Science Collection	SciTech Connect
General Science Full Text	SCOPUS
GeoBib	Simply Maps
GeoRef	Social Sciences Full Text

SocIndex With Full Text	USGS*
Social Explorer	USGS Board on Geographic Names*
SpringerLink	Water Resources Abstracts
SpringerOpen*	Web of Science
Today's Science	Wiley Online Library
UN Food and Agriculture Organization	WorldWide Science*
US Department of the Interior: Bureau of Land Management*	

\* Open-source materials or government document.

## **Appendix J**

# **Equipment & technology in the department**

### **J.1 Technology**

ArcGIS® software

1 MimioPad (Dymo part number 1747666, in 327.)

### **J.2 Equipment**

The following was updated in the fall of 2014.

#### **J.2.1 Geographic Science & Technology**

13 GPS systems (12 Garmin eTrex Summits purchased in 2007)

12 GPS systems (Garmin eTrex Summits purchased in 2011)

Departmental Map Library of more than 500 maps

#### **J.2.2 Earth Systems Science**

In Condiak 122:

Drawers by windows:

10x hand lenses (many)

etrex GPS (8)

graph paper

Silva compasses (many)

Brunton compasses (2 + 1 broken)

optical range finder

abney level

Brunton tripod (3)

Silva Teaching Aids (2 boxes)

rock hammers (5)

sledge hammers (2)

cold chisels (4)

sample bags (a few)

color pencils

office supplies (tape missing)

electric pencil sharpener

drawing compasses (many)

digital calipers (8)

rulers (many)

protractors (many)

Hubbard sun scale (11)

Army map reading materials

Earth Science Curriculum Project (ESCP) globes (10)

map projection models (2)

two planet planetarium (2)

earth globe (2)

star globe (2)

moon globe (1)

maps: Fitchburg quad 1988 (about 30)

USGS topographic map pamphlet (about 30)

USGS topographic map symbol pamphlet (about 30)

miscellaneous maps



romer (many)

physiographic maps (several of different areas)

stereo atlases (about 20 of ESCP, 2 of another brand)

anaglyph book (9)

landform feature books (13)

stereo pair viewers (many)

geoscopes (3)

land use maps (many)

binocular microscopes (5)

Shelves along room 120:

triple beam balance (5)

clipboards (many)

weight sets (5)

transverse wave demonstrators

bags of dirt (several)

refractometers (few)

hydrometers (few)

thermometers (few)

pH testers (few)

wooden blocks for isostasy (several)

tubing

deflated globe

sedimentator (19)

bags of dirt (several)

baggies for other bags of dirt

Ohaus digital analytical balance

Ohaus field digital balance

radiation kits

ring stands (4)

plastic sample tubes (many)

hot plates (2)

porosity, permeability hardware

Shelves along hallway:

assorted glassware

sieves (two plus one sets)

Kestrel weather meters (several)

sling psychrometer (at least 9)

solar lab stuff

diverse material for hands-on education

lesser quality sling psychrometer (many)

high quality anemometer

digital flow meter

field rain gauge

thermometers

soil thermometer (2)

hygrometer, high specific gravity

survey equipment for oceanography

more soil hydrometers

pressure difference demonstration equipment

HP LaserJet P2055dn

large format paper (many sheets)

Shelves along 120:

graduated cylinders, assorted sizes (many)

paper cutter

cart

trundle wheel (2)

tripod

maps

corrosives cabinet (empty)

rolling map rack and maps

jugs (3)

Interior shelves:

plastic ware (Erlenmeyer flasks etc.) (several)

Coriolis demonstrator

Foucault pendulum demonstrator

capillary tube demonstrators (4)

overflow buckets (11)

hydro gyro (1)

Edmund star finder (3)

turntable

rotators (2)

mechanical vacuum pump

additional equipment for rotators and pump:

Savart's toothed wheel (for sound demonstration) (1)

air pressure demonstrator

barycenter

Doppler

ESCP seismograph model

density equipment

radioactive decay lab equipment (not radioactive)

dendrochronology lab equipment

ESCP contour models

astrolabes (several)

VHS tapes (many) and unreadable dvds.

inclined planes and potential to kinetic energy demonstrators

overhead projectors (2)

overhead projector wave demonstrator

### J.2.3 Physics

**Physics, by room number** Room 350:

thread (front cabinet)

thermometers (2)

star globes (16) (shelves)

Solarscope (back bench)

homemade parallax equipment

Mac Mini w/HP monitor (8)

Room 348:

optics benches, short & long paired (8)

HeNe lasers, Uniphase model 155 SL (7)

HeNe laser, Industrial Fiber Optics, model F1 HN08 (1)

assorted optics

Fluke multimeters (8 open; 15? in 3 boxes)

Pasco temperature sensors (10)

Pasco calorimeters (15 + 14 = 29)

assorted clamps and bars (front right cabinets)

Pasco sound sensors (5) (front left cabinets)

Radio Shack electret condenser microphones (8)

spectrum tube power supplies (9) shelves

assorted low pressure spectrum tubes

Pasco voltage sensors (9)

Pasco RLC network (5)

assorted bar magnets

assorted old ammeters

Cenco electric field plates (9)

Extech DC power supplies (8)

Sargent Welch 75W AC/DC power supplies (9)

Pasco ring launcher (1)  
breadboards (8)  
assorted multimeters (15)  
Pasco resonance tubes (8)  
hooked masses (8 sets)  
diverse capacitors  
Pasco mechanical vibrators (8)  
Pasco function generators (8)  
Pasco ballistic pendula (8)  
assorted resistors  
assorted capacitors  
Pasco air tracks (8)  
Pasco air supplies (6)  
Pasco basic optics kits (8)  
Pasco mechanical wave driver (8)  
Pasco rotational motion apparatus (8)

Room 337:

Pasco ballistic pendula (8) (shelves)  
Pasco rotational motion apparatus (8)  
Pasco mechanical wave driver (8)  
Pasco function generators (8)  
Pasco mass and hanger set (8)  
hooked masses (7 sets)  
goggles (drawers)  
Pasco high current sensor (7) (floor)  
Pasco air tracks (8) (shelves)  
Pasco drop box (8)  
Ohaus triple beam balance (3)

Pasco free fall adapter (8)

Pasco air supplies (8)

Pasco intro. rotational app. (8)

Pasco time of flight (8)

Pasco shoot the target accessory (8)

Room 242:

force tables (8)

assorted tuning forks (rear cabinet)

hooked masses (7 sets) (side counter)

Beck ballistic pendula (5)

goggles

Room 240:

assorted clamps and bars (front right cabinets)

air tracks (8) (shelves)

Pasco air supplies (7)

brand x air supply (1)

Pasco ballistic pendula (8)

Pasco rotational motion apparatus (9)

diverse elementary optics

Ohaus triple beam balance (2)

goggles

Room 316:

Pasco free fall adapter (7) (A, 1)

Pasco table clamps (15)

Pasco mass and hanger sets (16)

hooked mass set (1)

Pasco Interface 850 (3)

Pasco basic optics light source (2) (A, 2)

Pasco optics viewing screen (9?)  
Pasco optics ray table (18?)  
Pasco function generator (3)  
Overbeck field mapping assembly (10) (A, 3)  
Coulomb's Law apparatus (8) (A, 4)  
Ward's spectrum tube power supply (16) (B, 2 and 3)  
Ohaus triple beam balances (15) (B, 3)  
Pasco basic optics, ray optics (25 in 1 box) (B, 4)  
Pasco Coulomb's Law apparatus (6)  
Pasco Interface 850 (5)  
Ohaus triple beam balances (4)  
air track gliders (1 box full) (C, 1)  
slinkies (5)  
thermodynamic kits (4)  
hot plate (1)  
stands and rods  
air tracks (2) (C, 2 and 3)  
Beck ballistic pendulum, broken (1)  
Beck centripetal force apparatus (2)  
HP Laserjet ink (1 box)  
rechargeable batteries (C, 3)  
strobe light  
Pasco photogate pulley system (16?)  
diverse wires  
goggles  
General vernier calipers (10) (C, 4)  
Westward vernier caliper (1)  
ripple tank

large concave mirrors (2)

Pasco time of flight accessories (8)

Pasco timer switch (8)

Pasco free fall balls acc. (8)

Pasco drop box (8)

Pasco photogate mounting bracket (8)

Pasco target (8)

Pasco photogate head (several)

Pasco function generators (4) (D, 1)

Pasco Interface 750 (9)

long, narrow spring (2) (D, 2)

small scales (3 boxes)

1 unopened box

Pasco stopwatches (one 10 pack) (D, 3)

Extech DC power supply (24) (D, 4)

Overbeck field mapping assembly (6)

Pasco Coulomb's Law apparatus (10) (E, 1 & 2)

Pasco ballistic pendula (2) (E, 2)

sundry capacitors

air supplies (4) (E, 3)

levels (11), plus angle finder (2)

old mechanical calipers (9)

stopwatches (9)

small box of AA batteries

diverse large masses (four 2k, five 5k, two 1k) (E, 4)

bricks (5)

Pasco basic optics light source (16)

Pasco basic optics ray table (5)



Pasco basic optics system (24)  
Pasco optics parts (many) (F, 3)  
diverse office supplies  
masses, hangers  
sundry gliders  
goggles  
Beck centripetal apparatus (8) (front bench)  
large display galvano-voltmeter  
Energizer recharger  
Casio fx-260solar calculators (35 in department; 18 here)  
Pasco function generator  
spectrometer  
interferometer  
spectrometers (2; may not be working)  
several compasses of diverse sizes;  
tall ring stands (7)

Room 126:

Radio Shack soldering gun  
Radio Shack helping hands w/magnifier  
Radio Shack rosin soldering flux  
Radio Shack cushion feet  
Radio Shack tip tinner & cleaner  
wire  
Kelvin multimeter (2)

**J.2.4 Shared**

diverse tools (Craftsman; kept in Ian Murray's office)  
1 Web camera with microphone (2010; IceCam2, Macally; Room 220A)  
1 Microscope with Video Camera  
All faculty have standard issue HPs and Macs



# Appendix K

## Syllabi

### K.1 Guth Common Syllabus Preamble

the boundary conditions constraining all Guth syllabi

#### K.1.1 Preamble: The New Educational Paradigm

##### INTRODUCTION

In the 1998-1999 academic year, the Department of Geophysical Sciences was required to conduct a self-assessment. It is a dangerous proposition to require scientists to conduct such a study for we will do it in a rigorous manner, following scientific methodologies, until a single model emerges that best explains the available evidence.

I looked at the department as a system for my contribution to this self-assessment. No system can be properly evaluated without knowing its boundary conditions and the external constraints imposed upon those boundaries. Without that information, it would be impossible for us to work within the system as we guide you on your educational trek.

What follows is my model that best explains the available evidence. Like all scientific models and hypotheses and theories, it can never be proven. Its validity is drawn from the evidence and its ability to tie all disparate threads of evidence together into a coherent whole. In science, models and hypotheses and theories are tested continuously by new observations. Indeed, my earlier, student-centered model of higher education in Massachusetts collapsed under the weight of the following lines of evidence that were pieced together as part of our departmental selfassessment.

##### THE MASSACHUSETTS HIGHER EDUCATION MODEL

The state colleges are seen by the Commonwealth of Massachusetts as government factories producing the trained workers needed by the state's businesses. This is not a matter of interpretation – the chairman of the Massachusetts Board of Higher Education has explicitly said so. At the Massachusetts Teachers Association summer conference on 1999 August 19, Massachusetts Board of Higher Education Chairman Stephen Tocco

urged the state teachers to work together so we can “*collectively as a state meet the challenge of the global economy and build the workers we need in this state.*”

**Worker Design Specifications** Worker design specifications are set forth by accrediting agencies in cooperation with professional organizations. Campus wide, the Liberal Arts and Science (LA&S) specifications are set by the New England Association of Schools and Colleges, Inc. (NEASC) Commission on Institutions of Higher Education (CIHE). Section 4.18 of their *Standards for Accreditation* requires that

Graduates successfully completing an undergraduate program demonstrate competence in written and oral communication in English; the ability for scientific and quantitative reasoning, for critical analysis and logical thinking; and the capability for continuing learning, including the skills of information literacy. They also demonstrate knowledge and understanding of scientific, historical, and social phenomena, and a knowledge and appreciation of the aesthetic and ethical dimensions of humankind.

(NEASC/CIHE, 2005)

To set the worker design specifications for each degree program, the Massachusetts Board of Higher Education recommends recruiting business leaders to examine college curricula. Once those worker design specifications have been set to satisfy the needs of the state’s businesses, Sections 4.4-4.5 of the *Standards for Accreditation* requires that

4.4) The institution publishes the learning goals and requirements for each program. Such goals include the knowledge, intellectual and academic skills, and methods of inquiry to be acquired. In addition, if relevant to the program, goals include creative abilities and values to be developed and specific career-preparation practices to be mastered. 4.5) Degree programs have a coherent design and are characterized by appropriate breadth, depth, continuity, sequential progression, and synthesis of learning.

(NEASC/CIHE, 2005)

The objectives you see in the syllabi for your individual courses are the required production steps needed to meet the objectives of the degree program as a whole.

**Production Quality Control** Accrediting agencies also require written procedures and quality control testing to make sure production processes create the value added leading toward the finished product, our graduates. As stated in the *Policy Statement on Institutional Effectiveness* :

An institution’s efforts and ability to assess its effectiveness and use the obtained information for its improvement are important indicators of institutional quality. The Commission, through its evaluation processes, will appraise these quality indicators..... Moreover, the institution needs documentary evidence to support (its) assertions of quality.... (and) these efforts will be both qualitative and quantitative. Assessment functions...as a basis for quality assurance.

(NEASC/CIHE, 1992 January 22)

Called “outcomes assessment” in education circles, this mandate is a version of *ISO 9002 Quality Systems – Model for Quality Assurance in Production and Installation*. This subset of the ISO 9000 standards addresses the prevention, detection, and correction of problems during product production (Breitenberg, 1992). Product design requirements are not covered under ISO 9002 as they are supplied by the customer, in this case by the accrediting agencies in cooperation with professional organizations and state businesses.

Entry assessments in reading, writing and math have already been initiated, testing the quality of our raw materials. The Massachusetts Board of Higher Education (BHE) has mandated a sophomore-level General Education Competency Exam to detect students that do not conform to the Liberal Arts and Sciences product specifications. Each degree program is required to adopt an exit exam appropriate to the discipline in order to assess competency in the major.

**Common Product Design Specifications (Common Degree Objectives)** Combining the product design specifications found in Section 4.18 of the *Standards for Accreditation* with the ISO 9002 quality assurance standards set forth in the *Policy Statement of Institutional Effectiveness* (NEASC/CIHE, 1992 January 22), I have summarized the worker specs required for all degree programs at Fitchburg State College. These are augmented by specifications unique to each program, so check with your department for the additional requirements needed for product conformity.

All graduates successfully completing an undergraduate program at Fitchburg State College shall have a DOCUMENTED ability to:

- communicate effectively in written English;
- communicate effectively in spoken English;
- critically and logically analyze competing ideas, using quantitative analysis whenever appropriate; and
- infer the consequences of competing ideas to test their validity (scientific reasoning).

They also have a DOCUMENTED knowledge, understanding and appreciation of:

- scientific issues;
- historic issues;
- social issues;
- aesthetic issues; and
- ethical issues.

Finally, all graduates successfully completing an undergraduate program at Fitchburg State College will demonstrate the capability for continuing learning so they can be self-upgrading with or without reasonable accommodations from their employers. They will do this with the knowledge that they are interchangeable workers made by the state for the state's businesses and failure to self-upgrade would result in their replacement by a newer model that does more and costs less.

Note that these are design specifications for graduates of the college, so you have about 40 classes to develop these skills. No one class will work on all points.

**Production Schedules** The state of Massachusetts maintains it is subsidizing your degree and in this state-run factory mandated to "build the workers we need in t h i s state", production schedules must be maintained. Therefore, a tuition surcharge of \$235 per credit hour is applied to all course registrations that exceed 118% of the credit hours required for graduation in your major (BHE meeting minutes, 1998-10-13). The state will only subsidize your degree, not your education.

If the state tries to slap a tuition surcharge on you, make sure the credit hour total excludes any courses you might have taken under the Division of Graduate and Continuing Education (DGCE). By legislative fiat, Graduate and Continuing Education courses at the state colleges receive no state support. Each class must generate enough tuition and fees to at least break even, or it is cancelled. Because the forprofit ventures run by the college through the DGCE (including Winter and Summer Session courses, Distance Learning courses, Graduate courses, Continuing Education courses, and Professional Development courses) are not subsidized by the state, the credits earned in those classes should be excluded from “*the 118% subsidized credit hour limit*” decreed by the Board of Higher Education.

**A Three-Year Limited Warranty** From the above evidence, it is clear that the supplier-product-customer relationship has fundamentally changed. In the past, it was the colleges supplying an education to meet the individual goals of each student. It is now the college supplying a trained employee to an employer. The new customers have demanded assurances that they will receive a quality product. Hence, course and program product design specifications (learning objectives, outcomes) with appropriate test procedures for incoming, in-process, and final inspections (outcomes assessments) are mandated by the state and accrediting agencies. Any doubts you might have with this interpretation are removed by the Fitchburg State College Guarantee (very slightly paraphrased here):

If within three years of manufacture a n employer determines our product to b e defective,  
Fitchburg State College will retool it at no additional cost.

(FSC Catalogs 1997/1998 to 2001/2002)

**Corporate Welfare** Why you are paying tuition to be turned into disposable workers for the state’s corporations and businesses is beyond me. Clearly, the college fee structure has not kept pace with this paradigm shift. To accurately reflect this change in the supplierproduct- customer relationship, you should be able to go to college tuition and fee free, with the costs recovered by the college from employers. They are, after all, the consumers of our product. Currently, the public component of a public higher education is just another government subsidy to private industry so businesses don’t have to pay for the training of their employees. This perversity is magnified by the tax breaks given by state and local governments to companies like Raytheon and Intel, further reducing their costs for worker training.

**“The Learnings”** The same folks who administer the ISO standards in the US, the American Society of Quality (ASQ), believe that corporate America is the appropriate model for education in this country. In their *Malcolm Baldrige National Quality Award – 1998 Education Criteria for Performance Excellence*, they have this message to school executives:

American businesses have faced many challenges similar to yours in their performance improvement efforts to become competitive and maintain a leadership position in a global economy. In the most competitive business sectors, companies with worldclass performance excellence systems and business results are able to achieve a score of 700 out of 1,000 points on the Baldrige scale. Where would your organization score? Your learnings start when you commit to a self-assessment.

Yes, indeed, we learned a lot from our departmental self-assessment. With accrediting agencies and state businesses dictating product design specifications for graduates and an ISO 9002 academic quality assurance program to guarantee all nonconforming students are identified and rejected before graduation, we have learned that college professors have been reduced by the state to the blue-collar workers needed to create

additional workers. It is, certainly, an odd sort of reproduction worthy of this Brave New World. If the state could only follow the leadership of GM, shut down the colleges and ship the students overseas to be built into workers, then the transition to the corporate model would be complete.

So, we both know our roles. You are the college's products, workers manufactured to the design specifications set by accrediting agencies and state businesses in a 4-year(!) production process. Your professors are the blue-collar workers that both build new workers and inspect them in order to reject any that do not conform to the customer's design specifications. That's OK. You can't work within the system until you understand the system, and I do bluecollar work well. I've cleaned toilets in a Michigan state park. I've worked as a production roustabout in the oil & gas fields. I was a graduate student. Above all, I know this to be true:

I came, I bought the books, lived in the dorms, followed directions.  
I worked, I studied hard, made lots of friends that had connections.  
I crammed, they gave me grades, and may I say, not in a fair way;  
But more, much more than this, I did it THEIR WAY.

I learned so many things, although I know I'll never use them.  
The courses that I took were all required, I didn't choose them.  
You'll find, that to survive, it's best to play the doctrinaire way;  
And so, I knuckled down and did it THEIR WAY.

Yes, there were times, I wondered why  
I had to cringe when I could fly.  
I had my doubts, but after all,  
I clipped my wings and learned to crawl.  
I learned to bend, and in the end, I did it THEIR WAY.

(Bright Morning Star, 1988)

## YOUR HIGHER EDUCATION

The above model explains all of the observations made during the department's selfassessment, but it is just a model. Like any scientific hypothesis and theory, it is always subject to revision under the light of new data. Unlike mathematical theorems, scientific theories can never be proven. They must imply consequences that can then be tested by making new observations. The new data will either support the original theory or lead to its modification or outright rejection. My earlier, student-centered model of higher education in Massachusetts had to be rejected under the weight of the evidence uncovered during the department's self-assessment.

I would be delighted if anyone could show me a conceptual model that better explains the observations presented above, for I find this model of higher education in Massachusetts to be greatly disturbing. Until such time, we must both work under the assumption that the constraints inferred from the model are valid. We need to plot a course around them as we trek together toward your educational goals within, and despite, the system imposed upon us by the Commonwealth of Massachusetts.

**Students Sometimes Ask.....** *Can I really get a degree in 4 years?* The odds are against it. Fitchburg State College is required to disclose its 4, 5, and 6 year graduation rates as part of the Students Right to Know. The current data are located at <http://www.fsc.edu/planningandir/> Looking at the averages for new, full-time freshmen admitted to campus between 1995 and 2002, only 21.3% had their degrees after four years, only 42.7% had their degrees after five years, and only 47.5% had their degrees after six years.

In 2004 April, the Board of Higher Education established a Task Force on Graduation Rates with the goal of getting the 6-year graduation rates at the Massachusetts State Colleges over the 50% bar. The Task Force issued its report 2005 June 21. [http://www.mass.edu/new/html\\_docs/GraduationRateTaskForceReport.pdf](http://www.mass.edu/new/html_docs/GraduationRateTaskForceReport.pdf) Their 2nd recommended strategy was the creation of “four-year ‘graduation contracts,’ in which the institution guarantees courses will be available to enable students to graduate within four years if they follow a defined program of study.” Only in Massachusetts would it take a task force a year to figure out that the state colleges need to offer the courses required for graduation if they want their students to graduate. In the years since that report was issued, no state college has made that commitment to its students. I believe it is because the college managements want to transfer as much instruction as possible to their for-profit DGCE divisions so they can keep both tuition and fees on campus.

This problem is compounded every time a department offers the required courses as scheduled by their published four-year plans of study, providing their students with degree programs that have coherent designs which are characterized by appropriate breadth, depth, continuity, sequential progression, and synthesis of learning as required by NEASC/CIEH, only to have the college managements cancel those classes due to low enrollments. At Fitchburg State College, any class with fewer than 10 students is potentially on the chopping block. This not only disrupts semester schedules, but it also disrupts the required course sequence making graduation in four years impossible unless students take these required courses through DGCE or at a different school, both at additional cost: <http://www.fsc.edu/registrar/reginfo.html>

As far as I am concerned, once the college accepts students into an undergraduate or graduate degree program, it has the moral obligation to offer the courses needed for graduation with the appropriate frequency and in the appropriate sequence to make graduation possible within the time frame promised regardless of enrollment.

Only you, as an informed consumer of higher education, can force the issue of “graduation contracts” recommended by the Task Force on Graduation Rates in 2005. Complain to the college management, the Board of Higher Education, the legislature and the governor if Fitchburg State College does not offer or cancels the classes you are required to take in your degree program. File claims of “bait-and-switch” advertising with the Massachusetts Attorney Generals Office if the college misrepresented the availability of classes without having to pay extra to take them through DGCE. If that doesnt work, then take your tuition and fees elsewhere. Without classes, there would be no students. Without students, there would be no Fitchburg State College.

## REFERENCES CITED

Breitenberg, Maureen, 1992, Questions and answers on quality, the ISO 9000 standard series, quality system registration, and related issues (NIST IR 4721): National Institute of Standards and Technology  
Bright Morning Star, 1988, Their way, in, Sweet and Sour (FF-478): Flying Fish Records.



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## **K.2 Guth Common Syllabus Supplement**

### **K.2.1 Contacts**

Dr. Lawrence Guth	Phone 978-665-3082
Department of Geo/Physical Sciences	Email: lguth@fsc.edu
Office Hours:	in McKay C289B

### **K.2.2 Description**

A Common Supplement to all Syllabi for Dr. Lawrence R. Guth, Associate Professor of Geophysical Sciences

### **K.2.3 Legal Disclaimers (the fine print)**

#### **COURSE CATALOG 2002-2003: Our Commitment to You**

**Notice of Catalog Changes** The rules, regulations, policies, fees and other charges, courses of study, and academic requirements that appear in this catalogue were in effect at the time of its publication. Like everything else in this catalogue, they are published for informational purposes only, and they do not constitute a contract between the College and any student, applicant for admissions or other person. Whether noted elsewhere in this catalogue or not, the College reserves the right to change, eliminate, and add to any existing (and to introduce additional) rules, regulations, policies, fees and other charges, courses of study and academic requirements. Whenever it does so, the College will give as much advance notice as it considers feasible or appropriate, but it reserves the right in all cases to do so without notice.

**Waiver of Academic Regulations** The college acknowledges that extenuating circumstances relative to rules, regulations, and programs occasionally require a waiver of regulations. Although students may petition for a waiver, they should understand that the justification for a waiver should be as exceptional as the granting of one. Petitions for a waiver of regulations begin with the Dean of Undergraduate Studies or Dean of the Graduate Studies. The provisions of this catalog are not to be regarded as an irrevocable contract between the College and its students.

#### **My Commitment(?) to You**

Since the college feels the need for such a disclaimer, I thought I'd better have one, too.

**Notice of Syllabus Changes** The rules, regulations, policies, and academic requirements that appear in this syllabus were in effect at the time of its publication. Like everything else in this syllabus, they are published for informational purposes only, and they do not constitute a contract between the Professor and any student or other person. Whether noted elsewhere in this syllabus or not, the Professor reserves the right to change, eliminate, and add to any existing (and to introduce additional) rules, regulations, policies, and academic requirements. Whenever (s)he does so, the Professor will give as much advance notice as (s)he considers feasible or appropriate, but (s)he reserves the right in all cases to do so without notice.

**Waiver of Academic Regulations** The Professor acknowledges that extenuating circumstances relative to rules, regulations, and programs occasionally require a waiver of regulations. Although students may petition for a waiver, they should understand that the justification for a waiver should be as exceptional as the granting of one. The provisions of this syllabus are not to be regarded as an irrevocable contract between the Professor and his/her students.

## **K.2.4 Student Support Services**

Get the FSC One Card—it's your ticket to services, so don't leave home without it:

<http://www.fsc.edu/onecard>

Use your professors: they are authorities in their subject areas, so question authority

Use the Hammond Open Computer Lab

Use the Academic Success Centers: <http://www.fsc.edu/success>

### **NOTES:**

(1) participation in these centers can be made a course requirement if a professor feels it necessary for your success;

(2) some Academic Success Center programs have eligibility requirements

## **K.2.5 Disability Services & Special Accommodations**

<http://www.fsc.edu/disability>

See Disability Services to document a disability & negotiate appropriate accommodations. Your professors will get a letter indicating the appropriate accommodations and they will be provided. The *only* time you need to reveal the nature of a disability to your professors would be if they would be needed to deal properly to emergencies that might occur in class such as seizures, allergic reactions, or help in evacuation.

## **K.2.6 Reading Preview**

Reading for content is different than reading for:

pleasure;

plot;

character development; or

symbolism (an English teacher crock anyway)

So, how should you read for content? Do it the Army way:

The Standard Military Way to Teach Content: **Do it in triplicate**

- 1) Tell 'em what you are going to tell 'em;
- 2) Tell 'em;
- 3) Tell 'em what you told 'em.

#### **Your textbook as a Drill Instructor**

- 1) Read the end-of-chapter summary & review before reading the chapter. Hits the high points determined by the author, so you know beforehand which concepts & terms are considered essential
- 2) Read the chapter with emphasis on stuff contained in the end-of chapter summary & review
- 3) Re-read the end-of-chapter summary & review

**Reading Review** [Reading goes quickly when you don't slow down to comprehend.]

but you will find slowing down to comprehend takes less time than reading quickly  
and then rereading and  
rereading and  
rereading and....

### **K.2.7 Work Load**

“Carnegie Unit: The unit of work expected of students for each college credit. The college expects students to spend 45 hours of work for each credit. The most common break down for one credit is one hour of class work and two hours of homework for 15 weeks each semester. A three credit course demands nine hours of work each week”

<http://www.fsc.edu/catalog/Glossary/>

**Work Load Implications** Most of the work is done outside of the classroom.

College is a full-time job. To get out of here in 4 years requires carrying 15 credits each semester that equates to 45 hours of school work per week! The game is to maximize your GPA while minimizing your time in school. Other constraints such as job, family, or disability might not let you put in those 45 hours. It is your responsibility to adjust your course load for your particular situation.

### **K.2.8 Implied Math & Science Backgrounds**

On 1995 December 18, the Massachusetts Higher Education Coordinating Council (since reorganized into the Board of Higher Education—perhaps to give it a better acronym) updated state college admission standards to require:

3 years of high school math including Algebra 1, Algebra 2 and Geometry/Trigonometry. A 4th year of high school math is strongly recommended for all students regardless of major (the previous 1984 admission standards were identical, except the 4th year was recommended only to students interested in physics or engineering). 3 years of high school sciences, 2 of which must include a lab.

### K.2.9 LA&S Math Requirements

The Fitchburg State College Liberal Arts & Sciences general education program recognizes quantitative skills as essential for life in the 21st century, specifically the “ability to express ideas and concepts accurately and appropriately in quantitative terms.”

If you don’t develop that ability in a class taught out of the Geophysical Sciences, where else will you do it?

**Required Scientific Calculator:** if you need to get one, make sure it has trig & exponential functions and scientific notation (engineering notation nice optional feature)—the \$10 models are perfectly fine

### K.2.10 FSC Politically Incorrect Speech Policy

“Fitchburg State College seeks to achieve its mission through a student-centered environment providing learning experiences where students come together to challenge one another’s ideas in an environment of mutual respect.”

from FSC Mission Statement

If you cannot challenge another’s ideas with the force of your arguments, without playground name-calling, then you might have to consider their validity even if you find them personally disturbing. Having an open mind is the nature of higher education.

### K.2.11 MY GRADING POLICIES

#### MY TEACHING PHILOSOPHY

Learning new things—that is why you come to college—is like climbing a mountain for the first time. I can only guide you. You have to walk the path yourself.

Expect to be tripped up on occasion by the square roots and loose rocks on the trail. It is likely that you’ll fall flat on your face several times along the way. The key is to get up and keep on climbing. No one has ever learned something new without making mistakes, and any fair grading system accounts for that. I use two safety nets so, by the time you’ve reached the summit at the end of the semester, you’re not too bruised & battered to enjoy the view (along with your newfound knowledge and skills and class grade).

#### STUMBLE RECOVERY; Bad grade days: Safety Net 1

If there are two or more grades within any category (i.e., two or more half-term exams, activities, proficiency quizzes, manuscripts, PowerPoint presentations, etc.), I will drop the lowest grade **WITHIN** each category.

#### The Secret Word

(parabolic)

Groucho Marx & his Secret Word duck in **You Bet Your Life**

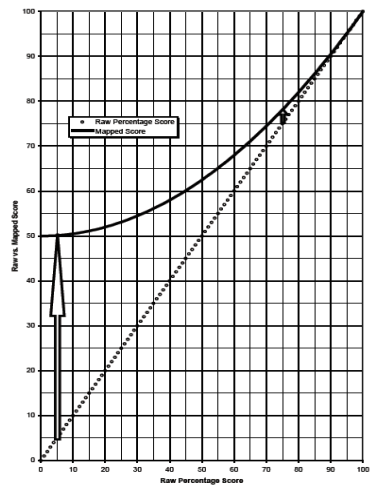
Radio: 1947-1956, TV: 1950-1961

Why a duck? **Duck Soup** (1933)

**STUMBLE RECOVERY; Bad grade days: Safety Net 2**

**Parabolic Grade Mapping** For grades that can be averaged (three or more grades per category where the lowest grade is dropped under Safety Net 1 before taking the average of the others ), the grades are mapped into a parabola that floors scores going into the average @ 50%.

WHY?? This allows a 100% score (A) to average with a 0% score (F) – when mapped as 50% – to come up with a 75% average (C). Without the map, averaging 100% and 0% gives you 50% (still an F)

**Parabolic Grade Mapping**

My mapping algorithm:

$$\text{Mapped Score} = \left[ 1 + \left( \frac{Pts}{Pts_{max}} \right)^2 \right] \times 50\% \times (\text{late fee})$$

**Examples:** A 5% raw score maps to 50.13% (you need lots of help).

A 75% raw score maps to 78.13% (you need little help).

You get help when you need it without setting off grade inflation.

**Attendance**

Face-time will be graded as noted in the course-specific syllabus because:

- 1) it is required for Federal Financial Aid
- 2) face time is often valued more highly than your work on jobs you will have for the next 50 years

An **EXCUSED ABSENCE** is your ticket to make up any work and not lose attendance points. Just contact me **BEFORE** the start of class (or as soon as possible if you are incommunicado) by phone, fax or e-mail.

**Attendance Penalty Points** One point minor penalty for cross-checking:  
(asking if you need to know this or can you ignore it now) One point minor penalty of interference:  
(making beeping, buzzing, ringing or other noises on cell phones, pagers, etc.)

Lab attendance requirement: you have to attend and participate in at least 70% of the lab explorations to pass the class regardless of your other grades (if you want credit for an LA&S Q-Lab course, you've got to go to the labs).

**K.2.12 FSC Academic Dishonesty Policy**

*Academic dishonesty in all its forms, including cheating, fabrication, plagiarism, and the facilitating of academic dishonesty by aiding and abetting any of the aforementioned, is not tolerated at Fitchburg State College.*

<http://www.fsc.edu/catalog/Policies/>

The Fitchburg State College catalog goes on to outline a 3 step process to determine if a student is responsible for a violation of the policy. If it goes to step 3, a Committee on Academic Dishonesty (2 profs, 2 students, chaired by someone from Academic Affairs) determines which side has more evidence. The “beyond a reasonable doubt” rules of evidence do not apply in college hearings, so neither of us want to go there.

### **Plagiarism in black & white among classmates**

Verbatim (or nearly so) submitted written assignments or identical supporting materials for homework assignments results in a zero for the work in question without benefit of the 50% parabolic grade floor. In this digital age, the copies are indistinguishable from the original, and so all papers have to be penalized.

Using someone else’s lab data as your own observations results in a zero for the lab and a zero on your Executive Summary interpreting those data without benefit of the 50% parabolic grade floor.

### **Plagiarism in Shades of Gray on Manuscripts**

Forget a reference? 2 point penalty on score card

Close paraphrasing or quoting large sections of a paragraph, but citing source?

Zero for synthesis and readability—they are not your own

Close paraphrasing without citation (you’ve claimed someone else’s ideas as your own) or stealing large sections of a paragraph without indicating quotation yet citing source (you’ve claimed someone else’s writing as your own)? Zeros for synthesis and readability—they are not your own—plus 5 points off end-of-semester course score.

Plagiarism in black & white: Zero for manuscript score and 10 points off end-of-semester course score.

## **K.2.13 Collaborative Learning Exploration Modules (CLEMs) and Collaborative Learning Activity Modules (CLAMs)**

Collaboration is encouraged, but by the end of the module, everyone should be able to do the work on their own. The data gathered in the lab-style CLEM is done during the lab periods, but any written reports interpreting those data are done outside of class. Coming to the lab period unprepared might make it impossible for you to finish collecting your data. BE PREPARED. Homework activities (CLAMs) don’t require data collection in the lab. If lab periods here are used, it is to make sure everyone is on track so the activities can be completed outside of class.

## **K.2.14 Late Fees**

Material with answers not posted will be accepted late with the following fees charged. This gives you some flexibility in dealing with life. Due to constraints to get in final grades, nothing will be accepted after the last day of class.

1 school day late:	(x 0.95)
2 school days late:	(x 0.90)
3 school days late:	(x 0.85)
4 school days late:	(x 0.80)
5 school days (1 week) late:	(x 0.70)
More than one week late:	(x 0.00)

### K.2.15 Proficiency Quizzes (after Doc Berry)

No book, note or cheat sheet, single topic quizzes demonstrating your mastery of minimal course competencies. There are 5, you **MUST** pass all 5 (*@geq60%*) to pass the class. With 4 quiz grades averaged together, the grades will be mapped into the parabola. You may take them as many times as needed to pass or if you have a chance to improve your score (up to the last day of class). However, each take has a lower cap (maximum) score:

Take 1 (original quiz):	maximum possible = 100%
Take 2:	maximum possible = 90%
Take 3:	maximum possible = 80%
Take 4:	maximum possible = 70%
Take 5 or more:	maximum possible = 60%

### K.2.16 Half-term Exams

Closed book, close notes—but you are allowed to make as you study for the exam and use during the exam one 8.5 x 11 inch cheat sheet.

Need to know the code (jargon) to do well

Half-term exams are non-cumulative, covering material from the beginning of the semester or from the last half-term exam scheduled near the middle and end of the semester.

### K.2.17 Exit Exam

Same format as the half-term exams: closed book, close notes—but no cheat sheet since the questions come from the material covered in the two previous half-term exams.

The exit exam is cumulative. Because it is cumulative and you've already been tested on materials covered in the half-term exams, expect many of the questions to come from those earlier exams. The exit exam is a chance to demonstrate you've learned from mistakes made on earlier exams—so don't toss them.

Because there can be only one exit exam, you are demonstrating your mastery of the material without benefit of either safety net—no parabolic mapping or dropping of lower/lowest scores.

### K.2.18 Exit Exam as a 3rd Half-Term

The exit exam is cumulative. Because it is cumulative and you've already been tested on materials covered in the half-term exams, expect many of the questions to come from those earlier exams. The exit exam is a chance to demonstrate you've learned from mistakes made on earlier exams—so don't toss them.

If you've learned from the earlier exams, those grades no longer reflect your semester-long performance. Therefore, the exit exam will also be entered into my Excel gradebook as a third half-term exam. This makes the half-term exam grades eligible for parabolic grade mapping & lets you recover from an earlier bad test by showing improvement throughout the semester. If you do worse on the exit exam than either half-term, then the exit exam as a third half-term exam grade is dropped.

### K.2.19 Cancellation Policy

*Massachusetts law requires that a merchant clearly and conspicuously disclose the store's refund, return, or cancellation policy*

<http://www.state.ma.us/consumer/Pubs/shop.htm>

That departmental coffee which does not kill me makes me stronger—it has been years since I took a sick day. Any assignment that is due on a day which then is cancelled because of weather, illness, etc. will be rescheduled for the next meeting period. For example, a paper due or quiz scheduled during a lecture period might be due or taken in lab if that is the next meeting period. The faculty absences/inclement weather hotline lets you check if classes are running before you make the drive in.

### K.2.20 Common end-of-semester FAQ

**No** extra credit projects will be considered. If you are already struggling with the course material, taking on additional work will make it even harder for you to master the intended subject matter.

If you signed out departmental equipment or borrowed materials from departmental faculty (because the college library collections are pitiful in the Geophysical Sciences), they must be returned in good condition before I release your final grade. If these are not returned before grades are due, I will submit an INC grade and give the Registrar your grade only after the materials have been returned.

### K.2.21 Final Grades

I don't give grades. You earn grades. The various assignments, quizzes, and exams of the class (i) are weighted as shown in the course-specific syllabus. Your final score is computed out of 100 and then quantized for the FSC grade scale as shown below. This is not a curve. If everyone earns a 4.0, everyone will get a 4.0!

$$x = \sum_{\text{all } i} \left( \frac{\text{Your sum}_i}{\text{Total possible}_i} \right) \times \text{Weight}_i$$



4.0	$90 \leq x$	2.0	$70 \leq x \leq 75$
3.5	$85 \leq x \leq 90$	1.5	$65 \leq x \leq 70$
3.0	$80 \leq x \leq 85$	1.0	$60 \leq x \leq 65$
2.5	$75 \leq x \leq 80$	0.0	$0 \leq x \leq 60$

### K.2.22 Musical Epilogue

Bright Morning Star, 1988, Their way in Sweet and Sour (FF-478): Flying Fish Records

I came, I bought the books, lived in the dorms, followed directions.  
 I worked, I studied hard, made lots of friends that had connections.  
 I crammed, they gave me grades, and may I say, not in a fair way;  
 But more, much more than this, I did it THEIR WAY.

I learned so many things, although I know I'll never use them.  
 The courses that I took were all required, I didn't choose them.  
 You'll find, that to survive, it's best to play the doctrinaire way;  
 And so, I knuckled down and did it THEIR WAY.

Yes, there were times, I wondered why I had to cringe when I could fly.  
 I had my doubts, but after all, I clipped my wings and learned to crawl.  
 I learned to bend, and in the end, I did it THEIR WAY

### K.3 GEOG 1000 Earth Systems Science

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#### Earth Systems Science (GEOG 1000), 3 credits, Fall 2014

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Condike Sci 133

Wed/Fri 2:00 - 3:15pm

[rparson4@fitchburgstate.edu](mailto:rparson4@fitchburgstate.edu)

(note that the "s" at the end of my last name was cut)

Dr. Reid Parsons (665-3613)

Geo/Physical Sciences

Condike Sci 329

office hrs: W 11:00am-12:00pm

R 10:00am-12:00pm

**Course Goals:** Welcome to Earth Systems Science! This course is designed to (1) acquaint you with how scientific investigation of the Earth has led to our current understanding, (2) explore how different Earth systems influence, and are influenced by, one another, and (3) discuss the human relationship with the Earth in terms of natural hazards, natural resources, and climate change.

By the end of this class you should be able to:

- Use the scientific process to find the most reasonable explanation
- Understand the major relationships between Earth's systems: the Hydrosphere, Biosphere, Geosphere, and Atmosphere
- Describe the origin, structure, and composition of the Earth
- Understand how water is transported and recycled in/on the Earth
- Describe how the landscape is shaped by climate and plate tectonics
- Understand how life has altered the composition of the atmosphere
- Describe plate tectonics and its role in recycling rocks and releasing Earth's internal heat
- Describe the structure of the atmosphere, the greenhouse effect, and the role of the ozone layer

**Class Materials:** A calculator with basic scientific functions (e.g. exponents) will be needed for in-class quizzes and tests. Cell phone use is *not* permitted during class, and cannot, therefore, be used as a calculator.

**Text:** David McConnell, et al., *The Good Earth: Introduction to Earth Science*, 2nd ed. McGraw Hill, 2010.

**What to Expect:** No prerequisites for the course are required - just your commitment to learn. You will do very well in this course if you *prepare* by doing the reading/homework, *attend* class, *engage* in lectures by asking questions, *review* class material before tests, and check the course's Blackboard site (and your University email) to get announcements and assignments.

Please understand that I expect you to complete the reading before the class day for which it is assigned. Homework will be posted to the Blackboard site and is due the week after it is assigned, with grades reduced 20% for each class period that it is late. Deadline extensions for homework etc. may be granted on a case-by-case basis. In class worksheets/quizzes will be given periodically. You must attend class to get credit for worksheets/quizzes! The midterm and final will be multiple choice.

**Reading “1-4-1”s:** For each of the assigned readings (unless otherwise indicated), a “reading 1-4-1” will be due. A “1-4-1” means that, for the assigned sections of reading you write:

“1” = One sentence that summarizes (in your own words) the overall scope of the reading (e.g.

This week’s reading on sections A, B, C discussed the global climate system and related changes in Earth’s orbit to the triggering of ice ages.).

“4” = Identify four things that you learned or found most interesting about the reading. Write those four things down.

“1” = Come up with one question about the reading. Either something that wasn’t clear to you, or maybe something that you are curious about related to what you read.

*This write-up will be due at the beginning of lecture (hand it in to me) on the day the reading is to be completed.*

**Attendance:** Attending class lectures will vastly increase your chance of success, and you are expected to attend every lecture.

**Grading:** Your grade will be evaluated under one of the following options\*:

1	2	3	
15%	20%	20%	In class quizzes
30%	20%	30%	Homework (on Blackboard)
25%	30%	25%	Mid-term Exam
30%	30%	25%	Final Exam

(\*) An option will be automatically chosen for each student in a way that maximizes the individual’s final grade

**Extra Credit:** *Students who share with the class a current event/news item whose topic addresses the interactions between 2 or more of Earth’s systems will earn 2% points of extra credit on their final grade.* Students must 1) first email me with a link to the event/news item, 2) include in the email a short (4-5 sentence) summary of the article and how it relates to Earth’s systems; 3) if I approve the topic, the student may then present the item at the beginning of class.

**Course Format:** Lectures will be given in different formats depending on the material being covered. Traditional “chalk talk,” power-points, and small group work will be used to convey class topics. I am a fan of the Socratic teaching method in which student participation in lecture by asking questions, working with your peers, and working with classroom materials is highly encouraged and will lead to a better learning experience.

**Office Hours/Contacting Me:** Please don’t hesitate to come visit me if you have questions, problems, or simply want to learn more about class topics. Email is the best way to reach me if you have a quick question, or you’d like to set up a time outside of my office hours to meet. My office is on the 3rd floor of the Science building ... please knock and wait for my response before entering - I may be on the phone.

**Liberal Arts & Sciences Program:** The LA&S curriculum at FSU contains five components in which students will take multiple courses: (1) Science, Math, and Technology; (2) Citizenship and the World; (3) the Arts; (4) Global Diversity; and (5) Advanced Study. This course fits into component #1 as a science course, with the objective of improving student skills in:

- The (tentative) Schedule:** **Reading** **(HW & Quizzes)**  
*(\* See Blackboard for the most up-to-date schedule & to see what assignments are due)*

Week 1 (Sept 5): Introduction,		
Week 2 (Sept 10): Earth in Space / Earth Interior	Ch. 1 & Ch. 2	
Week 3 (Sept 17): Plate Tectonics	Ch. 4	HW 1
Week 4 (Sept 24): Plate Boundaries / <b>Exam 1</b>		
Week 5 (Oct 1): Earthquakes	Ch. 5	
Week 6 (Oct 8): Volcanoes / Mountains	Ch. 6	HW 2
Week 7 (Oct 15): Rocks & Minerals	Ch. 7	
Week 8 (Oct 22): Weathering / Soil	Ch. 9	HW 3
Week 9 (Oct 29): <b>Exam 2</b> / Streams & Floods	Ch. 11	
Week 10 (Nov 5): Oceans & Coastlines	Ch. 13	
Week 11 (Nov 12): Atmosphere / Climate	Ch. 14 & Ch. 16.1 - 16.3	HW 4
Week 12 (Nov 19): Geologic Time & Cli. Chng.	Ch. 8 & Ch. 16.5 - 16.6	
Week 13 (Nov 26): <b>Thanksgiving Break</b>		
Week 14 (Dec 3): Global Warming	Ch. 17	HW 5
Week 15 (Dec 10): <i>Review (Last day of class)</i>	Ch. 15	
(Exam Week): <b>Final: Friday, Dec. 12 @ 12:20pm</b>		

## K.4 GEOG 1100 Principles of Human Geography

**GEOG 1100 – Principles of Human Geography** (3 cr. 3 hr.) – **FALL 2014**  
M W 9:30 – 10:45am or 11:00am – 12:15pm in Condikey Science 243

### PROFESSOR CONTACTS

Dr. Jane Huang

Department of Geophysical Sciences

Office Hours: T and Th 12:30 – 2:00pm in Condikey Science 328, or by appointment

Phone: 978-665-3496

Email: [jhuang2@fitchburgstate.edu](mailto:jhuang2@fitchburgstate.edu)

### COURSE DESCRIPTION

The purpose of this course is to introduce the major ideas and concepts in the field of human geography. In the broadest sense, the subject matter for a course on Human Geography can include any elements of the human-altered landscape, and how they came to be. We will select those elements that affect both large areas and large numbers of people in our search for geographic order and regularity in patterns of population and settlement, cultural achievements, location of economic activity, and individual spatial behavior. Emphasis will be on the questions "Where?" and "Why?" as in, why are towns located where they are, or why do people migrate in a particular geographic pattern? The course will explore many human activities that have geographic dimensions and will increase our understanding of the spatial organization of our own society as well as others, and the increasing importance of global connections in our societies.

### COURSE OBJECTIVES

Provide an interdisciplinary analysis of the processes that form Earth's cultural landscape. Build an appreciation for the diversity of the geographic patterns, and therefore improve world citizenship.

### COURSE RESOURCES

Textbook:

*An Introduction to Human Geography* by James Rubenstein, 11<sup>th</sup> edition, 2014, Pearson Prentice-Hall.

*Human Geography in Action* by M. Kubly, J. Harner, and P. Gober, 6<sup>th</sup> edition, 2013, John Wiley & Sons.

Equipment:

Fitchburg State University computer network/blackboard/email account

Calculator, thumb drive (or other data storage) to save any work you might do on a computer

### COURSE WEB PAGE

<http://blackboard.fitchburgstate.edu> The page is password protected so you will need to log on. If you are enrolled for other courses which use this utility, then when you log in you will see a list of all courses for which you are registered that are making use of this utility for the class web page. Click on "GEOG 1100" to access the page for our class. The web page for our course should be considered a helpful communication and learning tool for our class **but not a SUBSTITUTE for attending class.**

Syllabus, exercises, and a skeletal version of lectures notes will be posted on the course webpage. You are suggested to copy the posted lectures notes on your own notebook before class. During the lectures, the "missing" part in the lecture notes will be given for you to complete them. You should print the exercises and bring them to class since you will work on many of them during class time. Detailed demonstration of how to solve questions will be given in class. All exercises are due during class sessions. Make sure you bring them to class.

### COURSE COMMUNICATION

I will be emailing the class from time-to-time with important news and updates. In doing so, I'll be using an automated function within the registrar's web interface to email the entire class. Unfortunately, this function only utilizes email addresses with fitchburgstate.edu. So, to get all the news for this class and for other classes for which the instructors utilize this function, you'll have to **check** your fitchburgstate.edu email account regularly.

When you email me, make sure to indicate you are in the Geog1100 class.

### COURSE POLICIES

**Cheating will not be tolerated!** Although I encourage students to work together on assignments, your work must be your own. IT MUST BE WRITTEN ENTIRELY BY YOU. Do not plagiarize or copy the work of others. If you are caught cheating, you will receive absolutely no credit for that work, possibly a failing grade for the course, and you will be formally reported to the university for appropriate disciplinary action. The Fitchburg State University's policy on

cheating is described in the Student Handbook.

Exercises are due during class sessions specified by the instructor. Late exercises will **NOT** be accepted unless a doctor's note or other forms of signed proof is presented. **Not being in class is not an excuse for late assignments.** Make-up exams will not be allowed except in case of illness or if the student discusses his/her particular situation with the instructor **at least one day prior to the exam date.** A doctor's note or other forms of signed proof may be required. Make-up exams may be different from those given to other students, and may consist short answer and/or essay questions. You are responsible for knowing due dates and exam dates. You are also responsible for all material and announcements presented in the lecture, whether you are in class or not.

For students with disabilities: reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodation(s) needed for the course. Late notification may mean that requested accommodations might not be available. All accommodations must be approved through Disability Services. Contact Katrina Durham in the Disability Services by phone at 978-665-4029 or by email at [kdurham1@fitchburgstate.edu](mailto:kdurham1@fitchburgstate.edu) for more information.

**Cell phone policy:** please turn off or mute your cell phones during class time.

## COURSE REQUIREMENTS AND GRADING

### Attendance

Class attendance is required. Besides listening to lectures, taking notes, and participating in discussions, there are at least three other reasons of why you'd need to attend class: 1) All exercises are due during class sessions and they worth over 50% of total points; 2) Some exercises will be peer graded with instructions during class time; 3) Many exercise questions (with modifications) will be used in the tests. Thus, attendance will be critical to succeed in the class.

### Assignments

Throughout the semester, you will be required to complete at least one (1) assignment for each chapter and sixteen (16) assignments in total. An assignment will worth 10-25 points. All assignments will be posted on the course website. You are expected to download and print the assignments, bring them to class and finish them independently. Some assignments will be peer graded with instructions during class time and then collected; the others will be collected and graded by the instructor. All assignments will be returned. Late assignments or assignments not done by the student him/herself will not be accepted.

### Exams

There will be two mid-term exams and one final exam in this course. The mid-term exams will cover approximately one third of the course material. The final exam will be comprehensive and, therefore, will include questions from the entire semester. However, the final exam will emphasize the last third of the course. There will be a review session before each exam. All exams will be held in the classroom. The final exam will take place during the finals week.

### Grading:

Grades will be determined by the percentage of the total points you accumulate. We will have approximately 420 points available for you to earn in class (the exact number of total possible points possible will be determined as the semester continues). Points are earned as follows:

Assignments:	220	<i>Note that over <b>50%</b> of your grade in our class comes from non-exam sources. Don't take these points for granted – they do require work!</i>
Mid-term Exams (50 pts each):	100	
Final Exam:	100	
TOTAL:	420	

### The Golden Rule of Studying (Carnegie-unit workload and class times):

Put in three hours of studying for every hour you spend in class. For this course, 3 contact hours in class and 6 hours outside of class (reading, homework, and study)

#### *K.4 GEOG 1100 Principles of Human Geography*

##### **Grading Policy**

The grading policy recommended by the university as following is used for this class.

Percentage	FSU Grade	Percentage	FSU Grade
95-100	4.0	74-76	2.3
92-94	3.7	71-73	2.0
89-91	3.5	69-70	1.7
86-88	3.3	67-68	1.5
83-85	3.0	64-66	1.3
80-82	2.7	60-63	1.0
77-79	2.5	0-59	0.0

##### **COURSE OUTLINE**

The instructor reserves the right to change the chapters and the timelines during the semester:

Week 1: Prelim - Course Introduction

Week 2: Chapter 1 – Thinking Geographically (Ex1, 2, 3, and GPS exercise)

Week 3: Chapter 2 – Population (Ex4)

Week 4: Chapter 3 – Migration (Ex5)

Week 5: Chapter 4 – Folk and Popular Culture (Ex6)

**MID-TERM EXAM I in week 6 on Chapters 1, 2, 3 and 4**

Week 7: Chapter 5 – Language (Ex7)

Week 8: Chapter 7 – Ethnicity (Ex8)

Week 9: Chapter 9 – Development (Ex9)

Week 10: Chapter 10 – Agriculture (Ex10)

**MID-TERM EXAM II in week 11 on Chapters 5, 7, 9 and 10**

Week 12: Chapter 11 – Industry (Ex11)

Week 13: Chapter 12 – Services (Ex12, 13)

Week 14: Chapter 13 – Urban Patterns (Ex14)

Week 15: Chapter 14 – Resource Issues (Ex15)

**FINAL EXAM in the finals week is comprehensive**

## K.5 GEOG 1300 Earth, Sea & Air

EARTH, SEA & AIR (GEOG 1300) 2014 Fall Course-Specific Syllabus

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### 2014 FALL COURSE-SPECIFIC SYLLABUS

GEOG 1300: Earth, Sea and Air (3 credits, 4 contact hours)<sup>[1c, 1d]</sup>  
Sec. 01 (CRN=13899) & Sec. 03 (CRN=14674)

#### PROFESSOR CONTACTS<sup>[1a, 1b, 1f, 1g, 1h, 1i]</sup>

Lawrence R. GUTH, Ph.D.

Associate Professor of Geophysical Sciences

Department of Geo/Physical Sciences (GPS)

Office Phone: 978-665-3082

e-mail: [lguth@fitchburgstate.edu](mailto:lguth@fitchburgstate.edu)

Blackboard: <http://blackboard.fitchburgstate.edu>

Office: Condike Science 232

Office Hours, 2014 Fall

• 12:30–13:30 T, W, R;

• or

• by appointment

#### CARNEGIE-UNIT WORKLOAD AND CLASS TIMES<sup>[1e]</sup>

$$3 \text{ credit hours} \times \left( \frac{9 \text{ weekly work hours}}{3 \text{ credit hours}} \right) = 9 \text{ weekly work hours}$$

These 9 hours per week shall be apportioned as follows:

- 4 contact hours in class:  
Recitation = M F in Condike Science 124  
Lab = W in Condike Science 124  
@ 11:00–12:15 (Section 01) or 14:00–15:15 (Section 03)
- 5 hours outside of class (reading, homework, Blackboard quizzes, web tutorials & quizzes, & study)

!⚠️IMPORTANT! As a dedicated lab space, no food or drink are allowed in the lab.

#### CONTACT HOURS

The contract mandated by the Board of Higher Education specifies that for lectures, recitations and seminars, an hour is to be defined as a 50-minute period. Courses with laboratories that require longer periods of time are measured in 60-minute contact hours. It was a blatant attempt to force classes and students away from hands-on, discovery modes of learning and move them into the more cost efficient lecture halls full of sleeping students. In addition, both teachers and students are considered to do less work in a lab and so FSU equates 1.5 contact hours to be worth one 50-minute lecture. That is why your four contact hours in class gives you only 3 semester hours of credit. Making a four contact hour class fit into one block of the imposed block scheduling produces the three 75-minute class periods per week shown above. None of this affects the Carnegie-Unit Workloads, and so the extra hour in class is accommodated by decreased work outside of class.

#### PREREQUISITES

- Students should be proficient in the high school math required for their graduation from high school and their admission to Fitchburg State University. By the Massachusetts Department of Education K–12 Mathematics Curriculum Framework (1997, 2000, 2011), MassCore mandates and the admission standards set by the Massachusetts Department of Higher Education, this should be equivalent to Precalculus (MATH 1300).
- Students should be proficient in the high school science required for their graduation from high school and their admission to Fitchburg State University. By the MassCore

mandates and the admission standards set by the Massachusetts Department of Higher Education, this is three years of lab-based science (generally taken as one year each of three different lab sciences).

- Students should have done well in those courses. By BHE mandate, a minimum high school GPA of 3.0 is required in the 16 college prep courses required for admission. The math and science mandates noted above constitute six of those 16 courses.

Don't worry if your touchy-feely major allows these skills and knowledge to atrophy. We'll dust off the cobwebs as needed.



## 2 EARTH, SEA & AIR (GEOG 1300) 2014 Fall Course-Specific Syllabus

### REQUIRED RESOURCES [5]

#### Textbook (Required)

Tarbuck, E.J., Lutgens, F.K., and Pinzke, K.G.,  
2012, Applications and investigations in  
Earth Science (7<sup>th</sup> edition): Upper Saddle  
River, Pearson Prentice Hall, 320 p.  
**ISBN = 9780321689559**

#### --OR--

Tarbuck, E.J., Lutgens, F.K., and Pinzke, K.G.,  
2015, Applications and investigations in  
Earth Science (8<sup>th</sup> edition): Upper Saddle  
River, Pearson, 376 p.  
**ISBN = 9780321934529**

Both are available as an eTextbook from  
CourseSmart @ <http://www.coursesmart.com/>

#### Equipment (Required)

- a scientific calculator or scientific calculator app for your laptop, tablet or smartphone.

### LINK TO GENERAL GUIDELINES [13, 14]

The superscripted numerals in brackets refer to the **14** points in the Syllabi Guidelines mandated by the Academic Policy Committee, Student Affairs Committee and All University Committee. These were approved by President Antonucci and became effective at the start of the **2007** Fall semester.

Point **13**, a “statement regarding the College Academic Dishonest (*sic*) Policy” has already been superseded by the Academic Integrity Policy that was also imposed upon us for the **2007** Fall semester. We always go to the source in science. Read it yourself @:

<http://www.fitchburgstate.edu/campus-life/student-services/office-of-student-conduct-mediation-education/academic-integrity/>

Point **14**, an “informational statement about disability services available to students” is too limited in light of reoccurring school shootings. The university has services in place to help you academically, physically and mentally. You can review all of your options at:

<http://www.fitchburgstate.edu/campus-life/student-services/>

Both points are covered more fully in the General Guidelines, the common supplement to all of my syllabi. The General Guidelines are located on the class Blackboard site and on YouTube @

<https://www.youtube.com/watch?v=XrtULEsS4Ps>

### COURSE DESCRIPTION

#### Earth, Sea, and Air [2]

**GEOG 1300 3 cr. 4 hr.**

The course is comprised of selected topics from the Earth Sciences Learning Standards of the Massachusetts Science Curriculum Frameworks. Laboratory required. Credit cannot be earned for both GEOG 1000 and GEOG 1300. **LAB, SMT**

**2014–2015 FSU Undergraduate Catalog**

### COURSE OBJECTIVES [3]

All students receiving a passing grade in this course should acquire a documented ability to:

- communicate effectively in written English;
- communicate effectively in spoken English;
- critically and logically analyze competing ideas, using quantitative analysis whenever appropriate; and
- infer the consequences of competing ideas to test their validity (scientific reasoning).

Students also should acquire a documented knowledge and understanding of the

- scientific issues;
- social issues; and
- ethical issues

related to the human impact of the Earth & Space Sciences on human activities. These objectives will be documented by class discussions within the class web discussion group.

In addition, all students receiving a passing grade in this course should acquire a documented understanding of the Grades K-5 Next Generation Science Standards in Earth & Space Science that will form the basis for the next MA Science Curriculum Framework. This understanding will be in sufficient depth so that all students passing this class could win “Are You Smarter than a 5<sup>th</sup> Grader” if pitted against the most gifted 5<sup>th</sup> grader in Earth & Space Science.

### COURSE REQUIREMENTS [6]

#### FOR ASSESSMENT



ubrics are to assessment as promises are to politicians. They sound good, but are totally meaningless. First, consider the original definition that a rubric is the initial letter of a chapter or section in an illuminated manuscript that was commonly hand-colored in red (hence the Latin root). This definition is so ingrained that MS-Word keeps it as a formatting option, calling it a **Drop Cap**. (*Color the initial letter of this paragraph in red to make your own rubric*). Somehow, the EdD's who corrupted education also corrupted this meaning and applied it to qualitative assessment standards. For example, consider the following assessment levels

1. Far Exceeds Expectations
2. Exceeds Expectations
3. Meets Expectations
4. Needs Improvement
5. Does not meet minimal requirements

for a superhero's quality of work

1. Leaps tall buildings in a single bound
2. Leaps tall buildings with a running start
3. Can leap a short building if prodded
4. Bumps into buildings
5. Can't find buildings

In the sciences, we cannot use such stupid criteria, because we expect students to be able to

1. follow the procedures that let them
2. collect data in a reproducible manner,
3. that gives the input for calculations,
4. which they must do correctly
5. to provide the data reductions needed

for meaningful interpretations and conclusions.

It is impossible for a student to exceed expectations in the sciences because we expect students to follow the processes needed to get the data that will allow them to critically evaluate competing hypotheses. (I don't have the foggiest idea what the EdD's would want that exceeds this.) Hence, assessment in this class is based around quantitative score cards instead of nebulous, qualitative, subjective "rubrics".

#### Attendance Policy [4, 10, 12]

As stated in the General Guidelines, attendance will be used as one factor in determining your final grade. Attendance will be required and recorded in all sessions. An excused absence, obtained by dropping me a voice or email telling me that you can't make it to class that day, is your ticket to turn in the assignment due that day or to take the quiz/exam scheduled that day without penalty. An excused absence, however, does not excuse you from the class work done that day. Now that you can get all class documents from Blackboard, it is your responsibility for keeping up with all course activities even though you can't be present in class.

#### Recitation Participation:

##### Class Content Checks (C3s) [11]

Research data suggest that breaking up lecture with simple quizzes to reinforce what was just discussed and to make sure that greater than **75%** of students in the class got the content greatly improves student learning. I originally set these up for clickers, but so many students came to class without a working clicker that I gave up on that technology and reverted back to paper.

More recently, lecturing was deemed to be an unproductive activity where professors work hard while students tune out. The mode of instruction du jour is now flipped or inverted classrooms where students can control the pace of lecture material outside of class using the [**<<**], [**||**], and [**>>**] buttons on the media players of their mobile devices while class time is devoted to recitation where students are held accountable for their own learning. The EdD's call it "**taking ownership**" of your education. Recitation participation will be **10%** of your final grade. Because this occurs in class, no make ups are possible. However, dropping the lowest score with Safety Net **1** as discussed in the General Guidelines mitigates the no make up policy on this component of your grade.

#### BlackBoard Participation: [11]

##### Discussion Board & Secret Word Quizzes

As indicated in the General Guidelines, a BlackBoard website is available for required asynchronous class discussions, cross town collaboration, and cries for help in the middle of the night. In addition, as the university phases out copy machines and computer printers, many of the documents that used to be provided as handouts will now be distributed by posting PDF files to our Blackboard site. Specifically, Secret Word Quizzes (SWQs) posted on Blackboard confirms that you got the presentation materials posted on Blackboard. These activities constitute **5%** of your final grade.

Use of Blackboard requires you to use your FSU email address, so keep your old email address for personal use and check your FSU email account regularly for your school business. The direct URL to the Blackboard login page is given at the top of page one.

#### Just in Time Teaching [11]

##### (JiTT, Novak et al., 1999)

Having me regurgitate textbook information during class is a waste of your time. Class time should be devoted to discussions needed to clear up misconceptions from the readings and the introduction of additional material that uses the textbook reading as a springboard. The publisher does not provide test bank questions that I can post to Blackboard, but does provide a companion website with what they call GEODE self-paced tutorials and quizzes (originally provided on CD-ROMs with the same stupid name). These will be assigned before we cover the material in class and you will use the form at the end of the quiz to email me your top score before the due date. (You may take the

## 4 EARTH, SEA & AIR (GEOG 1300) 2014 Fall Course-Specific Syllabus

quizzes as many times as you want, but just send me your top score.) I can then evaluate response trends and tailor presentations to address common problems. If no problematic trends are found, then class time can then be used to expand on the textbook material.

### CLEMs (= LABs): <sup>[11]</sup>

#### Collaborative Learning Exploration Modules

Simple collaborative activities will be assigned throughout the semester for you to practice some of the quantitative aspects of Earth Science. Collaboration is always encouraged as you help each other learn and explore, but everyone will submit individual papers. These will be turned in and graded. Even though these are collaborative explorations, everyone should be able to do the work individually by the end of the module and this will be evaluated on exams.

These explorations are designed to be completed in the **75-minute** lab block devoted to the CLEM. However, there may be activities when we only have time to collect data in the lab and the data reduction and analysis will be done outside of class as homework. This could be the case in those labs where self-grading Excel spreadsheets are provided to give you immediate feedback, clues to common problems, and to reduce number crunching so you can concentrate on interpretation. In such cases, you will be expected to turn in a printout of your completed spreadsheet, either physically or by attaching the file to an email. It saves me time grading, but more importantly tells you if answers are right or wrong so you can ponder any incorrect responses, review the posted solution template, and then try, try again (usually in collaboration with me or your classmates) BEFORE turning in your printout.

You will be required to attend at least **70%** of the labs just to pass the course, since some of you are using this class to satisfy the LA&S lab requirement.

### Proficiency/Assessment Quizzes (PAQs) <sup>[11]</sup>

Students receiving a passing grade for the class must receive a passing grade (**≥60%**) on all proficiency quizzes. As noted in the General Guidelines, you may retake the quizzes up through the last day of class – but only if there is a possibility of improving your score. No retake will use class time. Proficiency quiz topics will be:

- quantitative reasoning & computational skills;
- solar system objects;
- reasons for the seasons;
- Earth & atmospheric layers; and
- global patterns explained by plate tectonics.

### Exams <sup>[7]</sup>

There will be two half-term exams, one near the middle of the semester and one near the end. These will be closed book, closed note exams. However, you may prepare and use during the test one **8.5"x11"** cheat sheet – your individual synthesis of the material covered on the half-term.

The exit (final) exam is cumulative. Questions will be variations of those appearing on the first two half-term exams and so no cheat sheet is permitted.

The exit (final) exam is your opportunity to demonstrate mastery of the course material despite the mistakes you expect to make as you learn something new. So, the exit (final) exam also counts as a third half-term exam with both Safety Nets active for the half-term portion of the class grade. This allows you to bomb the first or second exam and still recover a good grade for the course.

### Late Fees and Make-Up Policy <sup>[10]</sup>

Late fees for assignments are described in the General Guidelines. An excused absence is your ticket to turn in assignment at the next class meeting with no penalty. Otherwise, late fees increase with the number of days late. No late work will be accepted if (1) it is over one week late or (2) after **2014 December 10**, the last day the class meets before finals.

An excused absence is your ticket to make up quizzes and exams. However, the format of the quiz or exam could change. Traditionally in the Geophysical Sciences, make-up exams are essay even though the original exam was true/false, multiple guess, and fill in the blank and so most students avoid the make up exams if at all possible.

CONTENT CHRONOLOGY <sup>[8]</sup>

Week of...	NextGen Science Std. topics	Activity or Exam coverage
<b>Sept 05</b>	Syllabus	Syllabus
<b>Sept 08</b>	Quantitative Review	Exercise 23
<b>Sept 15</b>	Geodesy	Exercise 22
<b>Sept 22</b>	ESS1.A Universe & Stars	Exercises 17-20
<b>Sept 29</b>	ESS1.B Solar system	Exercises 17-20
<b>Oct 06</b>	ESS1.B Earth-Moon-Sun System	Exercises 12, 21
<b>Oct 13</b>	ESS2.A Minerals	Exercise 1
<b>Oct 20</b>	ESS2.A Rocks	Exercise 2
<b>Oct 27</b>	<b>Half-Term 01</b>	<b>Exercises 1,2,12,17-23</b>
<b>Oct 29-31</b>	ESS1.C Earth History	Exercises [6]7 or [9]8
<b>Nov 03</b>	ESS2.B Plate Tectonics & Global Patterns	Exercises [8, 10]7 or [6, 7]8
<b>Nov 10</b>	ESS3.C Mapping	Exercises [3, 7]7 or [3, 8]8
<b>Nov 17-21 + Nov 24</b>	ESS2.D Weather	Exercises 13-15
<b>Nov 26 &amp; 28</b>	<b>Thanksgiving</b>	<b>Recess</b>
<b>Dec 01</b>	ESS2.E Climate & Biogeography	Exercise 16
<b>Dec 08</b>	<b>Half-Term 02</b>	<b>Everything from Half-Term 01</b>
<b>Dec 10</b>	<b>Return exam</b>	<b>review</b>
<b>Sec 01: Dec 11 @ 12:20</b>  <b>Sec 03 Dec 12 @ 12:20</b>	<b>EXIT EXAM</b>	<b>Variations on Half-Terms 01 &amp; 02</b>

The dates of the exams are fixed. There may be some adjustments made to the topics covered in the exam depending on our progress.

EXIT EXAM <sup>[7]</sup>

From the **2014** Fall Final Exam Schedule distributed by the Registrar, MWF classes that start @...

**11:00 (Section 01)** fall in Exam Block **C**. The exit exam is therefore scheduled for **12:20-14:20** on Thursday, **2014 Dec 11**.

**14:00 (Section 03)** fall in Exam Block **G**. The exit exam is therefore scheduled for **12:20-14:20** on Friday, **2014 Dec 12**.

## WEIGHTING FACTORS OF COMPONENTS USED

TO EVALUATE THE FINAL GRADE <sup>[9]</sup>

The following weights will be used to evaluate your final grade. The general guidelines show how this is done and relate the final point total out of **100** to the numerical grade reported to the registrar.

Activity	Weighting Factor
$\sum$ half-term exams (best 2 of 3) <sup>†</sup>	<b>18% (09% each)</b>
$\sum$ proficiency quizzes (best 4 of 5)	<b>12% (03% each)*</b>
1 Exit Exam	<b>20%</b>
$\sum$ activities/labs	<b>20%</b>
$\sum$ JTT Exams	<b>10%</b>
$\sum$ C3 Quizzes	<b>10%</b>
BlackBoard	<b>05%</b>
attendance	<b>05%</b>

<sup>†</sup> includes the Exit Exam with the parabolic grade map applied as a 3<sup>rd</sup> Half-Term

\* As stated in the General Guidelines, you must receive a passing grade on all proficiency quizzes to pass the class.

## K.6 GEOG 2056 Climate Change and Human History

### Climate Change and Human History

GEOG/HIST2056 Fall 2014; TR2-3:15pm; 3cr; CDSC 243  
Dr. Benjamin Lieberman, Economics, History, and Political Science  
Dr. Elizabeth S Gordon, GeoPhysical Sciences

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Climate change and human history have been closely connected for thousands of years. This interdisciplinary course combines climate science and history to explore the connections between civilization and climate from the last ice age to the present. This course will provide students with the scientific and historical background to better understand one of the key issues facing today's world by examining how human history has been affected by past climate change and how human activity has altered climate.

By the end of the course, students will be able to:

- Describe how humans have reacted to and shaped climate
- Identify forcings and interactions within the climate system
- Explain how climate has changed as a result of natural and human causes
- Describe how past civilizations have prospered or suffered from climate change
- Identify current regions that are vulnerable to climate change
- Analyze scientific and historical evidence

#### Course Information

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Dr. Lieberman can be reached via email ([blieberman@fitchburgstate.edu](mailto:blieberman@fitchburgstate.edu)) or phone (978.665.3090). You can find him in his office, Miller 303, during office hours (T 11:00-12:30; W 12:30-2) or by appointment.

Dr. Gordon can be reached via email ([egordon3@fitchburgstate.edu](mailto:egordon3@fitchburgstate.edu)) or phone (978.665.3083). Her office is located in CDSC243, and you can be sure to find her there during office hours (M 9:30-11; F11-12:30), or at other times by arrangement.

There are no required textbooks for the course; required readings will be posted on Blackboard.

#### Classroom policies

##### *Attendance*

Attendance and preparation for each class, including completion of all required readings, is absolutely necessary for the success of this course. Please make certain to arrive to class on time, and once you are in class, plan on staying until the end. Please communicate with us about absences, whether due to planned or emergency situations.

##### *Technology*

In accordance with the University's Policy on Classroom Decorum, everyone will **turn off and store cell phones** and other electronic devices for the duration of each class. Laptops may be used for class work only.

##### *Academic integrity*

All Fitchburg State students are held to the highest standards of [academic integrity](#). Credit will only be earned for work that is your own. Note that academic dishonesty includes cheating, fabrication, plagiarism, and facilitating dishonesty; any student who violates standards for academic integrity by engaging in such activities will be subject to the appropriate disciplinary action. Plagiarism, the unattributed use of another author's work, will result in a grade of zero for the class.

##### *Learning accommodations*

Any student with a need for learning accommodations should make arrangements through [Disability Services](#) (665-3427) early in the semester. Please discuss these arrangements with us as soon as possible to ensure appropriate planning.

##### *Sustainable practices*

[Recycling](#) bins, which are located in the classroom, should be used for all appropriate items (including paper, soda cans, plastic bottles, etc). Please discard non-recyclable items (e.g., Styrofoam) in the wastebasket. Consider reducing your use of non-reusable items overall.

### Grading

Grades will be assigned in accordance with Fitchburg State's grading policy:

Points earned	Grade				
95 – 100	4.0	80 – 82	2.7	67 – 68	1.5
92 – 94	3.7	77 – 79	2.5	64 – 66	1.3
89 – 91	3.5	74 – 76	2.3	60 – 63	1.0
86 – 88	3.3	71 – 73	2.0	0 – 59	0.0
83 – 85	3.0	69 – 70	1.7		

Grades that fall between intervals will be rounded to the higher number.

### Student responsibilities

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**Each student is responsible for completing all course requirements and keeping up with readings and assignments.**

#### *Attendance and participation (10%)*

Your contributions during class will determine the success of this course. You must therefore prepare for and attend class, and participate in discussions. Please communicate absences to us in advance whenever possible; *documented* absences will not lower your grade. Inappropriate use of electronic gadgets will be counted as an absence.

#### *Online discussion forum (5%)*

The Blackboard (Bb) Discussion Forum will serve as a window into recent climate findings. Using the suggested websites on Bb, identify one new story to share with your peers, and summarize the article in a well developed paragraph that follows rules of standard English grammar. Your posts can focus on either news about climate science or on the effects of climate on human societies.

#### *In class activities and assignments (15%)*

We will work through several exercises focused specifically on analyzing scientific data. You must be in attendance to receive credit for those activities completed during class time.

#### *Short essays (15%)*

You will prepare three short (1-2 page) essays during the semester focused on climate change and society. For each essay, you will summarize and integrate evidence from at least one historical and one scientific article.

#### *Climate and history project (20%)*

For the final project, you will choose one geographic region for detailed study. In a 8-10 page paper, you will integrate the climate and cultural history of the region to describe: its current climate, how and why climate has changed in the past, how humans have responded to climate, and how climate is projected to change in the future. You will share your research findings with the rest of the class during an informal discussion toward the end of the semester.

#### *Midterm (15%) and Final (20%) exams*

The exams will cover relevant climate and history concepts. The final exam will be taken at the time assigned by the Registrar.

Additional details about assignments and the final project will be posted on Blackboard.

## K.6 GEOG 2056 Climate Change and Human History

### Tentative schedule – subject to change

	Date	Topic	Reading for class	Assignment
Unit 1	R 9/4	Introductions		
	T 9/9	Climate change discussion	<a href="http://www.nytimes.com/2014/08/27/science/earth/greenhouse-gas-emissions-are-growing-and-growing-more-dangerous-draft-of-un-report-says.html?src=me">http://www.nytimes.com/2014/08/27/science/earth/greenhouse-gas-emissions-are-growing-and-growing-more-dangerous-draft-of-un-report-says.html?src=me</a>  <a href="http://www.bostonglobe.com/opinion/2014/09/01/cool-summer-doesn-invalidate-climate-change/bYAgtE14rq4yFQuuUtl5O/story.html?s_campaign=8315">http://www.bostonglobe.com/opinion/2014/09/01/cool-summer-doesn-invalidate-climate-change/bYAgtE14rq4yFQuuUtl5O/story.html?s_campaign=8315</a>	Short summary of article
	R 9/11	Earth's orbital changes (Milankovitch cycles)	<a href="http://www.ncdc.noaa.gov/paleo/milankovitch.html">http://www.ncdc.noaa.gov/paleo/milankovitch.html</a> <a href="http://earthobservatory.nasa.gov/Features/Milankovitch/">http://earthobservatory.nasa.gov/Features/Milankovitch/</a>	
	T 9/16	Origins: Africa during the Ice Ages	<a href="http://www.bradshawfoundation.com/journey/">http://www.bradshawfoundation.com/journey/</a> <a href="https://genographic.nationalgeographic.com/human-journey/">https://genographic.nationalgeographic.com/human-journey/</a> "Traces of a Distant Past"	Article post
	R 9/18	Abrupt climate change: Volcanic eruptions; Heinrich events	"Apocalypse 73,000 BC"; "Did Climate Kill of the Neanderthals?"; "New Study Suggests Humans not Climate killed off the Neanderthals" <a href="http://www.smithsonianmag.com/smart-news/new-study-suggests-humans-not-climate-killed-off-neanderthals-6495207/?no-ist">http://www.smithsonianmag.com/smart-news/new-study-suggests-humans-not-climate-killed-off-neanderthals-6495207/?no-ist</a> <a href="http://www.ncdc.noaa.gov/paleo/abrupt/story.html">http://www.ncdc.noaa.gov/paleo/abrupt/story.html</a>	
Unit 2	T 9/23	Last glacial max and humans during LGM	"icy Isolation may have led to new human species"	Article post
	R 9/25	Human society at the end of the Ice Age	"1 <sup>st</sup> Americans"	
	T 9/30	Younger Dryas	<a href="http://www.ncdc.noaa.gov/paleo/abrupt/data4.html">http://www.ncdc.noaa.gov/paleo/abrupt/data4.html</a> <a href="http://shubeika.ccrs.ku.dk/about/">http://shubeika.ccrs.ku.dk/about/</a>	Essay 1 due
	R 10/2	Climate and the rise of farming	<a href="http://www.sciencedaily.com/releases/2013/07/130705101629.htm">http://www.sciencedaily.com/releases/2013/07/130705101629.htm</a> <a href="http://www.sciencedaily.com/releases/2007/06/070601173931.htm">http://www.sciencedaily.com/releases/2007/06/070601173931.htm</a>	
	T 10/7	Aridity: shocks to civilizations	<a href="http://www.sci-news.com/archaeology/article00350.html">http://www.sci-news.com/archaeology/article00350.html</a>	Article post
Unit 3	R 10/9	Climate, Rome, and Han China (monsoons)	"Climate Change during and after the Roman Empire"	
	T 10/14	Mayans and drought	<a href="https://www.ncdc.noaa.gov/paleo/drought/drght_mayan.html">https://www.ncdc.noaa.gov/paleo/drought/drght_mayan.html</a> <a href="http://dujs.dartmouth.edu/applied_sciences/climate-change-and-the-decline-of-mayan-civilization#.U_4XZWSwLgI">http://dujs.dartmouth.edu/applied_sciences/climate-change-and-the-decline-of-mayan-civilization#.U_4XZWSwLgI</a>	Article post
	R 10/16	Medieval warm period	<a href="http://www.spiegel.de/international/zeitgeist/archaeologists-uncover-clues-to-why-vikings-abandoned-greenland-a-876626.html">http://www.spiegel.de/international/zeitgeist/archaeologists-uncover-clues-to-why-vikings-abandoned-greenland-a-876626.html</a> 'Medieval Climate Optimum'	
	T 10/21	Midterm		midterm

## K.7 GEOG 2100 Geology

### Geology (GEOG 2100), 3 credits, Fall 2014

Lecture: TR 2:00-3:15pm; Condike Sci 124

Dr. Reid Parsons (665-3613)

Lab: F 2:00-3:15pm; Condike Sci 124

Geo/Physical Sciences

Condike Sci 329

[rparson4@fitchburgstate.edu](mailto:rparson4@fitchburgstate.edu)

office hrs: W 11:00am-12:00pm

(note that the "s" at the end of my last name was cut)

R 10:00am-12:00pm

Welcome to Geology! The goals of this lab course are to (1) acquaint you with the concept of geologic time and the geologic perspective: "the present is the key to the past," (2) explore the properties of the Earth and its materials using physics, chemistry, and mathematical tools, (3) facilitate the acquisition of practical mapping and computer software skills that will aid in the investigation of Earth's landforms.

By the end of this class you should be able to:

- Use the scientific process and critical thinking to find the most plausible explanation for geologic processes and phenomena.
- Describe the origin, structure, composition of the Earth.
- Understand the components of the rock cycle. Specifically, processes of mineral and rock formation, the characteristics of different types of minerals and rocks, and the methods used to identify and classify them.
- Understand erosional-depositional processes that change the earth's surface (e.g., weathering, erosion) and be able to identify what process has been operating using diagnostic landforms (e.g. the glacial landscape of Massachusetts).
- Understand the characteristics of the major geologic time divisions and the supporting evidence for the age of the Earth.

**Required Materials:** Access to a computer with Microsoft Excel or Apple Numbers for data analysis. A scientific calculator to use during tests - cell phone use will not be permitted. A clipboard is also recommended for when we take field trips.

**Text:** Edward J. Tarbuck, et al., *Earth: An introduction to Physical Geology*, 11th ed. Prentice Hall, 2013.

**What to Expect:** No prerequisites are listed for this course, although Earth Systems Science (GEOG 1000) is recommended. Please understand that I expect you to complete the reading before the day for which it is assigned. Short (5 question), open-book, online or in-class quizzes focused on the assigned reading will be given sporadically throughout the semester (although you will have forewarning that a quiz is coming). Online quizzes and assignments will be administered through the Blackboard website (<http://blackboard.fitchburgstate.edu>) - ***please check your FSU email frequently*** to make sure you complete these quizzes before class. Blackboard quizzes cannot be made-up (but your lowest grade will be dropped). Homework is due the week after it is assigned, with grades reduced 20% for each class period that it is late. The mid-terms and final will be mostly multiple choice with a few short answer questions.

**Lab:** We will meet in the same room for lab and lecture. Bring your calculator to the Friday lab sessions along with your lecture notes. Be prepared to complete a lab assignment during the lab



## K.7 GEOG 2100 Geology

session. We will be making a few short field trips during some lab sessions. One these days be sure to dress appropriately (sturdy shoes/boots, pants/shorts, sun hat, etc).

**Attendance:** Attending class lectures will vastly increase your chance of success. If you must miss class due to extenuating circumstances, you can email me before the start of class describing your situation. Extensions for late homework, lab make-ups etc. may be granted on a case-by-case basis. Because this is a lab course, completing 7 or more labs is required for a passing grade.

**Grading/Assignments:** Your grade will be evaluated as follows:

- 10% Class/Lab attendance
- 15% Blackboard quizzes (covering *mostly* reading material)
- 15% Homework
- 15% Lab Assignments
- 10% Lab Final (Rock and Mineral ID)
- 10% Mid-term Exams (for each of 2 tests)
- 15% Final Exam

**Extra Credit:** *Students who share with the class a geologically-themed current event/news item will earn 2% points of extra credit toward their final grade.* Students must 1) first email me with a link to the news item, 2) include in the email a short (4-5 sentence) summary of the article and how it relates to our class; 3) if I approve the topic, the student may then present the item at the beginning of class.

**Course Format:** Lectures will be given in different formats depending on the material being covered and on student preference. Traditional “chalk talk,” power-points, and small group work will be used to convey class topics. I am a fan of the Socratic teaching method in which student participation in lecture by asking questions, working with your peers, and working with classroom materials is highly encouraged and will lead to a better learning experience.

**Office Hours/Contacting Me:** Please don’t hesitate to come visit me if you have questions, problems, or simply want to learn more about class topics. *Email is the best way to reach me* if you have a quick question, or you’d like to set up a time outside of my office hours to meet. My office is in the bottom of the Sanders Administration building. To get there, go down the hall through the main entrance past the president’s office and go downstairs. After leaving the stairwell, go straight down the first row of offices, and turn right through the doorway where you see the office printers. My office is to your right: 104N-5 ... please knock and wait for my response before entering - I may be on the phone.

**Student Resources:** The *Academic Success Center* on the 3rd floor of the Library (Hammond Hall) provides a wealth of student support including: Math/Writing tutoring, academic advising, career guidance, disability services, and international student support. If you need a special arrangement relating to a medical, learning, or another condition, and you have already contacted disability services (978-665-4020), please talk with me at the beginning of the course so we can be sure to have your needs met.

**Liberal Arts & Sciences Program:** The LA&S curriculum at FSU contains five components in which students will take multiple courses: (1) Science, Math, and Technology; (2) Citizenship and the World; (3) the Arts; (4) Global Diversity; and (5) Advanced Study. This course fits into component #1 as a science course, with the objective of improving student skills in:

- Problem Solving (both quantitative and analytical),
- Written and Oral Communication of science concepts,
- Global Citizenship (as it pertains to the human relationship with our planet)

Also, course content is designed to cover all the topics necessary to pass the Massachusetts Test for Educator Licensure (MTEL) Earth Science exam. Students hoping to teach Earth Science in Massachusetts should be able to pass the Geology subarea of the MTEL based on this course alone.

### **Tentative Schedule**

Week	Date (Tuesday)	Reading / Topic	Lab
1	Sep 2, 2014	Syllabus	Units of Measure & Topo map Intro
2	Sep 9, 2014	Ch 1 & 12 / Intro	Field Trip 1
3	Sep 16, 2014	Ch 9 / Geologic Time	Field Trip 2
4	Sep 23, 2014	<b>Exam I</b> / Ch 2 / Plate Tectonics	Isostasy
5	Sep 30, 2014	Ch 13&14 / Plate Boundaries	Earthquakes
6	Oct 7, 2014	Ch 11 / Earthquakes	Exam Review
7	Oct 14, 2014	<b>Exam II</b> / Ch 3 / Mineral Characteristics	Mineral ID
8	Oct 21, 2014	Ch 4 & 5 / Igneous Rocks	Igneous Rx
9	Oct 28, 2014	Ch 6 & 7 / Sedimentary Rx	Sedimentary Rx
10	Nov 4, 2014	Ch 8 & 10 / Metamorphism & Deformation	Metamorphic Rx
11	Nov 11, 2014	<i>Lab make-up / review</i>	<b>Lab Final</b>
12	Nov 18, 2014	Ch 15-21 topics / Geomorphology	Rivers/Floods
13	Nov 25, 2014	<b>(Thanksgiving break)</b>	
14	Dec 2, 2014	Ch 15-21 topics / Geomorphology	Energy
15	Dec 9, 2014	Review	
16	Dec 12, 2014	<b>Final (Fri, 12:20-2:20pm)</b>	

## K.8 GEOG 2200 Meteorology

### Meteorology

GEOG 2200, Fall 2014, 3cr.

TR 12:30-1:45; Lab F 12:30-1:45; CDSC120

Dr. Elizabeth Gordon, GeoPhysical Sciences

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Welcome to Meteorology! Meteorology (from Greek, *meteoros*, which means "high in the air") is the study of the atmosphere and processes that cause weather. You already have some familiarity with many of the topics that will be covered in this course because you encounter weather every day. We will explore the scientific principles that govern atmospheric processes to develop a better understanding of daily weather. The focus of the course is on mid-latitude weather, but tropical and severe weather will also be discussed. Although there are no prerequisites for the course, it is expected that you have fulfilled mathematics requirements for admission to the college.

By the end of the course, you should be able to:

- Describe the composition and vertical structure of Earth's atmosphere
- Illustrate energy flow in the Earth system
- Explain and calculate various measures of humidity
- Identify the origin, movement, and results of interaction among major air masses
- Describe factors that lead to wind and storms
- Interpret weather maps and satellite and radar images
- Explain human impacts on natural atmospheric processes, such as air pollution and global warming

This course satisfies the Quantitative Lab Science requirement for the University's LA&S program. To meet this requirement, you must demonstrate proficiency in quantification and problem-solving strategies, which include:

- Using appropriate methods to collect data
- Analyzing, interpreting, and graphically presenting data
- Communicating scientific results and their implications

### Course logistics

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You can be sure to find me in my office (CDSC 327) during **office hours** (M9:30-11 and F 11-12:30), or you can arrange to meet me at a different time. **Email** ([egordon3@fitchburgstate.edu](mailto:egordon3@fitchburgstate.edu)) is the best way to communicate, but you can also **call** (978.665.3083). A **Blackboard** site ([blackboard.fitchburgstate.edu](http://blackboard.fitchburgstate.edu)) will be maintained – you'll find announcements, course documents, lecture notes, readings, learning resources, and grades posted there.

The **required textbook** for the course is: *The Atmosphere: An Introduction to Meteorology* Lutgens, Tarbuck, and Tasa, 12th Ed., 2013. Prentice Hall Publishers. ISBN 978-0-321-75631-2. You will need a **calculator** that can perform basic scientific functions (cell phone calculators are not allowed on tests). You will also need a **laptop** for several of our labs; those will be announced in advance.

### Ensuring your success

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Follow these basic steps in order to achieve course goals:

**Attend** class every day

**Prepare** for class by completing readings and assigned material on time

**Participate** in class discussion and **engage** in learning activities

**Review** course materials along the way

## Student responsibilities and grading

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### *In-class activities and assignments (25% of grade)*

We will work through numerous exercises during the semester – some during class and some to be completed on your own. You must be in attendance to receive credit for activities completed during class, but your lowest two activity grades will be dropped to allow for illness and emergencies. Take-home assignments must be submitted by the deadline; late work will not be accepted unless arrangements have been made prior to the due date.

Some assignments include [\*The Math You Need, When You Need It\* \(TMYN\)](#) tutorials. TMYN is designed to hone the quantitative skills you'll need to succeed in this course. You **must** complete the assigned tutorial and associated quiz by the deadline; **no late work accepted**. Quiz scores will count toward your total assignment grade.

### *Labs (25% of grade)*

Lab exercises, which are typically held on Fridays, will often be completed within the time allotted with follow-up questions completed on your own. Some labs will be type-written, though detailed calculations may be hand-written. You will have one week to complete each lab - late labs will not be accepted unless prior arrangements have been made. Make-up labs are not scheduled, but the lowest lab grade will be dropped. **You must be in attendance and arrive on time to receive credit for the lab.** Given that this course satisfies Fitchburg State's lab science requirement, **if you are tardy or absent to more than two labs, you will not pass the course.**

### *Tests (30% of grade)*

Three tests will be given during the semester, and will include topics from class discussion, assigned readings, and learning exercises. Make-up, essay tests will be allowed for documented emergency situations only, unless prior arrangements have been made. The lowest test score will be dropped when calculating the final course grade.

### *Final exam (20% of grade)*

Everyone must take the cumulative final exam during the time designated by the Registrar.

### *Field trip (counts as one lab)*

A field trip to the [Blue Hill Observatory](#) will be scheduled during the semester, and will take the place of a lab.

## Tentative schedule (subject to change); a detailed schedule will be posted on Blackboard

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Week of	Topic	Lab
Sept 1	Course introduction	Weather tools
Sept 8	Introduction to the Atmosphere	Ozone depletion
Sept 15	Atmospheric heating	Measuring solar angle
Sept 22	Temperature data	Contour maps
Sept 29	Atmospheric moisture	Measuring humidity
Oct 6	Atmospheric stability	Adiabatic processes
Oct 13	Clouds and precipitation	Clouds
Oct 20	Pressure and winds	Measuring wind
Oct 27	Atmospheric circulation	El Nino
Nov 3	Air masses and fronts	Weather maps
Nov 10	Mid-latitude weather; thunderstorms	Mid-lat cyclone case study
Nov 17	Severe weather (tornadoes and hurricanes)	Weather forecasting
Nov 24	Severe weather cont.; holiday	No lab - holiday
Dec 1	Air pollution	Acid rain
Dec 8	Climate change	No lab
Dec 11	Final exam, 2:30-4:30pm	

## K.8 GEOG 2200 Meteorology

### Classroom policies

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#### *Technology*

In accordance with the University's Policy on Classroom Decorum, **mutual respect and common courtesy** will be the guiding principles in the classroom. To achieve this, everyone will **turn off and store cell phones** and other electronic devices for the duration of every class.

#### *Attendance*

There are several reasons that you will want to attend class, including:

- It improves your learning.
- Credit for classroom graded work will only be earned if you are there to complete it.
- **You must attend labs in order to pass the course.**

Attendance is therefore expected for lecture, and required for labs. Please communicate with me about absences, whether due to planned or emergency situations.

#### *Academic integrity*

All Fitchburg State students are held to the highest standards of [academic integrity](#). Although much of our class will be group-based learning, **credit will only be earned for work that is your own**. Note that academic dishonesty includes cheating, fabrication, plagiarism, and facilitating dishonesty; any student who violates standards for academic integrity by engaging in such activities will be subject to the appropriate disciplinary action.

#### *Learning accommodations*

Any student with a need for learning accommodations should make arrangements through [Disability Services](#) (665-3427) early in the semester. Please discuss these arrangements with me as soon as possible to ensure appropriate planning.

#### *Sustainable practices*

[Recycling](#) bins, which are located in the classroom, should be used for all appropriate items (including paper, soda cans, plastic bottles, etc). Please discard non-recyclable items (e.g., Styrofoam) in the wastebasket. Consider reducing your use of non-reusable items overall.

#### *Grading*

Grades will be assigned in accordance with Fitchburg State's grading policy:

<i>Points earned</i>	<i>Grade</i>	83 – 85		69 – 70	1.7
95 – 100	4.0	3.0		67 – 68	1.5
92 – 94	3.7	80 – 82	2.7	64 – 66	1.3
89 – 91	3.5	77 – 79	2.5	60 – 63	1.0
86 – 88	3.3	74 – 76	2.3	0 – 59	0.0
		71 – 73	2.0		

*Grades that fall between intervals will be rounded to the higher number.*

## K.9 LEAD/GEOG 2250 Climate Change Science

### Honors seminar: GeoPhysical Sciences

LEAD/GEOG 2250, 3cr.

Spring 2011

WF 2-3:15, McKay C282

Dr. Elizabeth Gordon; GeoPhysical Sciences

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Welcome to the GeoPhysical Sciences Honors Seminar. This course will be focused on two of Earth's resources integral to our daily lives: oil and water. The overall framework for the course is the relationships among energy, water, climate, and human population from an Earth system perspective. We will examine: the geological formation, global distribution, and recovery of oil; the hydrological cycle, global distribution of water resources, and the link between water and climate; and human consumption patterns of these resources. We will consider the effect of consumption on Earth's climate, and the effect of climate change on future access to energy and water. Using Earth Science principles, we will also discuss economic and political considerations of the management of these resources.

By the end of the course, you should understand:

- The natural greenhouse effect and anthropogenic global warming.
- Distribution of oil reservoirs and global consumption patterns.
- Alternative and renewable forms of energy.
- The natural hydrological cycle and water's role in climate.
- Global access to, and consumption of, water resources.
- Geopolitics of energy and water resources.

### Course Information

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My **office** (McKay C265) is located diagonally across the hall from our classroom. You can be certain to find me there during **office hours** (W11-12:30, Th2-3:30), or you can arrange to meet me at a different time. **Email** ([egordon3@fitchburgstate.edu](mailto:egordon3@fitchburgstate.edu)) is the best way to communicate, but you can also **call** (978.665.3083) if necessary. A **Blackboard** site ([blackboard.fitchburgstate.edu](http://blackboard.fitchburgstate.edu)) will also be maintained – you'll find announcements, syllabus, lecture notes, readings, resources, and grades posted there.

We will use two **textbooks** for this course, both of which can be purchased from the Fitchburg State Bookstore. Additional readings will be available through Blackboard.



*Oil, Water, and Climate: An Introduction* (ISBN: 978-0-521-70949-4; Gautier) will form the basis for most of our discussions.



*Dire Predictions: Understanding Global Warming* (ISBN: 978-0-1360-4435-2; Mann and Kump) provides additional scientific background on climate change science.

## Classroom policies

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### *Technology*

In accordance with the University's Policy on Classroom Decorum, **mutual respect and common courtesy** will be the guiding principles in the classroom. To achieve this, everyone will **turn off and store cell phones** and other electronic devices for the duration of every class.

### *Attendance*

Group and classroom discussion will form the basis for the course, and your perspective is needed to enhance everyone's learning. Attendance is therefore required for this course. Please communicate with me about absences, whether due to planned or emergency situations.

### *Academic integrity*

All Fitchburg State students are held to the highest standards of academic integrity (please review the Code of Conduct for details: <http://www.fitchburgstate.edu/judicial>). Although much of our class will be group-based learning, **credit will only be earned for work that is your own**. Note that academic dishonesty includes cheating, fabrication, plagiarism, and facilitating dishonesty; any student who violates standards for academic integrity by engaging in such activities will be subject to the appropriate disciplinary action.

### *Learning accommodations*

Any student with a need for learning accommodations should make arrangements through Disability Services (665-3427) early in the semester. Please discuss these arrangements with me as soon as possible to ensure appropriate planning.

### *Sustainable practices*

Recycling bins, which are located in the classroom, should be used for all appropriate items (including paper, soda cans, plastic bottles, etc). Please discard non-recyclable items (e.g., Styrofoam) in the wastebasket. Consider reducing your use of non-reusable items overall.

### *Grading*

Grades will be assigned in accordance with Fitchburg State's grading policy:

<i>Points earned</i>	<i>Grade</i>	83 – 85	3.0	69 – 70	1.7
95 – 100	4.0	80 – 82	2.7	67 – 68	1.5
92 – 94	3.7	77 – 79	2.5	64 – 66	1.3
89 – 91	3.5	74 – 76	2.3	60 – 63	1.0
86 – 88	3.3	71 – 73	2.0	0 – 59	0.0

*Grades that fall between intervals will be rounded to the higher number.*

## Ensuring your success

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Follow these basic steps in order to achieve course goals.

**Attend** class every day

**Prepare** for class by reading assigned material ahead of time

**Participate** in class discussion

**Engage** in learning activities

**Review** course materials along the way

## Your responsibilities

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### *Reading*

Please complete assigned reading before class.

### *Attendance and participation (10%)*

Attending each class and engaging in meaningful class discussion are critical to the course's success. You will be evaluated based on your preparation for and contribution to our discussions.

### *Graded learning activities (30%)*

We will work through numerous exercises during class. Over the course of the semester, several of these will be collected and will count toward your overall course grade, though your lowest two grades will be dropped to allow for illness and emergencies. **You must be in attendance to receive credit for activities completed during class.** Several assignments will be completed on your own time. Assignments may take the form of an article summary, a short position paper, computations, or graphical representations of data. These must be submitted by the assignment deadline; grades will be reduced by 20% for each work day beyond the deadline.

### *Tests and quizzes (10%)*

Short quizzes and tests will be scheduled during the semester to evaluate your understanding of course material.

### *Alternative energy summit (10%)*

We will hold an "Alternative Energy Summit" during the first week of March, in which groups of 3-4 students will present one type of alternative energy. You will be evaluated on your group's oral presentation, as well as an individual written summary of alternative energy choices.

### *Leadership lifestyle project (20%)*

This project entails making specific changes to your consumption habits for three weeks and documenting successes and challenges along the way. This project will begin immediately after spring break. Details of this project will be distributed during the second week of class.

### *Final course project: The Fitchburg Protocol (20%)*

We will hold a climate negotiation treaty during the last day of class, with follow-up discussion and written reflection during the final exam period scheduled by the Registrar.

### *Field trip*

Several field trips will be organized this semester, and will be announced as dates become set.

## Tentative schedule

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Week of	Topic	Reading
Jan 19	Introduction to course, climate science	Ch1, 2
Jan 26	Global warming	Ch2; Mann and Kump
Feb 2	Population	Ch3
Feb 9	Carbon cycle	Ch4
Feb 16	Peak oil	Ch5
Feb 23	Oil and transportation; geopolitics of oil	Ch6, 7
Mar 2	Alternative energy	Ch8
Mar 9	Water cycle, freshwater resources	Ch9, 10
Mar 23	Surface water	Ch11
Mar 30	Groundwater	Ch12
Apr 6	Geopolitics of water and water alternatives	Ch13, 14
Apr 13	Climate change	Ch15
Apr 20	Climate change impacts	Mann and Kump
Apr 27	Challenges and solutions	Ch16
May 4	Solutions	Ch16



## K.10 GEOG 2400 Computer Applications in Geography/Earth Sciences

### GEOG 2400 – COMPUTER APPLICATION IN GEOGRAPHY/EARTH SCIENCES (3 cr. 3 hr.)

Fall 2013

T Th 12:30-1:45pm

Classroom Location: McKay C165

#### PROFESSOR CONTACTS

Dr. Jane Zhang

Phone: 978-665-3496

Department of Geophysical Sciences

Email: [xzhang2@fitchburgstate.edu](mailto:xzhang2@fitchburgstate.edu)

Office Hours: T and Th 9:30 – 11:00am in McKay C252, or by appointment

#### COURSE DESCRIPTION

An Earth scientist makes a living by observing and measuring nature. Whether recording and analyzing earthquakes or measuring subtle changes in sea surface temperature over many decades, a successful Earth scientist relies heavily on his or her ability to recognize patterns. Patterns in space and time are the keys to many of the great discoveries about how Earth works. Most of these patterns are presented through maps, which are among scientists' most important tools.

This course, as its name indicated, is focused on computer applications on a series of investigations about the Earth. The course will be taught in a computer lab with GIS (geographic information systems) and Google Earth software. Students will work on hand-on assignments to analyze recent scientific data and maps on computers and identify patterns in the data/maps that are difficult to discover through visual examination alone. This course may be used as the prerequisite of GEOG4000 Geographic Information System, a comprehensive GIS class.

#### COURSE OBJECTIVES

Provide a series of practices designed to help students develop ability to recognize and interpret nature's fundamental patterns by exploring recent scientific data using a computer and geographic information system (GIS) software.

#### COURSE RESOURCES

Required Lab-books:

Exploring the Dynamic Earth: GIS investigations for the Earth Sciences, ArcGIS® Edition by Hall et al. 2007, Thomson

Exploring Tropical Cyclones: GIS investigations for the Earth Sciences, ArcGIS® Edition by Hall et al. 2007, Thomson

Required Equipment:

Fitchburg State University computer network and email accounts

#### COMPUTER LITERACY REQUIREMENT

Students do not need prior experience using ArcGIS software. However, basic computer skills, as those listed below, are required.

- Navigating the file system to find, copy, paste, save folders, applications, and files;
- Launching applications, opening and saving files;
- Using tools, buttons, menus, and dialog boxes.

#### COURSE WEB PAGE

<https://blackboard.fitchburgstate.edu> You would need your university network user name and password to log in. When log in, click on "GEOG 2400" to access the page for our class. Syllabus and other materials will be posted on the course web page. Please note that the web page should be considered a helpful communication and learning tool *but not a SUBSTITUTE for attending class.*

#### LAB ASSIGNMENTS

A unit of exercises from the lab-books will be assigned approximately every week. Students are encouraged to finish the assignments as much as they can during class sessions when the instructor is available to assist them. Students are also encouraged to work in group and to bring questions to class so other students can benefit from the discussion. Due time of the assignment will be specified by the instructor.

All exercise data organized in subfolders are loaded on the university network drive *L:* under the *Geog2400* folder. Before beginning each exercise, you should navigate to the *L:* drive and copy the entire exercise subfolder (not individual files in the subfolder) onto your personal university network drive *J:* You will do **ALL** exercises

using data in your *J:* drive (**NOT** the *L:* drive). You may need to delete the subfolder after finishing the exercise to leave enough space for later exercises on your *J:* drive. On the exercise due date, the instructor will check your work on the computer and collect the tear-off answer sheets.

## **COURSE COMMUNICATION**

I will be emailing the class from time-to-time with important news and updates. In doing so, I'll be using an automated function within the registrar's web interface to email the entire class. Unfortunately, this function only utilizes email addresses with fitchburgstate.edu. So, to get all the news for this class and for other classes for which the instructors utilize this function, you'll have to **check** your fitchburgstate.edu email account regularly.

## **COURSE POLICIES**

**Cheating will not be tolerated!** Although I encourage students to work together on exercises, your work must be your own. IT MUST BE DONE ENTIRELY BY YOU. Do not plagiarize or copy the work of others. If you are caught cheating, you will receive absolutely no credit for that work, possibly a failing grade for the course, and you will be formally reported to the university for appropriate disciplinary action. The Fitchburg State University's Academic Dishonest Policy is described in the Student Handbook.

**Late assignments will not be accepted** except in case of illness or if the student discusses his/her particular situation with the instructor **at least one day prior to the due date**. A doctor's note or other form of proof may be required. You are responsible for knowing due dates. You are also responsible for all material and announcements presented in class, whether you are in class or not. **Not being in class is not an excuse for late assignments.**

For students with disabilities: reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodation(s) needed for the course. Late notification may mean that requested accommodations might not be available. All accommodations must be approved through Disability Services. Contact Katrina Durham in the Disability Services at 978-665-3562 or [kdurham1@fitchburgstate.edu](mailto:kdurham1@fitchburgstate.edu) for more information.

**Cell phone policy:** please turn off or mute your cell phones during class time.

## **COURSE REQUIREMENTS AND GRADING**

### **Attendance**

Attendance will be recorded in all sessions starting the second week of the semester and will be used as a factor in determining your final grade. Double credits might be given when the class attendance is low.

### **Lab Assignments**

Throughout the semester, you will be required to complete approximately nine sets of lab assignments depending on the pace of the class. Each set of assignment will worth 20 points. Students will not be able to finish the assignments during class time. They are expected to work on the assignments after class every week.

### **Exams**

There will be an exam following each lab book, which results in two exams in total. Each exam will worth 50 points. A review session will be provided before each exam. All exams will be held in the classroom.

### **Term Project**

You are required to conduct a computer application project and present during the term project weeks by the end of the semester. The project will worth 70 points in total. Detailed instructions of the project will be given in class.

### **The Golden Rule of Studying** (Carnegie-unit workload and class times):

Put in three hours of studying for every hour you spend in class. For this course, 3 contact hours in class and 6 hours outside of class (lab assignment, reading, and Blackboard)

### **Grading:**

Grades will be determined by the percentage of the total points you accumulate. We will have approximately 400 points available for you to earn in class (the exact number of total possible points possible will be determined as the semester continues). Points are earned as follows:

## K.10 GEOG 2400 Computer Applications in Geography/Earth Sciences

Attendance:	50	
Lab Assignments: (20 points each)	180	
Exams: (50 points each)	100	<i>Note that 75% of your grade in the class comes from non-exam sources. Don't take these points for granted – they do require work!</i>
Term Project:	70	
TOTAL:	400	

### Grading Policy

The grading policy recommended by the university as following is used for this class.

Percentage	FSU Grade	Percentage	FSU Grade
95-100	4.0	74-76	2.3
92-94	3.7	71-73	2.0
89-91	3.5	69-70	1.7
86-88	3.3	67-68	1.5
83-85	3.0	64-66	1.3
80-82	2.7	60-63	1.0
77-79	2.5	0-59	0.0

### COURSE OUTLINE

The instructor reserves the right to change the chapters during the semester:

Week 1:	Prelim – Course Basics
	<i>Exploring the Dynamic Earth</i> Lab-book
Week 2:	Unit 1: Searching for Evidence
Week 3:	Unit 2: Exploring Plate Tectonics
Week 4:	Unit 3: Earthquake Hazards
Week 5:	Unit 4: Volcano Hazards
Week 6:	Unit 5: Tsunami Hazards
Week 7:	<b>Exam I</b>
	<i>Exploring Tropical Cyclones</i> Lab-book
Week 8:	Unit 1: Recipe for a Cyclone
Week 9:	Unit 2: The Life of a Cyclone
Week 10:	Unit 3: Hurricane Hazards
Week 11:	Unit 4: Hurricanes in the Big Apple
Week 12:	<b>Exam II</b>
Weeks 13-15:	Term Project Weeks
Finals week:	<b>Project Presentation</b>

## K.11 GEOG 2500 Oceanography

### Oceanography

GEOG 2500, Fall 2014, 3cr, CDSC120; TRF 9:30-10:45am

Dr. Elizabeth Gordon; GeoPhysical Sciences

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Welcome to Oceanography! With rapid human population growth and environmental change, demands on our ocean continue to increase. The future health of the ocean requires an educated populace to make informed decisions to effectively manage this resource and protect organisms that inhabit it. The overall goals of the course are for you to 1) understand fundamental scientific principles that describe natural ocean processes, 2) identify the connection between the ocean and your daily life, and 3) recognize the impact of human activities on ocean health. This requires learning the basic principles of marine geology, marine chemistry, physical oceanography, and biological oceanography, which you will do within the context of major marine environmental issues such as overfishing, ocean acidification, and climate change.

By the end of this course, you should be able to:

- Discuss the importance of the ocean within the Earth system
- Explain the theory of plate tectonics, particularly as it relates to ocean science
- Measure and discuss chemical and physical properties of seawater
- Describe physical, chemical, and geological process that affect marine life
- Evaluate human impacts on the marine environment

This course satisfies the **Quantitative Lab Science** requirement for Fitchburg State's Liberal Arts and Sciences program. To meet those requirements, you must demonstrate proficiency in quantification and problem-solving strategies, which include:

- Using appropriate methods to collect data
- Analyzing, interpreting, and graphically presenting data
- Communicating scientific results and their implications

### Course Logistics

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You can be sure to find me in my office (CDSC 327) during **office hours** (M 9:30-11 and F 11-12:30), or you can arrange to meet me at a different time. **Email** ([egordon3@fitchburgstate.edu](mailto:egordon3@fitchburgstate.edu)) is the best way to communicate, but you can also **call** (978.665.3083). A **Blackboard** site ([blackboard.fitchburgstate.edu](http://blackboard.fitchburgstate.edu)) will be maintained – you'll find announcements, course documents, lecture notes, readings, learning resources, and grades posted there.

The **recommended textbook** for this course is: *Essentials of Oceanography*, Trujillo and Thurman, Tenth Edition, 2011. ISBN 978-0-321-66812-7

You will need a **calculator** that can perform basic scientific functions; cell phone calculators are not allowed during exams. You may also need a **laptop** for several of our labs.

### Ensuring your success

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Follow these basic steps in order to achieve course goals:

**Attend** every class period, and arrive on time

**Prepare** for class by completing readings and assigned material on time

**Participate** in class discussion and **engage** in learning activities

**Review** course materials along the way

## Classroom policies

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### *Technology*

In accordance with the University's Policy on Classroom Decorum, **mutual respect and common courtesy** will be the guiding principles in the classroom. To achieve this, everyone will **store cell phones** and other electronic devices for the duration of class.

### *Attendance*

There are several reasons that you should attend class, including:

- It improves your learning.
- Credit for classroom graded work will only be earned if you are there to complete it.
- **You must attend labs in order to pass the course.**

Attendance is therefore expected for lecture, and required for labs. Please communicate with me about absences, whether due to planned or emergency situations.

### *Academic integrity*

All Fitchburg State students are held to the highest standards of [academic integrity](#). Although much of our class will be group-based learning, **credit will only be earned for work that is your own**. Note that academic dishonesty includes cheating, fabrication, plagiarism, and facilitating dishonesty; any student who violates standards for academic integrity by engaging in such activities will be subject to the appropriate disciplinary action.

### *Learning accommodations*

Any student with a need for learning accommodations should make arrangements through [Disability Services](#) (665-3427) early in the semester. Please discuss these arrangements with me as soon as possible to ensure appropriate planning.

### *Sustainable practices*

[Recycling](#) bins, which are located in the classroom, should be used for all appropriate items (including paper, soda cans, plastic bottles, etc). Please discard non-recyclable items (e.g., Styrofoam) in the wastebasket. Consider reducing your use of disposable items overall.

### *Grading*

Grades will be assigned in accordance with Fitchburg State's grading policy:

<i>Points earned</i>	<i>Grade</i>	83 – 85	3.0	69 – 70	1.7
95 – 100	4.0	80 – 82	2.7	67 – 68	1.5
92 – 94	3.7	77 – 79	2.5	64 – 66	1.3
89 – 91	3.5	74 – 76	2.3	60 – 63	1.0
86 – 88	3.3	71 – 73	2.0	0 – 59	0.0

*Grades that fall between intervals will be rounded to the higher number.*

## Course activities

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### **Activities and assignments (25% of course grade)**

We will work through numerous exercises during the semester – some during class and some to be completed on your own. **You must be in attendance to receive credit for activities completed during class**, but your lowest two activity grades will be dropped to allow for illness and emergencies. Take-home assignments must be submitted by the deadline; **late work will not be accepted unless arrangements have been made prior to the due date** (see exception below).

Some assignments include [The Math You Need When You Need It \(TMYN\)](#) tutorials. TMYN is designed to hone the quantitative skills you'll need to succeed in this course. You **must** complete the assigned tutorial and associated quiz by the deadline; **no late work accepted**. Quiz scores will count toward your total assignment grade.

**Labs (25% of course grade)**

Lab exercises, which are typically held on Fridays, will often be completed within the time allotted with follow-up questions completed on your own. Some labs will be type-written, though detailed calculations may be hand-written. You will have one week to complete each lab - late labs will not be accepted unless prior arrangements have been made. Make-up labs are not scheduled, but the lowest lab grade will be dropped. **You must be in attendance and arrive on time to receive credit for the lab.** Given that this course satisfies Fitchburg State's lab science requirement, **if you are tardy or absent to more than two labs, you will not pass the course.**

**Tests (30% of course grade)**

Three tests will be given during the semester, and will include topics from class discussion, assigned readings, and learning exercises. Make-up, essay tests will be allowed for *documented* emergency situations only, unless prior arrangements have been made. The lowest of the three test scores will be dropped when calculating the final course grade.

**Final exam (20% of course grade)**

Everyone must take the cumulative final exam during the time designated by the Registrar.

**Field trip**

A field trip to Plum Island will be scheduled, and will count as one lab.

**Tentative schedule**

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	Topic	Lab
Week 1	Intro to ocean science and marine life	Shark migration
Week 2	Biological oceanography	Overfishing
Week 3	Human impacts on marine life	Dead zones
Week 4	Chemical properties of seawater	Properties of seawater
Week 5	Physical properties of seawater	Ocean acidification
Week 6	Deep ocean circulation	Thermohaline circulation
Week 7	Surface circulation	Surface circulation
Week 8	Waves and tsunamis	Waves
Week 9	Tides and ocean energy	Tides
Week 10	Coasts and coastal processes	Coastal processes
Week 11	Plate tectonics	Seafloor spreading
Week 12	Seafloor features	Bathymetry
Week 13	Marine sediments	Sediment record
Week 14	Marine pollution	Marine protected areas
Week 15	Climate change and the oceans	Evidence of change

## K.12 GEOG 2800 Map Use & Interpretation

### MAP USE (GEOG 2800) 2014 Fall Course-Specific Syllabus

1

## 2014 FALL COURSE-SPECIFIC SYLLABUS

GEOG 2800: Map Use & Interpretation (3 credits)<sup>[1c, 1d]</sup>

Sec. 01 (CRN=13087)

### PROFESSOR CONTACTS<sup>[1a, 1b, 1f, 1g, 1h, 1i]</sup>

Lawrence R. GUTH, Ph.D.

Associate Professor of Geophysical Sciences

Department of Geo/Physical Sciences (GPS)

Office Phone: 978-665-3082

e-mail: lguth@fitchburgstate.edu

Blackboard: <http://blackboard.fitchburgstate.edu>

Office: Condike Science 232

Office Hours, 2014 Fall

• 12:30–13:30 T, W, R;

• or

• by appointment

### CARNEGIE-UNIT WORKLOAD AND CLASS TIMES<sup>[1e]</sup>

$$3 \text{ credit hours} \times \left( \frac{9 \text{ weekly work hours}}{3 \text{ credit hours}} \right) = 9 \text{ weekly work hours}$$

These 9 hours per week shall be apportioned as follows:

- 3 recitation hours in class: 14:00–15:15 T R in Condike Science 127
- 6 hours outside of class (reading, homework, Blackboard collaboration, & study)

### PREREQUISITES

- Students should be proficient in the high school math required for their graduation from high school and their admission to Fitchburg State University. By the Massachusetts Department of Education K–12 Mathematics Curriculum Framework (1997, 2000, 2011), MassCore mandates and the admission standards set by the Massachusetts Department of Higher Education, this should be equivalent to Precalculus (MATH 1300).
- Students should be proficient in the high school science required for their graduation from high school and their admission to Fitchburg State University. By the MassCore mandates and the admission standards set by the Massachusetts Department of Higher Education, this is three years of lab-based science (generally taken as one year each of three different sciences).
- Students should have done well in those courses. By BHE mandate, a minimum high school GPA of 3.0 is required in the 16 college prep courses required for admission. The math and science mandates noted above constitute six of those 16 courses.

Don't worry if your touchy-feely major allows these skills and knowledge to atrophy. We'll dust off the cobwebs as needed.

### REQUIRED RESOURCES<sup>[5]</sup>

#### Textbooks (Required)

Kimerling, A.J., Buckley, A.R., Muehrcke, P.C., and Muehrcke, J.O., 2012, Map use – reading, analysis and interpretation (7<sup>th</sup> edition): Redlands, CA, ESRI Press Academic, 581 p.

ISBN: 9781589482791

– AND –

Monmonier, M., 1996, How to lie with maps (2<sup>nd</sup> edition): Chicago, The University of Chicago Press, 207 p.

ISBN: 9780226534213

#### Equipment (Required)

- a mm scale between 300–500 mm long;
- a half-circle protractor with 0.5° divisions;
- a 0.5 mm mechanical pencil; and
- a scientific calculator or scientific calculator app for your laptop, tablet or smartphone.

**LINK TO GENERAL GUIDELINES** <sup>[13, 14]</sup>

The superscripted numerals in brackets refer to the **14** points in the Syllabi Guidelines mandated by the Academic Policy Committee, Student Affairs Committee and All University Committee. These were approved by President Antonucci and became effective at the start of the **2007** Fall semester.

Point **13**, a “statement regarding the College Academic Dishonest (*sic*) Policy” has already been superseded by the Academic Integrity Policy that was also imposed upon us for the **2007** Fall semester. We always go to the source in science. Read it yourself @:

<http://www.fitchburgstate.edu/campus-life/student-services/office-of-student-conduct-mediation-education/academic-integrity/>

Point **14**, an “informational statement about disability services available to students” is too limited in light of reoccurring school shootings. The university has services in place to help you academically, physically and mentally. You can review all of your options at:

<http://www.fitchburgstate.edu/campus-life/student-services/>

Both points are covered more fully in the General Guidelines, the common supplement to all of my syllabi. The General Guidelines are located on the class Blackboard site and on YouTube @

<https://www.youtube.com/watch?v=XrtULesS4Ps>

**COURSE DESCRIPTION****Map Use** <sup>[2]</sup>

**GEOG 2800 3 cr. 3 hr.**

This course considers the nature and role of maps in communicating aspects of the Earth's natural and human environments. Skills learned include map reading, relating map symbols to real world features, map analysis, extracting information from maps and map interpretation.

**SMT**

2014-2015 FSU Undergraduate Catalog

**COURSE OBJECTIVES** <sup>[3]</sup>

All students receiving a passing grade in this course should acquire a documented ability to:

- communicate effectively in written English;
- communicate effectively in map graphics;
- critically and logically analyze competing ideas, using quantitative analysis whenever appropriate; and
- infer the consequences of competing ideas to test their validity (scientific reasoning).

They also should acquire a documented knowledge and understanding of the

- scientific issues;
- social issues; and
- ethical issues

related to the use and abuse of maps to communicate information.

In addition, all students receiving a passing grade in this course should acquire a documented knowledge of:

- map scales and projections [**Ch. 2–3**];
- map reference frames [**Ch. 1, 4, 5**];
- map data: their sources & accuracy [**Ch. 9–10**];
- thematic map symbols and methods of display [**Ch. 6–8**];
- map analysis [**Ch. 11–16**]; and
- map abuse [Monmonier, 1996].

A more detailed outline of topics is in the provided supplement to this syllabus taken from the Departmental Assessment Plan.

**COURSE REQUIREMENTS** <sup>[6]</sup>  
**FOR ASSESSMENT**

rubrics are to assessment as promises are to politicians. They sound good, but are totally meaningless. First, consider the original definition that a rubric is the initial letter of a chapter or section in an illuminated manuscript that was commonly hand-colored in red (hence the Latin root). This definition is so ingrained that MS-Word keeps it as a formatting option, calling it a **Drop Cap**. (*Color the initial letter of this paragraph in red to make your own rubric*). Somehow, the EdD's who corrupted education also corrupted this meaning and applied it to qualitative assessment standards. For example, consider the following assessment levels

1. Far Exceeds Expectations
2. Exceeds Expectations
3. Meets Expectations
4. Needs Improvement
5. Does not meet minimal requirements

for a superhero's quality of work

1. Leaps tall buildings in a single bound
2. Leaps tall buildings with a running start
3. Can leap a short building if prodded
4. Bumps into buildings
5. Can't find buildings

In the sciences, we cannot use such stupid criteria, because we expect students to be able to

1. follow the procedures that let them
  2. collect data in a reproducible manner,
  3. that gives the input for calculations,
  4. which they must do correctly
  5. to provide the data reductions needed
- for meaningful interpretations  
and conclusions.



**MAP USE (GEOG 2800) 2014 Fall Course-Specific Syllabus****3**

It is impossible for a student to exceed expectations in the sciences because we expect students to follow the processes needed to get the data that will allow them to critically evaluate competing hypotheses. (I don't have the foggiest idea what the EdD's would want that exceeds this.) Hence, assessment in this class is based around quantitative score cards instead of nebulous, qualitative, subjective "rubrics".

**Attendance Policy [4, 10, 12]**

As stated in the general guidelines, attendance will be used as one factor in determining your final grade. Attendance will be required and recorded in all sessions. An excused absence, obtained by dropping me a voice or email telling me that you can't make it to class that day, is your ticket to turn in the assignment due that day or to take the quiz/exam scheduled that day without penalty. An excused absence, however, does not excuse you from the class work done that day. Now that you can get all class documents from Blackboard and YouTube, it is your responsibility for keeping up with all course activities even though you can't be present in class.

**Class Participation [11]**

Woody Allen once quipped that *"80% of success is showing up."* Being able to nail a performance does you no good if you don't show up to the audition -- but just showing up is not sufficient. Blowing your performance even if you got to the audition on time will not win you the job. Similarly, just attending class does you no good if you spend the class period texting or listening to music. So, I've needed to add a grade component to evaluate if you've left your brain idling while your body attends class or if you've put your brain in gear and engaged.

I tried clickers to evaluate class engagement as soon as FSU adopted a campus-wide hardware standard in the **2011** Fall semester. Unfortunately, because students were responsible for their end of the technology, the many forgotten & dead clickers outweighed any advantages.

The clicker questions I embedded into my classroom presentations have been turned into recitation problems for in-class problem solving based on the posted YouTube videos and correlative Blackboard slides. The resulting classroom content checks (**C3s**) give you a record of the skills that you have mastered during the class.

**BlackBoard Participation [11]**

As indicated in the General Guidelines, a BlackBoard website is available for required asynchronous class discussions, cross town collaboration, and cries for help in the middle of the night. In addition, as the University phases out copy machines and computer printers, many of the documents that used to be provided as handouts will now be distributed by posting PDF files to our Blackboard site. Use of Blackboard requires you to use your FSU email address, so keep your old email address for personal use and check your FSU email account regularly for your school business. The direct URL to our class website is given at the top of page one.

I post the slides from my YouTube videos and/or classroom presentations to Blackboard so you have the discussed solutions templates and a record of the color commentary that augments your textbooks. To make sure everyone has seen these materials, Secret Word Quizzes (**SWQs**) are embedded in the posted slides. These quizzes along with other Blackboard assignments will be another factor used to determine your final grade.

**CLAMs: [11]****Collaborative Learning Activity Modules**

Simple collaborative activities will be assigned throughout the semester for you to practice map use and interpretation. Collaboration is always encouraged as you help each other learn and explore, but everyone will submit individual papers. These will be turned in and graded. As described in the general guidelines, a completed template solution will be posted on Blackboard to guide your quantitative explorations.

As indicated in the general guidelines, Briefing Notes describing the activity will be provided on Blackboard and some recitation time will be devoted to get you started. However, you should expect that some time outside of class will be required to complete the activity. Digging out the old metric ruler and protractor that you had to buy for your high school geometry class will let you complete these activities at home. Even though these are collaborative explorations, everyone should be able to do the work individually by the end of the module and this will be evaluated on quizzes and exams.

When self-grading Excel spreadsheets are provided to give you immediate feedback and clues to common problems, you will be expected to turn in a printout of your completed spreadsheet, either physically or by attaching the file to an email. It saves me time grading, but more importantly tells you if answers are right or wrong

so you can ponder any incorrect responses, review the posted solution template, and then try, try again (usually in collaboration with me or your classmates) BEFORE turning in your printout.

#### Proficiency/Assessment Quizzes (PAQ's) <sup>[11]</sup>

Students receiving a passing grade for the class must receive a passing grade ( $\geq 60\%$ ) on all proficiency/assessment quizzes. As noted in the General Guidelines, you may retake the quizzes up through the last day of class – but only if there is a possibility of improving your score. No retake will use class time. Proficiency quiz topics will be:

- The Units Shall Lead You and calc comp
- map scales
- interpolation of (lat,long) & UTM coordinates
- map directions (using azimuths & bearings)
- topographic analysis & profiles

#### Exams <sup>[7]</sup>

There will be two half-term exams, one near the middle of the semester and one near the end. These will be closed book, closed note exams. However, you may prepare and use during the test one 8.5"x11" cheat sheet – your individual synthesis of the material covered on the half-term.

The exit (final) exam is cumulative. Questions will be variations of those appearing on the first two half-term exams and so no cheat sheet is permitted.

The exit (final) exam is your opportunity to demonstrate mastery of the course material despite the mistakes you expect to make as you learn something new. So, the exit (final) exam also counts as a third half-term exam with both Safety Nets (described in the General Guidelines) active for the half-term portion of the class grade. This allows you to bomb the first or second exam and still recover a good grade for the course.

#### Late Fees and Make-Up Policy <sup>[10]</sup>

Late fees for assignments are described in the General Guidelines. An excused absence is your ticket to turn in assignment at the next class meeting with no penalty. Otherwise, late fees increase with the number of days late. No late work will be accepted if **(1)** it is over one week late or **(2)** after **2014 December 09**, the last day the class meets before finals.

An excused absence is your ticket to make up quizzes and exams. However, the format of the quiz or exam could change. Traditionally in the Geophysical Sciences, make-up exams are essay even though the original exam was true/false, multiple guess, and fill in the blank and so most students avoid the make up exams if at all possible.

**MAP USE (GEOG 2800) 2014 Fall Course-Specific Syllabus****5****2014F CONTENT CHRONOLOGY <sup>[8]</sup>**

Dates	Topics	Activity / Exam coverage
Sept 04	Syllabus	Syllabus
Sept 09 & 11	Math review	Units
Sept 16	Into	
Sept 18 & 23	Geodesy	Latitude of Fitchburg
Sept 25 & 30 Oct 02	Map Scale	Map Scale
Oct 07 & 09	Projections	Cylindrical gradicules
Oct 14, 16, 21	Directions	Azimuth & Bearing in MN↔GN↔★
Oct 23 & 28	Apply It!	Make a map
<b>Oct 30</b>	<b>Half-Term 01</b>	<b>everything since day 1</b>
No 04	Land Partition	US Public Land Survey
No 06	Relief in 2D	Contouring, Profiles
No 11	Veteran's Day	NO CLASS
Nov 13 & 18	Relief in 2D	Contouring, Profiles
Nov 20	Analytical Geometry	Distance, Slopes, Areas
Nov 25	Thematic maps	Proportional symbol size
Nov 27	<b>HOLIDAY</b>	<b>no class</b>
Dec 02	Image Maps	Remote Sensing
Dec 04	<b>Half-Term 02</b>	<b>all since Half-Term 01</b>
Dec 09	Return	Half-Term 02
<b>Dec 16 @ 12:20</b>	<b>EXIT EXAM</b>	<b>Variations on Half-Terms 01 &amp; 02</b>

The dates of the exams are fixed. There may be some adjustments made to the topics covered in the exam depending on our progress. To save space, proficiency quizzes are not listed.

**EXIT EXAM <sup>[7]</sup>**

From the **2014** Fall Final Exam Schedule distributed by the Registrar, classes that meet TR with a start time between **14:00 and 15:25** fall in Exam Block **O**. The exit exam is therefore scheduled for **12:20–14:20** on Tuesday, **2014 December 16**.

**WEIGHTING FACTORS OF COMPONENTS USED****TO EVALUATE THE FINAL GRADE <sup>[9]</sup>**

The following weights will be used to evaluate your final grade. The general guidelines show how this is done and relate the final point total out of 100 to the numerical grade reported to the registrar.

Activity	Weighting Factor
Σ Half-Term exams (best 2 of 3) <sup>†</sup>	18% (09% each)
Σ proficiency quizzes (best 4 of 5)	12% (03% each)*
1 Exit Exam	20%
Σ CLAMs	25%
Σ BlackBoard	10%
Σ Class Content Checks	10%
Σ attendance	05%

<sup>†</sup> includes the Exit Exam with the parabolic grade map applied as a 3<sup>rd</sup> Half-Term

\* As stated in the general guidelines, you must receive a passing grade on all proficiency quizzes to pass the class.

## K.13 GEOG 3110 Climatology

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### Climatology

GEOG 3110 (CRN 31311), 3cr., Spring 2013

TR 11-12:15, McKay C284

Dr. Elizabeth Gordon, GeoPhysical Sciences

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Welcome to Climatology! This course is designed to explore climate science from an Earth system perspective, recognizing the interactions and feedbacks among the atmosphere, geosphere, hydrosphere, biosphere, and anthroposphere. The course includes an overview of the climate system, regional climate classification schemes, and natural, long-term climate changes. Future climate change scenarios, including the role of human activity in altering Earth's atmosphere, will also be discussed.

Earth System Science (GEOG1000) or Meteorology (GEOG2200) serve as prerequisites for this course. You will build on your knowledge of atmospheric processes to develop an understanding for the changes climate has undergone in the past, how it is currently changing, and how it is predicted to change in the near future. We will analyze and interpret paleoclimate and real-time data to quantitatively examine climate science, so you be using and honing your mathematics skills relevant to the climate system. The overall goal of the course is for you to be a “climate-literate” person, which has defined by the *Climate Literacy Network* as someone who:

- understands the essential principles of Earth's climate system,
- knows how to assess scientifically credible information about climate,
- communicates about climate and climate change in a meaningful way, and
- is able to make informed and responsible decisions with regard to actions that may affect climate.

To achieve that goal, you should walk away from this course being able to:

- Describe interactions among the atmosphere, hydrosphere, geosphere, and biosphere that shape climate
- Analyze and interpret climographs to classify regional climate
- Describe methods and analyze data used for paleoclimate research
- Explain processes that influence changes in climate on various timescales
- Examine the effect of climate on human activities, and vice versa
- Understand and use models for predicting future climate

### Ensuring your success – a simple formula!

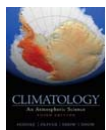
Follow these basic steps, which will lead you to content mastery.

- Attend** class every day
- Prepare** for class by reading assigned material ahead of time
- Participate** in class discussion
- Engage** in learning activities and submit assignments on time
- Review** course materials along the way

### Course Information

My **office** (McKay C265) is located across the hall from our classroom. You can be certain to find me there during **office hours** (W10-11:30, Th2-3:30), or you can arrange to meet me at a different time. **Email** ([egordon3@fitchburgstate.edu](mailto:egordon3@fitchburgstate.edu)) is the best way to communicate, but you can also **call** (978.665.3083) if necessary. A **Blackboard** site ([blackboard.fitchburgstate.edu](http://blackboard.fitchburgstate.edu)) will also be maintained – you'll find announcements, the syllabus, lecture notes, readings, assignments, resources, and grades posted there.

We will use the following **textbook** for the course, which can be purchased or rented from the Fitchburg State Bookstore.



*Climatology, An Atmospheric Science*, 3<sup>rd</sup> Edition (ISBN: 978-0-321-60205-3; Hildore, Oliver, Snow, and Snow) is required, and will guide us through most of the semester. Supplemental readings will be assigned as well, and should be completed prior to discussion in class.

## K.13 GEOG 3110 Climatology

### Classroom policies

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#### *Technology*

In accordance with the University's Policy on Classroom Decorum, **mutual respect and common courtesy** will be the guiding principles in the classroom. In addition, we agreed on the first day of class that cellphones will be set to vibrate, and that laptops and mobile devices will be used for class purposes only. We also agreed that violation of this policy will affect the participation grade – see below.

#### *Attendance*

We agreed that students will communicate about absences ahead of time when possible. We agreed that two unexcused absences are allowed during the semester; beyond that, the attendance grade (below) will be affected. An absence is considered excused if it is accompanied by documentation of an emergency or illness. Anyone who completes the semester with no unexcused absences earns additional points on the attendance grade.

#### *Academic integrity*

All Fitchburg State students are held to the highest standards of academic integrity (please review the Code of Conduct for details: <http://www.fitchburgstate.edu/judicial>). Although much of our class will be group-based learning, **credit will only be earned for work that is your own**. Note that academic dishonesty includes cheating, fabrication, plagiarism, and facilitating dishonesty; any student who violates standards for academic integrity by engaging in such activities will be subject to the appropriate disciplinary action.

#### *Learning accommodations*

Any student with a need for learning accommodations should make arrangements through Disability Services (665-3427) early in the semester. Please discuss these arrangements with me as soon as possible to ensure appropriate planning.

#### *Sustainable practices*

Recycling bins, which are located in the classroom, should be used for all appropriate items (including paper, soda cans, plastic bottles, etc). Please discard non-recyclable items (e.g., Styrofoam) in the wastebasket. Consider reducing your use of non-reusable items overall.

#### *Grading*

Grades will be assigned in accordance with Fitchburg State's grading policy (which can be found in the Course Catalog: <http://www.fitchburgstate.edu/catalog/links.cfm>).

Points earned	Grade				
95 – 100	4.0	80 – 82	2.7	67 – 68	1.5
92 – 94	3.7	77 – 79	2.5	64 – 66	1.3
89 – 91	3.5	74 – 76	2.3	60 – 63	1.0
86 – 88	3.3	71 – 73	2.0	0 – 59	0.0
83 – 85	3.0	69 – 70	1.7		

Grades that fall between intervals will be rounded to the higher number.

## Quantifying your academic engagement

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The overall grade you earn for the course will reflect your mastery of climate science concepts and quantitative skills. You'll provide me with evidence of your achievement via:

### **Attendance and participation (15%)**

We agreed that attendance (see above policy) will constitute 5% of the grade and participation as 10%. This grade will be determined by frequency of attendance, preparedness for class (e.g., completing readings and assignments on time), and participating during classroom and online discussions. A full 15% will be earned for coming to class and engaging in meaningful discussion based on assigned readings. Excessive unexcused absences, incomplete or late assignments, lack of participation, and use of electronic devices (e.g., cell phones, laptops) for purposes other than course work will result in 0%. Students who are hesitant to speak out during class time will have an opportunity to participate in the online discussions instead; students who do both will earn additional participation points.

### **Problem solving (35%)**

We will work through numerous problem-solving activities during the semester. You will only be able to make up in-class problem solving activities due to an excused absence. Take-home assignments must be submitted by the assignment deadline for full credit; grades will be reduced by 20% for each work day beyond the deadline.

### **Tests (30%)**

We agreed that three tests will be given during the semester, and will include topics from class discussion, assigned readings, and problem solving exercises. The tests will not be cumulative to the degree that it is possible to segment content, with the caveat that atmospheric processes don't adhere to topical boundaries. The lowest test grade will be dropped. Make-up, essay tests will be allowed for *documented* emergency situations only, unless prior arrangements have been made.

### **Final Climate Project (20%)**

A semester-long project will allow you to focus on a region or climate change topic of your choosing. The project will include a written report and a short presentation, to be delivered during the final exam period. More details on this project will be provided separately.

## Tentative schedule

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Week of	Topic	Reading
Jan 15	Review of basic concepts; Energy in the Climate System	Ch1-2
Jan 22	Earth's energy and Temperature trends	Ch2-3
Jan 29	Atmospheric moisture and circulation	Ch4-5
Feb 5	Atmosphere-Ocean interactions	Ch6
Feb 12	Regional Climates; Tropical climates	Ch15-16
Feb 19	Midlatitude and polar climates	Ch17-18
Feb 26	Natural causes of climate change	Ch9
Mar 5	Natural causes of climate change continued	Supplemental
Mar 19	Reconstruction of past climate	Ch10
Mar 26	Greenhouse gases and global warming	Ch11
Apr 2	Global warming	Ch12-13
Apr 9	Ozone depletion and acid rain	Ch14
Apr 16	Future climate	IPCC
Apr 23	Climate models	Supplemental
Apr 30	Global warming impacts	IPCC
May 7	Project discussion	

## K.14 GEOG 3120 Computer Cartography

### GEOG 3120 – COMPUTER CARTOGRAPHY (3 cr. 3 hr.)

T/Th 12:30 – 1:45, McKay C165 – Spring 2013

#### PROFESSOR CONTACTS

Dr. Jane Zhang

Phone: 978-665-3496

Department of Geophysical Sciences

Email: [xzhang2@fitchburgstate.edu](mailto:xzhang2@fitchburgstate.edu)

Office Hours: T and R 11:00am – 12:30pm in McKay C252, or by appointment

#### COURSE OBJECTIVES

The objective of this course is to introduce students to the study and design of thematic maps, primarily through the application of a computer mapping system known as GIS (Geographic information system). Thematic maps show the spatial distribution of a particular geographic phenomenon. Important aspects of mapmaking and effective cartographic techniques will be examined in both lecture and lab during the semester.

The class will use the widely-used professional GIS software program: ArcGIS® 10. The software has been installed on computers in the McKay computer labs in room C165 and also on computers in the instruction lab in the library. There are no prerequisites for this course. However, computer literacy is strongly recommended. If you do not have a working knowledge of personal computing you can anticipate spending much more time completing lab assignments.

#### COURSE RESOURCES

Textbook:

*Cartography – Thematic Map Design*, 6<sup>th</sup> edition, by Dent, Torguson, and Hodler, McGraw Hill

Required Equipment:

Fitchburg State University computer network, blackboard, and email accounts

#### CLASS MEETINGS:

Class periods will be devoted into two parts: lecture by the instructor, and hand-on exercise by the students. The exercises require you fully understand the concepts and methodology within the framework of cartography and GIS.

#### COURSE WEB PAGE

<http://blackboard.fitchburgstate.edu> You would need your university network user name and password to log in. When log in, click on “GEOG 3120” to access the page for our class. Syllabus, lectures slides, exercises, and class announcements will be posted on the course web page. During the class, the “missing” part in your lecture slides will be given and you should complete the lecture slides on your computer.

Please note that the web page should be considered a helpful communication and learning tool **but not a SUBSTITUTE for attending class.**

#### LAB ASSIGNMENTS

A lab assignment will be assigned every week. You are encouraged to do as much as possible during class sessions when the instructor is available to assist you. You **WILL** need to spend significant amount of time after class to finish the assignments. You are also encouraged to work in group and to bring your questions to class so other students can benefit from the discussion. Due time of the assignments will be a week after the lab assigned unless specified by the instructor. The instructor will collect a printed copy of your answer sheet on the due date. Late assignments will not be accepted. Please plan ahead.

All the lab assignment data can be found in the university network drive **L:\ComputerCartography**. However, the L: drive is a shared space and does not allow you save any work to it. Thus, before beginning each exercise, you should navigate to **L:\ComputerCartography**, copy and then unzip the exercises data file onto your personal university network drive **J:** You will do **ALL** the work for the class in your **J: drive** (NOT the L: drive). You'll have to save your work properly in **J:** drive to ensure they can be correctly opened on any computers in the McKay lab.

#### COURSE COMMUNICATION

I will be emailing the class from time-to-time with important news and updates. In doing so, I'll be using an automated function within the registrar's web interface to email the entire class. Unfortunately, this function only utilizes email addresses with fitchburgstate.edu. So, to get all the news for this class and for other classes for which the

instructors utilizes this function, you'll have to **check** your fitchburgstate.edu email account regularly.

## COURSE POLICIES

**Cheating will not be tolerated!** Although I encourage students to work together on assignments, your work must be your own. IT MUST BE DONE ENTIRELY BY YOU. Do not plagiarize or copy the work of others. If you are caught cheating, you will receive absolutely no credit for that work, possibly a failing grade for the course, and you will be formally reported to the university for appropriate disciplinary action. The Fitchburg State University's Academic Dishonest Policy is described in the Student Handbook.

**Late assignments will not be accepted.** Make-up exams will not be allowed except in case of illness or if the student discusses his/her particular situation with the instructor **at least one day prior to the exam date**. A doctor's note or other form of proof may be required. Make-up exams may be different from those given to the other students, and may consist totally of short answer and/or essay questions. You are responsible for knowing due dates and exam dates. You are also responsible for all material and announcements presented in the lecture, whether you are in class or not.

For students with disabilities: reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodation(s) needed for the course. Late notification may mean that requested accommodations might not be available. All accommodations must be approved through Disability Services. Contact Katrina Durham in the Disability Services at 978-665-4020 or [kdurham1@fitchburgstate.edu](mailto:kdurham1@fitchburgstate.edu) for more information.

**Cell phone policy:** please turn off your cell phones during class time.

## COURSE REQUIREMENTS AND GRADING

### Attendance

Attendance will be recorded in all sessions and will be used as one factor in determining your final grade.

### Lab Assignments

Throughout the semester, you will be required to complete ten (10) lab assignments. Each assignment will worth 20 points in average.

### Class Project

You are required to conduct a mapping project and present during the term project week by the end of the semester. Detailed instructions of the project will be forthcoming.

### Exams

There will be three exams (two midterms and one final) in this course. Each exam will cover approximately one third of the course material. There will be a short review before each exam. All exams will be held in the classroom.

### The Golden Rule of Studying (Carnegie-unit workload and class times):

Put in three hours of studying for every hour you spend in class. For this course, 3 contact hours in class and 6 hours outside of class.

### Grading

Grades will be determined by the percentage of the total points you accumulate. We will have approximately 450 points available for you to earn in class (the exact number of total possible points possible will be determined as the semester continues). Points are earned as follows:

Attendance:	50
Exercises:	200
Project:	50
Exams (50 pts each):	150
TOTAL:	450

*Note that two thirds of your grade in our class comes from non-exam sources. Don't take these points for granted – they do require work!*



## K.14 GEOG 3120 Computer Cartography

### Grading Policy

The grading policy recommended by the university as following is used for this class.

Percentage	FSU Grade	Percentage	FSU Grade
95-100	4.0	74-76	2.3
92-94	3.7	71-73	2.0
89-91	3.5	69-70	1.7
86-88	3.3	67-68	1.5
83-85	3.0	64-66	1.3
80-82	2.7	60-63	1.0
77-79	2.5	0-59	0.0

### COURSE OUTLINE

The instructor reserves the right to change the chapters during the semester:

Week 1:	Prelim	– Course Basics
Week 2:	Chapter 1 Exercise 1	– Introduction to Thematic Mapping – Getting Started: Making Your First Map
Week 3:	Chapter 2 Exercise 2	– Basic Geodesy, Coordinate Systems, and Scale – Creating a Base Map
Week 4:	Chapter 3 Exercise 3	– Map Projections – Map Projections
Week 5:	Chapter 4 Exercise 4	– Nature of Geographic Data and Selection of Thematic Map Symbols – Data Entry
Week 6:	<b>Midterm Exam I</b>	
Week 7:	Chapter 6 Exercise 5	– The Choropleth Map – Thematic Mapping: The Choropleth Map
Week 8:	Chapter 7 Exercise 6	– The Dot Density Map – Thematic Mapping: The Dot Density Map
Week 9:	Chapter 8 Exercise 7	– The Proportional Symbol Map – Thematic Mapping: Graduated Symbol Mapping
Week 10:	Exercise 8	– Thematic Mapping: Proportional Symbol Mapping
Week 11:	<b>Midterm Exam II</b>	
Week 12:	Chapter 11 Exercise 9	– The Design of Flow Maps – Thematic Mapping: The Flow Map
Week 13:	Chapter 13 Exercise 10	– Making Map Readable: The Intelligent Use Of Type – Map Labeling and Typography
Finals 14:	<b>Final Exam</b>	
Week 15:	Project Week	– Term Project
Week 16:	Project Week	– Term Project Presentation

## K.15 GEOG 3400 Population Geography

### GEOG 3400 – Population Geography (3 cr. 3 hr.) – FALL 2010

T Th 11:00-12:15pm

Classroom Location: McKay C282

#### PROFESSOR CONTACTS

Dr. Jane Zhang

Phone: 978-665-3496

Department of Geophysical Sciences

Email: [xzhang2@fsc.edu](mailto:xzhang2@fsc.edu)

Office Hours: T and Th 9:30 – 11:00 in McKay C252, or by appointment

#### COURSE DESCRIPTION

The class focuses on understanding the history, effects, and geographic variation of population change. The class will examine theories that explain the causes of demographic change, variation, and how population is related to environmental change. The class focuses most heavily on understanding population and environment/development, and migration.

#### COURSE OBJECTIVES

- 1) Develop an understanding of size and geographical distribution of the human population over time.
- 2) Learn the various theories of population growth and the limitations of these theories.
- 3) Understand the contributions of fertility, mortality, and migration to population change at the local, national, and global levels.
- 4) Identify and understand the demographic trends shaping the world's future.

#### COURSE RESOURCES

Textbook:

*Population Geography: Problems, Concepts, and Prospects* by Peters and Larkin, 9<sup>th</sup> Edition, 2008

Required Equipment:

Fitchburg State College computer network/blackboard/email account

Calculator, thumb drive (or other data storage) to save any work you might do on a computer

#### COURSE WEB PAGE

<http://blackboard.fsc.edu/webapps/login> The page is password protected so you will need to log on. If you are enrolled for other courses which use this utility, then when you log in you will see a list of all courses for which you are registered that are making use of this utility for the class web page. Click on "GEOG 3400" to access the page for our class. The web page for our course should be considered a helpful communication and learning tool for our class *but not a SUBSTITUTE for attending class.*

Syllabus, exercises, and a skeleton version of lectures notes will be posted on the course webpage. You are suggested to copy the posted lectures notes on your own notebook before class. You should also print the exercises and bring them to class. During the lectures, the "missing" part in the lecture notes will be given for you to complete them. You will work on many of the exercises during class time. Detailed demonstration of how to solve questions will be given in class. All exercises are due during class sessions. Make sure you bring them to class.

#### COURSE COMMUNICATION

I will be emailing the class from time-to-time with important news and updates. In doing so, I'll be using an automated function within the registrar's web interface to email the entire class. Unfortunately, this function only utilizes email addresses with fsc.edu. So, to get all the news for this class and for other classes for which the instructors utilizes this function, you'll have to **check** your fsc.edu email account regularly.

#### COURSE POLICIES

**Cheating will not be tolerated!** Although I encourage students to work together on assignments, your work must be your own. IT MUST BE WRITTEN ENTIRELY BY YOU. Do not plagiarize or copy the work of others. If you are caught cheating, you will receive absolutely no credit for that work, possibly a failing grade for the course, and you will be formally reported to the college for appropriate disciplinary action. The Fitchburg State College's policy on cheating is described in the Student Handbook.

Exercises are due during class sessions specified by the instructor. Late exercises will **NOT** be accepted unless a doctor's note or other forms of signed proof is presented. **Not being in class is not an excuse for late assignments.** Make-up exams will not be allowed except in case of illness or if the student discusses his/her particular situation with the

## K.15 GEOG 3400 Population Geography

instructor **at least one day prior to the exam date**. A doctor's note or other forms of signed proof may be required. Make-up exams may be different from those given to other students, and may consist totally of short answer and/or essay questions. You are responsible for knowing due dates and exam dates. You are also responsible for all material and announcements presented in the lecture, whether you are in class or not.

For students with disabilities: reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodation(s) needed for the course. Late notification may mean that requested accommodations might not be available. All accommodations must be approved through Disability Services. Contact Katrina Durham in the Disability Services at 978-665-4020 or [kdurham1@fsc.edu](mailto:kdurham1@fsc.edu) for more information.

**Cell phone policy:** please turn off your cell phones during class time.

### COURSE REQUIREMENTS AND GRADING

#### Attendance

Attendance will not be recorded in class. However, there are at least three reasons you'd need to attend class: 1) all exercises are due during class sessions and they worth over 50% of total points; 2) some exercises will be peer graded with instructions during class time; 3) many exercise questions (with modifications) will be used in the tests. Thus, attendance will be critical to succeed in the class.

#### Exercises

Throughout the semester, you will be required to complete one (1) exercise for each chapter and nine (9) exercises in total. The exercise will worth 15-25 points. All exercises will be posted on the course website. You are expected to download and print the exercises, bring them to class and finish them independently. Some exercises will be peer graded with instructions during class time and then collected; the others will be collected and graded by the instructor. All exercises will be returned. Late exercises or exercises not done by the student him/herself will not be accepted.

#### Class Project

You are required to conduct a population project and present during the Population Week by the end of the semester. Detailed instructions of the project will be given in class.

#### Extra Credits

Announcement(s) to be made in class. Participation in class discussion may be considered for extra credits.

#### Exams

There will be two mid-term exams and one final exam in this course. The mid-term exams will cover approximately one third of the course material. The final exam will be comprehensive and, therefore, will include questions from the entire semester. However, the final exam will emphasize the last third of the course. There will be a review session before each exam. All exams will be held in the classroom. The final exam will take place during the finals week.

#### Grading:

Grades will be determined by the percentage of the total points you accumulate. We will have approximately 450 points available for you to earn in class (the exact number of total possible points possible will be determined as the semester continues). Points are earned as follows:

Exercises:	200	<i>Note that above <b>50%</b> of your grade in our class comes from non-exam sources. Don't take these points for granted – they do require work!</i>
Term Project	50	
Mid-term Exams (50 pts each):	100	
Final Exam:	100	
TOTAL:	450	

#### The Golden Rule of Studying (Carnegie-unit workload and class times):

Put in three hours of studying for every hour you spend in class. For this course, 3 contact hours in class and 6 hours outside of class (reading, homework, and study)

**Grading Policy**

The grading policy recommended by the college as following is used for this class.

Percentage	FSC Grade	Percentage	FSC Grade
95-100	4.0	74-76	2.3
92-94	3.7	71-73	2.0
89-91	3.5	69-70	1.7
86-88	3.3	67-68	1.5
83-85	3.0	64-66	1.3
80-82	2.7	60-63	1.0
77-79	2.5	0-59	0.0

**COURSE OUTLINE**

The instructor reserves the right to change the chapters and the timelines during the semester:

- Week 1: Prelim - Course Introduction
- Week 2-3: Chapter 1 – Population Growth and Change (Ex1)
- Week 3-4: Chapter 2 – Population Data (Ex2)
- Week 4-5: Chapter 3 – Population Distribution and Composition (Ex3)
- Week 5: **MID-TERM EXAM I in week 5 on Chapters 1, 2, and 3**
- Week 6-7: Chapter 4 – Theories of Population Change (Ex4)
- Week 8-9: Chapter 5 – Mortality Patterns and Trends (Ex5)
- Week 9-10: Chapter 6 – Fertility Patterns and Trends (Ex6)
- Week 10: **MID-TERM EXAM II in week 10 on Chapters 4, 5, and 6**
- Week 11-12: Chapter 8 – Migration and Mobility (Ex7)
- Week 12-13: Chapter 9 – Population and the Environment (Ex8)
- Week 13-14: Chapter 10 – Population and Food Supply (Ex9)
- Week 15: Population Project Week
- FINAL EXAM in the finals week is comprehensive**

## K.16 GEOG 4000 Geographic Information Systems

### GEOG 4000 – GEOGRAPHIC INFORMATION SYSTEMS (3 cr. 3 hr.)

T/Th 9:30 – 10:45am, McKay C165 – Spring 2013

#### PROFESSOR CONTACTS

Dr. Jane Zhang

Phone: 978-665-3496

Department of Geophysical Sciences

Email: [xzhang2@fitchburgstate.edu](mailto:xzhang2@fitchburgstate.edu)

Office Hours: T and R 11:00am – 12:30pm in McKay C252, or by appointment

#### COURSE OBJECTIVES

The objective of this course is to introduce students to the theory and practice of GIS (Geographic Information System). GIS is a map-based computer decision support system that allows for the investigation of geographic data relationships. People that are trained in GIS are in high demand today, both in government and private industry. GIS applications use both spatial information (maps) and databases to perform analytical studies. This course covers underlying geographic concepts (world coordinate system and projections, vector map topology, tiled and layered maps, standard computer map file formats, urban applications, etc).

The class will use the latest version of the prevailing GIS software: ArcGIS® 10. The software has been installed on computers in the McKay computer lab in room C165, and also on computers in the instruction lab in the library. This is an introductory class – as a result, I will assume that all participants have no prior knowledge of GIS principles and the class will be taught accordingly. However, computer literacy is required and an introductory database class are recommended. If you do not have a working knowledge of personal computing you can anticipate spending much more time completing lab assignments.

#### COURSE RESOURCES

Required Textbook:

*GIS Tutorial 1 – Basic Workbook for ArcGIS 10*, 4<sup>th</sup> edition, by Gorr and Kurland, ESRI Press,

Required Equipment:

Fitchburg State University computer network/blackboard/email account

#### CLASS MEETINGS:

T/Th 9:30 – 10:45am in McKay C165. Class periods will be devoted into two parts: lecture by the instructor, and hand-on exercise by the students. The exercises require you fully understand the concepts and methodology within the framework of the GIS.

#### COURSE WEB PAGE

<http://blackboard.fitchburgstate.edu> You would need your university network user name and password to log in. When log in, click on “GEOG 4000” to access the page for our class. Syllabus, class announcements, and a skeletal version of lectures notes will be posted on the course web page. You are suggested to copy the posted lectures notes on your own notebook before class. During the lectures, the “missing” part in the lecture notes will be given for you to complete them. You would need the tutorial book for doing the tutorials, make sure you bring it to each class session.

Please note that the web page should be considered a helpful communication and learning tool **but not a SUBSTITUTE for attending class.**

#### LAB ASSIGNMENTS

A lab assignment will be assigned every week. You are encouraged to do as much as possible during class sessions when the instructor is available to assist you. You **WILL** need to spend significant amount of time after class to finish the assignments. You are also encouraged to work in group and to bring your questions to class so other students can benefit from the discussion. Due time of the assignments will be a week after the lab assigned unless specified by the instructor. **Late assignments will not be accepted.** Please plan ahead.

All the lab exercises and assignment data can be found in the *GIS* folder under the university network drive *L:* (containing the same data as in the DVD in the textbook). Since the *L:* drive is a shared space and does not allow you save any work, you should copy the four subfolders under the *L:/GIS* folder (Data, Maps, MyAssignments, MyExercises) to your *J:* drive, your personal university network drive, where only you yourself have access. All your work should be saved in your **J: drive**. The instructor will check your completed exercises and assignments on the *J: drive* and collect a printed copy of your assignments on due dates. When the McKay labs are closed, you can work in

the library instruction lab. You'll have to save your work properly in your J: drive to ensure maps can be correctly opened by computers in the McKay lab. You can also install the 180-day trial GIS software (contained in the textbook) to your personal computer and work at home.

### **COURSE COMMUNICATION**

I will be emailing the class from time-to-time with important news and updates. In doing so, I'll be using an automated function within the registrar's web interface to email the entire class. Unfortunately, this function only utilizes email addresses with fitchburgstate.edu. So, to get all the news for this class and for other classes for which the instructors utilize this function, you'll have to **check** your fitchburgstate.edu email account regularly.

When you email me, make sure to indicate you are in the Geog4000 class.

### **COURSE POLICIES**

**Cheating will not be tolerated!** Although I encourage students to work together on assignments, your work must be your own. IT MUST BE DONE ENTIRELY BY YOU. Do not plagiarize or copy the work of others. If you are caught cheating, you will receive absolutely no credit for that work, possibly a failing grade for the course, and you will be formally reported to the university for appropriate disciplinary action. The Fitchburg State University's Academic Dishonest Policy is described in the Student Handbook.

**Late assignments will not be accepted.** Make-up exams will not be allowed except in case of illness or if the student discusses his/her particular situation with the instructor **at least one day prior to the exam date**. A doctor's note or other forms of signed proof may be required. Make-up exams may be different from those given to other students, and may consist totally of short answer and/or essay questions. You are responsible for knowing due dates and exam dates. **Not being in class is not an excuse for late assignments or missing exams.** You are also responsible for all material and announcements presented in the lecture, whether you are in class or not.

For students with disabilities: reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodation(s) needed for the course. Late notification may mean that requested accommodations might not be available. All accommodations must be approved through Disability Services. Contact Katrina Durham in the Disability Services at 978-665-3562 or [kdurham1@fitchburgstate.edu](mailto:kdurham1@fitchburgstate.edu) for more information.

**Cell phone policy:** please turn off your cell phones during class time.

### **COURSE REQUIREMENTS AND GRADING**

#### **Attendance**

Attendance will be recorded in all sessions and will be used as one factor in determining your final grade.

#### **Lab Assignments**

Throughout the semester, you will be required to complete approximately ten (10+/-) lab assignments depending on the pace of the class. Assignment will worth 10-20 points in average.

#### **Class Project**

You are required to conduct a GIS project and present during the GIS project week by the end of the semester. Detailed instructions of the project will be given in class.

#### **Exams**

There will be three exams in this course. Each exam will cover approximately one third of the course material. There will be a short review before each exam. All exams will be held in the classroom.

#### **The Golden Rule of Studying** (Carnegie-unit workload and class times):

Put in three hours of studying for every hour you spend in class. For this course, 3 contact hours in class and 6 hours outside of class.

#### **Grading**

Grades will be determined by the percentage of the total points you accumulate. We will have approximately 440 points available for you to earn in class (the exact number of total possible points possible will be determined as the semester continues). Points are earned as follows:

## K.16 GEOG 4000 Geographic Information Systems

Attendance:	50
Exercises:	190
Project:	50
Exams (50 pts each):	150
TOTAL:	440

*Note that two thirds of your grade in the class comes from non-exam sources. Don't take these points for granted – they do require work!*

### Grading Policy

The grading policy recommended by the university as following is used for this class.

Percentage	FSU Grade	Percentage	FSU Grade
95-100	4.0	74-76	2.3
92-94	3.7	71-73	2.0
89-91	3.5	69-70	1.7
86-88	3.3	67-68	1.5
83-85	3.0	64-66	1.3
80-82	2.7	60-63	1.0
77-79	2.5	0-59	0.0

### COURSE OUTLINE

The instructor reserves the right to change the chapters during the semester:

Week 1:	Prelim	– Course Basics
Week 2:	Tutorial 1	– Introduction
Week 3:	Tutorial 2	– Map Design
Week 4:	Tutorial 3	– GIS Output
Week 5:	Tutorial 4	– File Geodatabases
Week 6:	<b>Exam I</b>	
Week 7:	Tutorial 5	– Spatial Data
Week 8:	Tutorial 6	– Digitizing
Week 9:	Tutorial 7	– Geocoding
Week 10:	<b>Exam II</b>	
Week 11:	Tutorial 8	– Geoprocessing
Week 12:	Tutorial 9	– Spatial Analysis
Week 13:	Tutorial 10	– ArcGIS 3D Analyst
Week 14:	<b>Exam III</b>	
Week 15:	Project Week	– Term Project Presentation
Finals week:	Project Week	– Term Project Presentation

## K.17 GEOG 4110: Planetary Atmospheres

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### **Planetary Atmospheres (GEOG 4110), 3 credits, Spring 2014**

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McKay C282

Tue/Thur 9:30 - 10:45am

Dr. Reid Parsons (665-3613)

[rparson4@fitchburgstate.edu](mailto:rparson4@fitchburgstate.edu)

Geo/Physical Sciences

Sanders 104N-5

office hrs: Tue/Thur 10:30am-11:30am; Wed 9:30 - 10:30 am

**Prerequisite** for the class is Meteorology (GEOG 2200) or permission of instructor.

**Course Goals:** In this class we will explore the history, evolution & structure of solar system bodies which host substantial atmospheres. By using spacecraft observations and applying physics and mathematic concepts, students will gain an understanding for the planets and how they are investigated.

**Class Materials:** A scientific calculator will be needed for tests and homework assignments. Cell phone use is *not* permitted during class, and cannot, therefore, be used as a calculator. Access to a computer with the ability to plot data/equations (e.g. Excel) for homework purposes.

**Class Resources:** Reading from online course by Nick Strobel on Planetary Science:

<http://www.astronomynotes.com/solarsys/sl.htm>

Table of Contents: <http://www.astronomynotes.com/solarsys/chindex.htm>

Library Course Reserve: *Introduction to planetary atmospheres*, Agustín Sánchez-Lavega.

**What to Expect:** Your attendance is expected, and will greatly contribute to your success in the class, although it is not directly factored into your grade. As an upper-level course, some quantitative rigor is to be expected, so some familiarity with physics and pre-calculus or calculus will be an asset. We will do some “brushing-up” but be prepared to do calculations. That said, I am here to help you, and I expect you to be responsible for your own learning by completing assignments and to seek help when you need it.

**Disability:** If you need a special arrangement relating to a medical, learning, or another condition, and you have already contacted disability services (978-665-4020), please talk with me at the beginning of the course so we can be sure to have your needs met.

**Assignments/Projects:** There will be two research projects for the class: 1) a presentation of a planetary mission and it’s findings, and 2) a final project presentation and write-up on a planetary feature/phenomenon of your choosing. These projects will require some research and you are expected to cite outside sources. Projects may be completed as a group, but the length of presentation, and number of references is to be scaled according to the number of group members. Some smaller assignments will help build up to these projects. We will also occasionally meet in the computer lab to conduct some in-class activities/assignments.

**Academic Integrity:** Collaboration on homework assignments is permitted and encouraged. But the work that you hand in must be your own i.e. if I ask you to reproduce your work, you must be able to do so. If you are ever unsure about the appropriate level of collaboration, please ask..



**Grading:** Your grade will be evaluated as follows:

- 25% Class/Homework
- 20% Mission Research Presentation/Discussion
- 25% Mid-term Exam
- 35% Final Project Presentation

**Office Hours/Contacting Me:** Please don't hesitate to come visit me if you have questions, problems, or simply want to learn more about class topics. *Email is the best way to reach me* if you have a quick question, or you'd like to set up a time outside of my office hours to meet. My office is in the bottom of the Sanders Administration building. **To get there**, go down the hall through the main entrance past the president's office and go downstairs. After leaving the stairwell, go straight down the first row of offices, and turn right through the doorway where you see the office printers. My office is to your right: 104N-5 ... please knock and wait for my response before entering - I may be on the phone.

**The (tentative) Schedule:**

- Week 1 (Jan 14): Introduction, Quantitative refresh
- Week 2 (Jan 21): Orbits, Gravity, and Spacecraft Missions
- Week 3 (Jan 28): Computer Lab: Orbits / Solar Energy
- Week 4 (Feb 4): Spacecraft research (In Library) / Recent Missions video
- Week 5 (Feb 11): Mission Assignment group work
- Week 6 (Feb 18): **No class (on 18th)** / Mission Discussion
- Week 7 (Feb 25): Solar System Formation / Atm Intro
- Week 8 (March 4): Atmospheres
- Week 9 (March 11): **Spring Break**
- Week 10 (March 18): Project Research / Paper Discussion
- Week 11 (March 25): Mission Presentations
- Week 12 (April 1): Terrestrial Planets
- Week 13 (April 8): Giant Planets / Review
- Week 14 (April 15): Midterm ; Moons /Satellites & Rings
- Week 15 (April 22): Project Reading Discussion ; **No class (on 24th)**
- Week 16 (April 29): Climate Change on Earth and Mars
- Week 17 (May 1): Extra Solar planets
- Week 18 (May 8): Presentations
- Week 19 (Exam): Final Project Presentations (**Thur. 15th @ 10:10am**)

## K.18 GEOG 4220 Structural Geology

### STRUCTURAL GEOLOGY (GEOG 4220) 2011 Fall Course-Specific Syllabus 1

## 2011 FALL COURSE-SPECIFIC SYLLABUS

GEOG 4220: Structural Geology (3 cr. 4 hr.)<sup>[1c, 1d]</sup>

Section 01 (CRN=16878)

#### PROFESSOR CONTACTS<sup>[1a, 1b, 1f, 1g, 1h, 1i]</sup>

Lawrence R. GUTH, Ph.D.

Department of Geophysical Sciences

Office Phone: 978-665-3082

Office Fax: 978-665-3081

e-mail: lguth@fitchburgstate.edu

Clicker Channel: 2

Blackboard: <http://blackboard.fitchburgstate.edu>

Office: McKay (MK) C251b

Office Hours, 2011 FALL

• 12:45-13:45 T, W, R;

-- or --

• by appointment

#### CARNEGIE-UNIT WORKLOAD AND CLASS TIMES<sup>[1e]</sup>

$$3 \text{ credit hours} \times \left( \frac{9 \text{ weekly work hours}}{3 \text{ credit hours}} \right) = 9 \text{ weekly work hours}$$

These 9 hours per week shall be apportioned as follows:

- 4 contact hours in class:  
Lecture = 14:00-13:15 M F in MK C284  
Lab = 14:00-13:15 W in MK C284
- 5 hours outside of class (reading, homework, study & manuscript/talk prep)

#### CONTACT HOURS

The contract mandated by the Board of Higher Education specifies that for lectures, recitations and seminars, an hour is to be defined as a 50-minute period. Courses with laboratories that require longer periods of time are measured in 60-minute contact hours. It was a blatant attempt to force classes and students away from hands-on, discovery modes of learning and move them into the more cost efficient lecture halls full of sleeping students. In addition, both teachers and students are considered to do less work in a lab and so FSC equates 1.5 lab contact hours to be worth one 50-minute lecture. That is why your four contact hours in class gives you only 3 semester hours of credit. Making a four contact-hour class fit into one block of the imposed block scheduling produces the three 75-minute class periods per week shown above. None of this affects the Carnegie-Unit Workloads, and so the extra hour in class is accommodated by decreased work outside of class.

#### PREREQUISITES

The 2010-2011 Fitchburg State University Catalog lists the following prerequisites for Structural Geology:

- Physical Geology (GEOG 2100) **AND**
- General Physics 1 (PHYS 2300) **AND**
- PreCalculus (MATH 1300) **OR**
- permission of the instructor.

PreCalc is needed for the trig (structural geology draws heavily on descriptive analytical geometry for the relationships between lines & planes in space) and General Physics 1 is needed for the kinematics & dynamics as applied to rock deformation. You didn't think we would make you take those required cognate classes and then not apply them in the major classes, did you?

#### REQUIRED RESOURCES<sup>[5]</sup>

##### Textbook (Required)

Ragan, D.M., 2009, Structural geology – an introduction to geometrical techniques (4<sup>th</sup> edition): Cambridge, Cambridge University Press, 602 p.  
**ISBN = 978-0-521-74583-3**

##### Equipment & Materials (Required)

##### Equipment (Required)

- a Turning Technologies ResponseCard NXT;
- a triangular 12-inch engineer's scale;
- a half-circle protractor with 0.5° least count;
- a 0.5 mm mechanical pencil; and
- a scientific calculator or scientific calculator app for your laptop, tablet or smartphone;

## 2 STRUCTURAL GEOLOGY (GEOG 4220) 2011 Fall Course-Specific Syllabus

### COURSE DESCRIPTION

#### Structural Geology <sup>[2]</sup>

**GEOG 4220 3 cr. 4 hr.**

***Offered in the fall semester in odd years for day students.***

This course studies rock structures developed by the application of deformational forces. Topics covered include the elementary concepts of stress and strain and the geometry of joints, faults, folds, foliations and lineations. **LAB**

**Prerequisites:** GEOG 2100, PHYS 2300, MATH 1300 or permission of the instructor  
<http://www.fitchburgstate.edu/catalog/>

### COURSE OBJECTIVES<sup>[3]</sup>

All students receiving a passing grade in this course should acquire a documented ability to:

- communicate effectively in written English;
- critically and logically analyze competing ideas, using quantitative analysis whenever appropriate; and
- infer the consequences of competing ideas to test their validity (scientific reasoning).

Students also should acquire a documented knowledge and understanding of the

- scientific issues;
- social issues; and
- ethical issues

related to the problems caused when human activities do not consider the natural anisotropies of the rocks underfoot. These objectives will be documented by class discussions within the class web discussion group. Communication skills will be further developed by writing manuscripts and presenting them in class.

In addition, all students receiving a passing grade in this course should acquire a documented knowledge of the types of rocks structures and the ability to use the geometric tools for their spatial analysis.

### COURSE REQUIREMENTS <sup>[6]</sup> FOR ASSESSMENT

#### Attendance Policy<sup>[4, 10, 12]</sup>

As stated in the general guidelines, attendance will be used as one factor in determining your final grade. Attendance will be required and recorded in all sessions. An excused absence, obtained by dropping me a voice or email telling me that you can't make it to class that day, is your ticket to turn in the assignment due that day or to take the quiz/exam scheduled that day without penalty. An excused absence, however, does not excuse you from the class work done that day. Now that you can get class documents from Blackboard, it is your responsibility for keeping up

with all course activities even though you can't be present in class.

#### Class Clicker Participation <sup>[11]</sup>

Now that FSU has committed to a clicker standard, we will be using them for attendance and classroom participation so we don't always see the same hands.

#### Blackboard Participation<sup>[11]</sup>

As indicated in the General Guidelines, a BlackBoard website is available for required asynchronous class discussions, cross town collaboration, and cries for help in the middle of the night. In addition, as the university phases out copy machines and computer printers, many of the documents that used to be provided as handouts will now be distributed by posting PDF files to our Blackboard site. Use of Blackboard requires you to use your FSC email address, so keep your old email address for personal use and check your FSC email account regularly for your school business. The direct URL to our class website is given at the top of page one.

#### CLEMs:<sup>[11]</sup>

#### Collaborative Learning Exploration Modules (i.e., LABS in education speak)

Simple collaborative activities will be assigned throughout the semester for you to practice some of the quantitative aspects of structural geology. Collaboration is always encouraged as you help each other learn and explore, but everyone will submit individual papers. These will be turned in and graded. Even though these are collaborative explorations, everyone should be able to do the work individually by the end of the module and this will be evaluated on exams.

These explorations are designed to be completed in the 75-minute lab block devoted to the CLEM. However, there may be activities when we only have time to collect data in the lab and the data reduction and analysis will be done outside of class as homework. This will be the case in those labs where self-grading Excel spreadsheets are provided to give you immediate feedback, clues to common problems, and to reduce number crunching so you can concentrate on interpretation. In such cases, you will be expected to turn in a printout of your completed spreadsheet, either physically or by attaching the file to an email. It saves me time grading, but more importantly tells you if answers are right or wrong so you can ponder any incorrect responses, review the posted solution template, and then try, try again (usually in collaboration with me or your

classmates) BEFORE turning in your printout. Until we get a printer for Earth Science labs, expect to do any computer components outside of class.

### **Manuscripts & PowerPoint Presentations<sup>[11]</sup>**

I have decided that a single term paper and oral presentation due at the end of the semester do not give you the feedback needed to improve your writing and speaking skills. Instead, twice during the semester, students will take over the lecture and present selected topics covering class material. The student's PowerPoint presentation will be based on a manuscript, a short (four-page double spaced minimum; eight pages maximum) paper written in accordance with the style guide for the Geological Society of America's journal *Geology*. In rare cases, a student may be unable to give an oral presentation due to a disability documented by Disability Services. Following our GSA presentation model, those unable to give an oral presentation will construct HTML poster presentations based on their manuscript (my web site has an example). Presentations in either form are an absolute class requirement. You cannot pass the class without giving these presentations.

All manuscripts will follow the format provided by the instructor and will be graded on style and grammar as well as the content. With two manuscripts due during the semester (dealing with specific case studies involving structural geology), the lowest manuscript grade will be dropped in calculating the student's semester course grade. **To make sure you have the opportunity to improve, all must do the first manuscript and presentation.**

In my days with Big Oil, we called those short presentations to management required to support your project "*Dog & Pony Shows*". Company sponsored professional development workshops in making these presentations often videotaped our performances. Both of your PowerPoint presentations (10 minutes each) will be videotaped. The grade you receive for each presentation will be a combination of the grade from the instructor and your critique of your own videotaped performance as follows: If your self score is lower than the instructor's, then you will get the instructor's grade. If your self score is higher than the instructor's, then the two will be averaged. Hopefully, by this time in your university education, you have written enough papers and given enough presentations to ace the first set. It would then be your option to skip the second manuscript and presentation and drop those zero scores in accord with the standard class safety nets.

Students are encouraged to use the GeoRef database available on-line from the

library's web page. However, due to the short research time you have for each manuscript, do not expect to use interlibrary loan. The number of primary sources required for each paper is therefore minimal in recognition of our library limitations.

As a reminder to the majors (and Earth Science wantabees), the little extra work in each of our major courses writing papers and giving oral presentations saves you from taking two classes -- you are exempt from the Junior-Senior writing and speech LA&S requirements.

### **Proficiency/Assessment Quizzes<sup>[11]</sup>**

Proficiency/Assessment Quizzes (PAQ's), after Doc Berry, are simple one-topic quizzes assessing minimum course competencies that anyone earning a passing grade in the class must master. You must pass **ALL** proficiency quizzes to pass the class. However, the lowest of those passing grades ( $\geq 60\%$ ) will be dropped in computing your final grade for the course.

There will be five proficiency quizzes during the semester. The dates for these quizzes are flexible depending on our progress. However, you will always have at least one week's notice before the quiz is given. You may retake the quizzes until you pass or the last day of class. No retake will use class time, retakes are scheduled on an individual basis at a mutually convenient time. The structural geology proficiency quiz topics will be:

- LA&S analytic & quantitative skills
- descriptors of the orientation of planes & lines in space (strike, dip, apparent dip, dip direction, trend, plunge, pitch, rake, pole);
- 3-point problem;
- plotting & computations on an equal-area (Schmidt) stereonet;
- earth structures picture-puzzle ID  
(types of faults, folds, joints, foliations, lineations, etc.);

### **Exams<sup>[7]</sup>**

There will be two half-term exams, one near the middle of the semester and one near the end. These will be closed book, closed note exams. However, you may prepare and use during the test one 8.5"x11" cheat sheet -- your individual synthesis of the material covered on the half-term.

The exit (final) exam is cumulative. Questions will be variations of those appearing on the first two half-term exams and so no cheat sheet is permitted.

The exit (final) exam is your opportunity to demonstrate mastery of the course material despite the mistakes you expect to make as you

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learn something new. So, the exit (final) exam also counts as a third half-term exam with both Safety Nets active for the half-term portion of the class grade. This allows you to bomb the first or second exam and still recover a good grade for the course.

##### Late Fees and Make-Up Policy<sup>[10]</sup>

Late fees for assignments are described in the General Guidelines. An excused absence is your ticket to turn in assignment at **the next class meeting** with no penalty. Otherwise, late fees increase with the number of days late. No late work will be accepted if (1) it is over one week late or (2) after 2011 December 16 the last day the class meets before finals.

An excused absence is your ticket to make up quizzes and exams. However, the format of the quiz or exam could change. Traditionally in the Geophysical Sciences, make-up exams are essay even though the original exam was true/false, multiple guess, and fill in the blank and so most students avoid the make up exams if at all possible.

##### CONTENT CHRONOLOGY<sup>[8]</sup>

Exam Date or Week	Text chapters / Activity	Lab / Exam coverage
02 Sept.	Prelims	Prelims
<b>05 Sept.</b>	<b>HOLIDAY</b>	<b>no classes</b>
07 & 09 Sept.	more prelims	pre-PAQ's
12-16 Sept.	intro to	manuscripts
19-23 Sept.	Chapter 1	
26-30 Sept.	Chapter 2	
03-07 Oct.	Chapter 3	
<b>10 Oct.</b>	<b>HOLIDAY</b>	<b>no classes</b>
12-14 Oct.	Chapter 4	
14 Oct.	First draft of	manuscripts
17-19 Oct.	Presentations	
21 Oct.	Chapter 4	
<b>24 Oct</b>	<b>Half-Term 01</b>	<b>Ch. 1-4</b>
26-28 Oct.	Chapter 5	
31 Oct – 04 Nov	Chapter 8	
07-09 Nov	Chapter 14	
<b>11 Nov</b>	<b>HOLIDAY</b>	<b>no classes</b>
14-18 Nov.	Chapter 14	
21-23 Nov.	Chapter 18	
<b>25 Nov</b>	<b>HOLIDAY</b>	<b>no classes</b>
28 Nov-02 Dec	Ch. 9 & 12	
05 Dec	catch up	review
<b>07 Dec</b>	<b>Half-Term 02</b>	<b>all since Exam 1</b>
09 Dec		Make Up Labs
<b>12-14 Dec.</b>	<b>any Take 2 presentations</b>	
<b>16 Dec</b>	<b>review</b>	<b>any manuscript revisions due</b>
<b>20 Dec. @ 12:30</b>	<b>EXIT EXAM</b>	<b>Variations on Half-Terms 01 &amp; 02</b>

The dates of the exams are fixed. There may be some adjustments made to the topics covered in each exam depending on our progress.

Note that the same schedules for manuscripts and presentations are used in Geomorphology and Structural Geology so those students can double dip and research structural landforms (e.g., Upheaval Dome, metamorphic core complexes, Basin and Range topography, etc.) that can be used in both classes.

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### EXIT EXAM<sup>[7]</sup>

According to the Registrar's Fall 2011 Final Exam Schedule, classes that meet on Monday's @ 14:00 fall into exam block **E**. Exam block **E** is scheduled for 12:30-14:30 on Tuesday, December 20.

### WEIGHTING FACTORS OF COMPONENTS USED

#### TO EVALUATE THE FINAL GRADE<sup>[9]</sup>

The following weights will be used to evaluate your final grade. The general guidelines show how this is done and relates the final point total out of 100 to the numerical grade reported to the registrar.

Activity	Weighting Factor
best 2 of 3 exams <sup>†</sup>	18% (9% each)
best 4 of 5 proficiency quizzes	12% (03% each)*
1 cumulative final	20%
Better of 2 manuscripts	10%
Better of 2 PowerPoint presentations	10% (or 100%)*
Σ lab-based activities	15%
Blackboard activities	5%
Clicker participation	5%
attendance	5%

\* As stated in the general guidelines, you must receive a passing grade on all proficiency quizzes AND do an oral presentation to pass the class.

<sup>†</sup> includes the Exit Exam with the parabolic grade map applied as a 3<sup>rd</sup> Half-Term

### LINK TO GENERAL GUIDELINES<sup>[13, 14]</sup>

The superscripted numerals in brackets refer to the 14 points in the Syllabi Guidelines mandated by the Academic Policy Committee, Student Affairs Committee and All College Committee. These were approved by President Antonucci and became effective at the start of the 2007 Fall semester.

Point 13, a "statement regarding the College Academic Dishonest (*sic*) Policy" has already been superceded by the Academic Integrity Policy that was also imposed upon us for the 2007 Fall semester. We always go to the source in science. Read it for yourself at:

<http://www.fsc.edu/judicial/AcademicIntegrity.cfm>

Point 14, an "informational statement about disability services available to students" is too limited in light of the 2007 Virginia Tech tragedy. The university cares for all students, not just those with documented disabilities. Let me know if I am stressing you out. Perhaps a simple change on my part or your part can lessen the stress and increase the learning. You can review all of your options at:

<http://www.fsc.edu/studentsupport>

Both points are covered more fully in the General Guidelines, the common supplement to all of my syllabi.

## K.19 GEOG 4400 Urban Geography

**GEOG 4400 – Urban Geography (3 cr. 3 hr.) – FALL 2014**  
T Th 9:30 – 10:45am Classroom Location: Condike Science 127

### PROFESSOR CONTACTS

Dr. Jane Huang Phone: 978-665-3496  
Department of Geophysical Sciences Email: [jhuang2@fitchburgstate.edu](mailto:jhuang2@fitchburgstate.edu)  
Office Hours: T and Th 12:30 – 2:00pm in Condike Science 328, or by appointment

### COURSE DESCRIPTION

Fifty percent of the global population and eighty percent of Americans live in cities. Urban geography is the science that investigates the integration of built forms, human interactions and the environmental aspects of places. This course examines urban patterns; discusses urban planning issues; and studies cities and forces of urbanization around the world through a series of case studies. This course will bring an understanding of what it means to be "urban" in a global perspective. Students will conduct urban/spatial analysis using Google Earth and GIS (geographic information system) through exercises and term projects. This course may be used as the prerequisite of GEOG4000 Geographic Information System, a comprehensive GIS class.

### COURSE RESOURCES

Required Textbook:

*Exploring the Urban Community – A GIS Approach*, 2<sup>nd</sup> edition, by Richard P. Greene and James B. Pick

Required Equipment:

Fitchburg State University computer network/Blackboard/email account  
Thumb drive (or other data storage) to save any work you do on a computer

### COURSE WEBPAGE

<https://blackboard.fitchburgstate.edu> The page is password protected so you will need to log on. If you are enrolled for other courses which use this utility, then when you log in you will see a list of all courses for which you are registered that are making use of this utility for the class web page. Click on "GEOG 4400" to access the page for our class. Syllabus, lecture notes, exercise guidelines, and other materials will be posted on the course webpage. During the class, the "missing" part in your lecture slides will be given and you should complete the lecture slides on your computer.

The webpage should be considered a helpful communication and learning tool for our class **but not a SUBSTITUTE for attending class.**

### LAB ASSIGNMENTS

A lab assignment will be assigned every week. You are encouraged to do as much as possible during class sessions when the instructor is available to assist you. You WILL need to spend significant amount of time after class to finish the assignments. You are also encouraged to work in group and to bring your questions to class so other students can benefit from the discussion. Due time of an assignment will be a week after the lab assigned unless specified by the instructor. The instructor will collect a printed copy of your answer sheet on the due date. Late assignments will not be accepted. Please plan ahead.

All the lab assignment data can be found in the university network drive **L:\GeoUrban**. However, the L: drive is a shared space and does not allow you save any work to it. Thus, before beginning the exercises, you should navigate to **L:\GeoUrban**, copy and then unzip the exercises data files onto your personal university network drive **J:**. You will do **ALL** the work for the class in your **J: drive** (NOT the L: drive). You'll have to save your work properly in **J: drive** to ensure they can be correctly opened on any computers in the Condike Science lab.

### COURSE COMMUNICATION

I will be emailing the class from time-to-time with important news and updates. In doing so, I'll be using an automated function within the registrar's web interface to email the entire class. Unfortunately, this function only utilizes email addresses with students.fitchburgstate.edu. So, to get all the news for this class and for other classes for which the instructors utilizes this function, you'll have to **check** your fitchburgstate.edu email account regularly.

### COURSE POLICIES

**Cheating will not be tolerated!** Although I encourage students to work together on assignments and there will be group projects students would work on, your work must be your own. IT MUST BE WRITTEN/DONE ENTIRELY

BY YOU. Do not plagiarize or copy the work of others. If you are caught cheating, you will receive absolutely no credit for that work, possibly a failing grade for the course, and, if necessary, you will be formally reported to the university for appropriate disciplinary action. The Fitchburg State University's policy on cheating is described in the Student Handbook.

All assignments are due in class sessions specified by the instructor. Late assignments will **NOT** be accepted unless a doctor's note or other forms of signed proof is presented. **Not being in class is not an excuse for late assignments.** Make-up exams will not be allowed except in case of illness or if the student discusses his/her particular situation with the instructor **at least one day prior to the exam date.** A doctor's note or other forms of signed proof may be required. Make-up exams may be different from those given to other students. You are responsible for knowing due dates and exam dates. You are also responsible for all material and announcements presented in the lecture, whether you are in class or not.

For students with disabilities: reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodation(s) needed for the course. Late notification may mean that requested accommodations might not be available. All accommodations must be approved through Disability Services. Contact Katrina Durham in the Disability Services by phone at 978.665.4029 or by email at [kdurham1@fitchburgstate.edu](mailto:kdurham1@fitchburgstate.edu) for more information.

**Cell phone policy:** please turn off or mute your cell phones during class time.

## **COURSE REQUIREMENTS AND GRADING**

### **Attendance and Participation**

Attendance will be recorded in all sessions starting the second week of the semester and will be used as one factor in determining your final grade.

### **Lab Assignments**

Throughout the semester, you will be required to complete ten (10) computer-based lab assignments using Google Earth and ArcGIS. An assignment will worth 5-25 points.

### **Term Projects**

Students will work in small groups on two term projects with the first project focusing on knowing the City of Leominster and the second one on analyzing the city using GIS. Each project requires a presentation, a report, and lots of work. A student's contribution to the projects will be evaluated by both the instructor and the peers. Notice the two projects would count as the largest component towards the overall grade. Specific guidelines of the projects will be announced in class and posted on class webpage during the semester.

### **Exams**

There will be two mid-term exams and one final exam in this course. Each exam will cover approximately one third of the course material. There will be a brief review session before each exam. All exams will be held in the lab. The final exam will take place during the finals week.

### **Grading:**

Grades will be determined by the percentage of the total points you accumulate. We will have approximately 550 points available for you to earn in class (the exact number of total points will be determined as the semester continues). Points are earned as follows (approximately):

Attendance	50	<i>Note that above 70% of your grade in the class comes from non-exam sources. Don't take these points for granted – they do require work!</i>
Assignments	150	
Term Projects	200	
Exams (3 X 50 pts each):	150	
TOTAL:	550	

### **The Golden Rule of Studying** (Carnegie-unit workload and class times):

Put in three hours of studying for every hour you spend in class. For this course, 3 contact hours in class and 6 hours outside of class (reading, research, exercises, and studying)



## K.19 GEOG 4400 Urban Geography

### Grading Policy

The grading policy recommended by the university as following is used for this class.

Percentage	FSU Grade	Percentage	FSU Grade
95-100	4.0	74-76	2.3
92-94	3.7	71-73	2.0
89-91	3.5	69-70	1.7
86-88	3.3	67-68	1.5
83-85	3.0	64-66	1.3
80-82	2.7	60-63	1.0
77-79	2.5	0-59	0.0

### COURSE OUTLINE

The instructor reserves the right to change the chapters, materials, or the timelines during the semester:

Week 1:	Prelim - Course Introduction
Week 2:	Chapter 1 Spatial Display of Urban Environment
Week 3:	Chapter 2 Defining the Metropolis
Week 4:	Chapter 3 Internal Structure of Cities
Week 5:	Chapter 4 Systems of Cities; <b>Midterm I</b>
Week 6:	<b>Project I: Profile of Leominster</b>
Week 7:	Chapter 5 Neighborhoods
Week 8:	Chapter 6 Migration and Residential Mobility
Week 9:	Chapter 7 Race and Ethnicity
Week 10:	Chapter 8 Industrial Location and Cities; <b>Midterm II</b>
Week 11:	Chapter 9 Urban Sprawl
Week 12:	Chapter 10 Environmental Problems
Week 13:	Chapter 11 Urban and Regional Planning
Week 14-15:	<b>Project II: Urban Structure of Leominster</b>
Finals Week:	<b>Final Exam</b>

## **K.20 GEOG 4600 Environmental Hydrogeology**

### **K.20.1 Contacts**

Dr. Lawrence R. GUTH	Phone 978-665-3082
Department of Geo/Physical Sciences	Email: lguth@fitchburgstate.edu
Office Hours: T and W 12:30–13:45	in McKay C289, or by appointment
Blackboard: <a href="http://blackboard.fitchburgstate.edu">http://blackboard.fitchburgstate.edu</a>	Fax: 978-665-3081

### **K.20.2 Description**

A case study approach is used to apply basic principles of geology to environmental problems caused by flooding, groundwater contamination, pollution due to human activity, and landslides, among other topics. Laboratory is required.

Prerequisite: GEOG 2100 or GEOG 4200, CHEM 1300, MATH 1300, PHYS 2300 or permission of Instructor

3 cr. 4 hr.

### **K.20.3 Objectives**

All students receiving a passing grade in this course should acquire a documented ability to:

- communicate effectively in written English;
- critically and logically analyze competing ideas, using quantitative analysis whenever appropriate; and
- infer the consequences of competing ideas to test their validity (scientific reasoning).

Students also should acquire a documented knowledge and understanding of the

- scientific issues;
- social issues; and
- ethical issues

related to the environmental problems caused when human activities alter natural hydrologic processes. These objectives will be documented by class discussions within the class web discussion group. Communication skills will be further developed by writing manuscripts and presenting them in class.

In addition, all students receiving a passing grade in this course should acquire a documented understanding of the basic tools used to characterize the flow of water in channels and aquifers.

### K.20.4 Resources

Hornberger, G.M., Raffensperger, J.P., Wiberg, P.L. and Eshleman, K.M., 1998, *Elements of physical hydrology*: Baltimore, The Johns Hopkins University Press, 302 p.

Heath, Ralph C., 1983, Basic ground-water hydrology (U.S. Geological Survey Water-Supply Paper 2220): United States Government Printing Office, 84 p.

Available online @ <http://pubs.er.usgs.gov/usgspubs/wsp/wsp2220>

Required Equipment:

- A Fitchburg State student ID (One Card);
- a Fitchburg State University computer account;
- a Fitchburg State University email address for Blackboard; and
- a scientific calculator with scientific notation, trig and exponential functions (or your required laptop computer with software to duplicate the functions of a scientific calculator).

### K.20.5 Matter

**Carnegie-unit workload and class times:**

$$3 \text{ credit hours} \times \left( \frac{9 \text{ weekly work hours}}{3 \text{ credit hours}} \right) = 9 \text{ weekly work hours}$$

These 9 hours per week shall be apportioned as follows:

- 4 contact hours in class: Lecture = 14:00-15:15 MW in MK C279  
Lab = 14:00-15:15 F in MK C279
- 5 hours outside of class (reading, homework, & study)

### CONTACT HOURS

The contract mandated by the Board of Higher Education specifies that for lectures, recitations and seminars, an hour is to be defined as a 50-minute period. Courses with laboratories that require longer periods of time are measured in 60-minute contact hours. It was a blatant attempt to force classes and students away from hands-on, discovery modes of learning and move them into the more cost efficient lecture halls full of sleeping students. In addition, both teachers and students are considered to do less work in a lab and so FSC equates 1.5 lab contact hours to be worth one 50-minute lecture. That is why your four contact hours in class gives you only 3 semester hours of credit. Making a four contact-hour class fit into one block of the imposed block scheduling produces the three 75-minute class periods per week shown above. None of this affects the Carnegie-Unit Workloads, and so the extra hour in class is accommodated by decreased work outside of class.

## **REQUIRED STUDENT ACTIVITIES**

### **Attendance Policy**

As stated in the general guidelines, attendance will be used as one factor in determining your final grade. Attendance will be required and recorded in all sessions. An excused absence, obtained by dropping me a voice or email telling me that you can't make it to class that day, is your ticket to turn in the assignment due that day or to take the quiz/exam scheduled that day without penalty. An excused absence, however, does not excuse you from the class work done that day. Now that you can get all class documents from Blackboard, it is your responsibility for keeping up with all course activities even though you can't be present in class.

### **BlackBoard Participation**

As indicated in the General Guidelines, a BlackBoard website is available for required asynchronous class discussions, cross town collaboration, and cries for help in the middle of the night. In addition, as the college phases out copy machines and computer printers, many of the documents that used to be provided as handouts will now be distributed by posting PDF files to our Blackboard site. Use of Blackboard requires you to use your FSC email address, so keep your old email address for personal use and check your FSC email account regularly for your school business. The direct URL to our class website is given at the top of page one.

### **CLEMs: Collaborative Learning Exploration Modules (i.e., LABS in education speak)**

Simple collaborative activities will be assigned throughout the semester for you to practice some of the quantitative aspects of environmental hydrogeology. Collaboration is always encouraged as you help each other learn and explore, but everyone will submit individual papers. These will be turned in and graded. Even though these are collaborative explorations, everyone should be able to do the work individually by the end of the module and this will be evaluated on exams.

These explorations are designed to be completed in the 75-minute lab block devoted to the CLEM. However, there may be activities when we only have time to collect data in the lab and the data reduction and analysis will be done outside of class as homework. This will be the case in those labs where self-grading Excel spreadsheets are provided to give you immediate feedback, clues to common problems, and to reduce number crunching so you can concentrate on interpretation. In such cases, you will be expected to turn in a printout of your completed spreadsheet, either physically or by attaching the file to an email. It saves me time grading, but more importantly tells you if answers are right or wrong so you can ponder any incorrect responses, review the posted solution template, and then try, try again (usually in collaboration with me or your classmates) BEFORE turning in your printout. Since not everyone yet is required to have a laptop and we had to dismantle the departmental computer lab, expect to do any computer components outside of class.

### **Manuscripts & PowerPoint Presentations**

I have decided that a single term paper and oral presentation due at the end of the semester do not give you the feedback needed to improve your writing and speaking skills. Instead, twice during the semester, students will take over the lecture and present selected topics covering class material. The student's PowerPoint presentation will be based on a manuscript, a short (four-page double spaced minimum; eight pages maximum) paper written in accordance with the style guide for the Geological Society of America's journal

## K.20 GEOG 4600 Environmental Hydrogeology

*Geology.* In rare cases, a student may be unable to give an oral presentation due to a disability documented by Disability Services. Following our GSA presentation model, those unable to give an oral presentation will construct HTML poster presentations based on their manuscript (my web site has an example). Presentations in either form are an absolute class requirement. You cannot pass the class without giving these presentations.

All manuscripts will follow the format provided by the instructor and will be graded on style and grammar as well as the content. With two manuscripts due during the semester (dealing with specific case studies involving hydrogeology), the lowest manuscript grade will be dropped in calculating the student's semester course grade. To make sure you have the opportunity to improve, all must do the first manuscript and presentation.

In my days with Big Oil, we called those short presentations to management required to support your project "*Dog & Pony Shows*". Company sponsored professional development workshops in making these presentations often videotaped our performances. Both of your PowerPoint presentations (10 minutes each) will be videotaped. The grade you receive for each presentation will be a combination of the grade from the instructor and your critique of your own videotaped performance. Hopefully, by this time in your college education, you have written enough papers and given enough presentations to ace the first set. It would then be your option to skip the second manuscript and presentation and drop those zero scores.

Students are encouraged to use the GeoRef database available on-line from the library's web page. However, due to the short research time you have for each manuscript, do not expect to use interlibrary loan. The number of primary sources required for each paper is therefore minimal in recognition of our library limitations.

As a reminder to the majors (and Earth Science wantabees), the little extra work in each of our major courses writing papers and giving oral presentations saves you from taking two classes—you are exempt from the Junior-Senior writing and speech LA&S requirements.

### **Proficiency Quizzes**

Proficiency Quizzes, after Doc Berry, are simple one-topic quizzes assessing minimum course competencies that anyone earning a passing grade in the class must master. You must pass **ALL** proficiency quizzes to pass the class. However, the lowest of those passing grades ( $\geq 60$ ) will be dropped in computing your final grade for the course.

There will be five proficiency quizzes during the semester. The dates for these quizzes are flexible depending on our progress. However, you will always have at least one week's notice before the quiz is given. You may retake the quizzes until you pass or the last day of class. No retake will use class time, retakes are scheduled on an individual basis at a mutually convenient time. The Geology proficiency quiz topics will be:

- The Units Shall Lead You Plug and Chug;
- three-point problem (graphically finding the gradient)
- the continuity equation:  $Q=VA$

- Darcy's Law
- porosity, water content relationships in vadose (unsaturated) zone

## **Exams**

There will be two half-term exams, one near the middle of the semester and one near the end. These will be closed book, closed note exams. However, you may prepare and use during the test one 8.5"×11" cheat sheet—your individual synthesis of the material covered on the half-term.

The exit (final) exam is cumulative. Questions will be variations of those appearing on the first two half-term exams and so no cheat sheet is permitted.

The exit (final) exam is your opportunity to demonstrate mastery of the course material despite the mistakes you expect to make as you learn something new. So, the exit (final) exam also counts as a third half-term exam with both Safety Nets active for the half-term portion of the class grade. This allows you to bomb the first or second exam and still recover a good grade for the course.

## **Late Fees and Make-Up Policy**

Late fees for assignments are described in the General Guidelines. An excused absence is your ticket to turn in assignment at the next class meeting with no penalty. Otherwise, late fees increase with the number of days late. No late work will be accepted if (1) it is over one week late or (2) after 12 December, the last day the class meets before finals.

An excused absence is your ticket to make up quizzes and exams. However, the format of the quiz or exam could change. Traditionally in the Geophysical Sciences, make-up exams are essay even though the original exam was true/false, multiple guess, and fill in the blank and so most students avoid the make up exams if at all possible.

## WEIGHTING FACTORS OF COMPONENTS USED TO EVALUATE THE FINAL GRADE

The following weights will be used to evaluate your final grade. The general guidelines show how this is done and relate the final point total out of 100 to the numerical grade reported to the registrar.

Table K.1: default

Activity	Weighting Factor
best 2 of 3 exams†	24% (12% each)
best 4 of 5 proficiency quizzes	12% (03% each)*
1 cumulative final	14%
Better of 2 manuscripts	10%
Better of 2 PowerPoint presentations	10% (or 100%)*
∑ lab-based activities	20%
Web discussion	05%
attendance	05%

†includes the Exit Exam with the parabolic grade map applied as a 3rd Half-Term

\*As stated in the general guidelines, you must receive a passing grade on all proficiency quizzes AND do an oral presentation to pass the class.

## LINK TO GENERAL GUIDELINES

The superscripted numerals in brackets refer to the 14 points in the Syllabi Guidelines mandated by the Academic Policy Committee, Student Affairs Committee and All College Committee. These were approved by President Antonucci and became effective at the start of the 2007 Fall semester.

Point 13, a “*statement regarding the College Academic Dishonest (sic) Policy*” has already been superseded by the Academic Integrity Policy that was also imposed upon us for the 2007 Fall semester. We always go to the source in science. Read it for yourself at:

<http://www.fitchburgstate.edu/judicial/AcademicIntegrity.html>

Point 14, an “informational statement about disability services available to students” is too limited in light of the 2007 Virginia Tech tragedy. The college cares for all students, not just those with documented disabilities. Let me know if I am stressing you out. Perhaps a simple change on my part or your part can lessen the stress and increase the learning. You can review all of your options at:

<http://www.fitchburgstate.edu/studentsupport>

Both points are covered more fully in the General Guidelines, the common supplement to all of my syllabi.

### Content chronology

Exam Date or Week	Text chapters/ Activity	Lab/Exam coverage
week of Jan 14	Prelims	Prelims
week of Jan 21	Ch. 1	Problems p. 14-15
week of Jan 28	Ch. 2	Estimating rain input
March 12	Half Term 01	
March 14	Manuscript	due
17-21 March	SPRING	BREAK
March 26	Talks	
May 02	Half Term 02	
May 05	Manuscript	Revisions
May 07	Talk	Two
May 09 14:45	EXIT EXAM	Variations on Half-Terms 01 & 02

The dates of the exams are fixed. There may be some adjustments made to the topics covered in each exam depending on our progress.

### Exit exam

From the 2008 Spring Final Exam Schedule distributed by the Registrar, classes that first meet for the week on Monday at 14:00 fall in Exam Block E. The exit exam is therefore scheduled for Friday, 2008 May 09 @ 14:45-16:45.



## K.21 PHYS 1100 Physical Science I

Physical Science I - Syllabus

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### Physics 1100 -- Physical Science I

3 undergraduate credits

Spring 2013

Sections 110001 & 110002

Professor: Dr. Jiang Yu, Dept. of Geo/Physical Sciences

Office: Condike 310E

Telephone: 978-665-3380

E-mail: [jyu@fitchburgstate.edu](mailto:jyu@fitchburgstate.edu)

Office Hours: 10:00 – 11:00 a.m., Tuesday, Wednesday, and Thursday

Course: Physics 1100 is a physical science survey course designed to help non-science students develop a meaningful and functional literacy of concepts and methodology of physics with a minimal use of mathematics. Topics we'll study are Electricity and Light.

Objectives: (1) Learn the basic concepts and laws of the covered topics; (2) Apply the course material to improve logical and critical thinking skills; and (3) Develop oral and written skills for critical communication of scientific ideas and reasoning.

Prerequisite: Math 0200 or Math Placement Exam.

Books: Electrifying America: Social Meanings of a New Technology by David E. Nye

Empire of Light: A History of Discovery in Science and Art by Sidney Perkowitz

Materials: Other required and recommended reading materials, worksheets, videos, etc. will be posted on Blackboard.

Ancillaries: A scientific calculator; **cell phones are not allowed during tests.**

Attendance: Attendance to all class meetings including lectures and labs is expected. You should understand that credit-bearing work such as Reading Quizzes, Class Participation, labs and worksheet discussion, etc. finished during your absence cannot be made up, despite the reason for your absence. In addition, if you miss a class, it is your responsibility to submit homework by deadline, find out what happened in class, and make up the work. You should not expect reviews of class work during office hours or assume permission for late homework submissions.

Study: Your success of the course lies on your study and understanding of the books and materials. The class meetings and labs are grounds where you may seek help to better your understanding of the material while make contribution to discussion and group work. While group interaction is encouraged as a means of study, individual performance is the goal of assessment.

Reading Quiz: Reading quizzes will be given in class on all reading materials including the required books and materials posted on Blackboard. See Credit Calculation below for details on grades.

Lab Session: Lab sessions may include observation, investigation, testing/measurement, and group discussion. Lab exercises are designed to help deepen your understanding of the concepts and theories; they are not independent from lecture and/or reading materials. **Lab materials/outlines will be posted on Blackboard. You must bring your printed copy with you to the lab, which will be counted as part of the lab grade.** Lab quizzes may be given in the beginning of lab sessions on the study materials, and post-lab assignments may be also given for report or question/answer exercises. Post-lab assignments will be collected by specified deadlines. Late submissions can be accepted, but a 20% grade reduction will take into account for each calendar day.

- Homework: Qualitative and quantitative questions on study materials may be assigned from time to time. They will be discussed during class/lab sessions and will carry credit.
- Tests: Two tests will be given, one on Electricity and the other on Light. Test questions will be drawn from or similar to the homework/lab questions. If you miss a test with a legitimate reason (which means you presented a written proof, such as a police report of an accident or a doctor's statement of a medical emergency), you may take a make-up test. **Note since you have more time to prepare for the make-up, it will have a slightly higher level of difficulty than the original test.**
- Final: A final exam (cumulative) or a project (to be determined) will take place close to the end of semester.

**In Addition:**

- Disability Assistance: If you require academic accommodations for disability, please contact Disability Services as soon as possible and provide me with a copy of your established accommodation agreement so we can discuss your specific needs. Any information that you share with me will be held in the strictest confidence, unless you give me permission to do otherwise.
- Academic Integrity: I give my trust to you on following the college's published policy on academic honesty and plagiarism. **While peer discussion is encouraged, each one of you is expected to do your own work including quiz, homework, lab assignment, and tests.**
- Laptop, Cell phone And food: Laptops are not allowed in lectures or labs, unless I permit you in special cases. Cell phones must be turned off and stowed away (yes - that means no texting either!). Food and drink are not allowed to enter the classroom in accordance with the university's lab safety regulations.

Grade Calculation: Go to next page

**Physical Science I - Syllabus****3 of 3**

Grade Calculation:

Performance	Credit Weight (%)	Note
<b>Books:</b>		Read one chapter per week.
Create Reading Quiz Items with Answers	10	A reading quiz question with answer per week must be created and submitted by you. Check Blackboard for assignment.
Reading Quiz Performance	10	Selected reading quiz questions will be given to you individually to answer in class.
Reading Quiz Grading	10	Your answers to the reading quiz questions will be graded in class by your classmates.
Create and Lead Class Discussion	10	A thoughtful discussion prompt must be submitted each week, which if selected will be used in class discussion.
Discussion Participation (group grade)	10	Each group will discuss the book using one or more of the given prompts. Each group will present its summary of the discussion to the class.
<b>Physical Science Content:</b>		Study the Blackboard posts and class handouts. Your understanding of the material (theories, laws, etc.) will be assessed by quizzes, lab performance, and tests.
Study Quiz	10	Qualitative and quantitative questions of the physical science content will be given in class.
Class/Lab participation (individual)	5	Homework, lab material, worksheets, etc. will be given on Blackboard or in class. You are expected to work on them according to instructions.
Class/Lab participation (group grade)	5	Class/lab exercises will be done in class.
Electricity test	10	Individual performance
Light test	10	Individual performance
Final Exam/Project	10	TBD

## K.22 PHYS 1200 Physical Science II

PHYS 1200 - Physical Science II - Syllabus

Fall 2014

### Physics 1200 -- Physical Science II 3 undergraduate credits, 4 hours Sections – 13552-01 & 14437-02

Instructor: Mr. J. Dignam, Geo/Physical Dept.  
Office: CDSC - 324  
Telephone: 978-665-3246 (Geo-Physical Dept.)  
E-mail: [jdignam@fitchburgstate.edu](mailto:jdignam@fitchburgstate.edu) –Best way to contact me.  
Office Hours: Tuesday & Thursday 11:00 a.m. – 12:00 p.m.

Course: Physical Science II, PHYS-1200, is a course designed to help students, not majoring in a science, develop a familiarity with many of the key concepts found in the Physical Sciences. Topics include the study of uniform and accelerated motion, projectiles, forces, mechanical energy, and heat. This course is also a member of the Quantitative Science Cluster - Q.

Objectives: There are three main student objectives: (1) Gaining factual knowledge of the physical sciences, including terminology, subject categorization, and methods of study; (2) Learning many of the fundamental principles, theories, and generalizations found in the physical sciences; and (3) Learning to apply course material to improve logical thinking and problem-solving.

Prerequisite: Math 0200 or equivalent. A pocket scientific calculator is essential for all lectures, labs, and exams.

Textbook: **Physical Science Custom for Fitchburg State University**, Pearson Publishing Company, also, **Mastering Physics** for the custom ed. of the text is the online homework and tutorial system required to access assignments and evaluations. **The Pearson Custom Library Text with Mastering Physics is available for purchase ONLY from the book store at a reduced cost.**

Class: Lectures meet in **CDSC 242**, Tuesday and Thursday from **12:30 to 1:45 PM**.  
Section 14437-02 Lab & Seminar meet Thursday in **CDSC242** from **2:00 to 3:15 PM**.

Attendance: Attendance at all lectures, seminars and laboratory sessions is required.  
**Note: If you need accommodations because of a documented disability or a need for special building evacuation arrangements, please discuss this with me before the second class.**

Assignments: Assignments will make up approximately **25%** of your final course grade. Textbook material should be reviewed prior to the day the topics are discussed in class. Questions and problems are assigned for each chapter (see the class assignment schedule). **Most assignments are internet based using the Mastering Physics program. Students must self-enroll once the text and program access are purchased. [www.masteringphysics.com](http://www.masteringphysics.com) Class ID is (MPDIGNAM79723). Late assignments are not accepted for full credit without a documented reason.** Text sections are assigned for you to re-study each week as you complete assignments.

Lab Exercise: There are tentatively 10 lab exercises designed for the semester. Each exercise is a hands-on activity or experiment, performed by lab partners. If you miss a lab exercise and you have documentation stating you have a legitimate reason, you may take an excused absence for the lab. With no make up. No more than one such excuse will be allowed for each person, and no other make-ups will be allowed during the semester. **Lab work will contribute approximately 25% toward your course grade.**

Quizzes: There will be frequent quizzes scheduled during the semester. Quizzes are short and concentrate on a single topic. Quizzes will be administered during the lecture classes or online. **The quiz grade will contribute approximately 25% of the final course grade. A documented reason for an absence is required for a make up.**

Exams: There will be a mid-semester exam and a comprehensive final exam. Exams are based on the homework, lectures and labs, and will assess your understanding of the basic concepts and principles studied during the semester. **Exams will contribute 25% of the course grade. A documented reason for an absence is required for a make up.**  
**Note: Students are reminded to review the College Academic Dishonesty Policy, found in the student handbook, as it applies to all aspects of this course.**

Grading Scale:	4.0	95 - 100%	3.0	83 - 85%	2.0	71 - 73%	1.0	60 -63%
	3.7	92 - 94%	2.7	80 - 82%	1.7	69 - 70%	0.0	0 - 59%
	3.5	89 - 91%	2.5	77 - 79%	1.5	67 - 68%		
	3.3	86 - 88%	2.3	74 - 76%	1.3	64 - 66%		

PHYS 1200 - Physical Science II Lecture, Assignment, and Laboratory Schedule

Fall Semester 2014

Date	Chapter	Lecture Topic - Text to study	Assignments – Due Tues. week after assigned	Lab Thursday (tentative)	Evaluation
Sep. 4		Prologue Nature of Science Pages 1 - 10	Hand Out- Measurement and Unit Conversion. Exercise: Units of Measure – refer to Appendix 197 - 201 <b>MP</b> assignment #1 Introduction to Mastering Physics. <b>MP</b> #2 Prologue, Nature of Science	<b>No Lab this week seminar</b> Make & Take Build a Metric Cube	
Sep. 9 - 11	1	Motion & Equilibrium Pages 14 - 24	<b>MP</b> assignment #3 Force & Motion	Measurement Techniques "Determining Pi" Lab.	
Sep. 16 - 18	1	Motion & Equilibrium Pages 24 - 30	<b>MP</b> assignment #4 Velocity & Acceleration	"Uniform Motion Lab Physical Science 500"	Quiz Measurement (Thursday) In lab.
Sep. 23 - 25	2	Newton's Laws of Motion Pages 41 - 56	<b>MP</b> assignment #5 Newton's Laws	Newton's 2 <sup>nd</sup> Law "Force and Motion" Lab	Quiz Motion (On-Line MP) (Available Thurs.)
Oct. 30 - 2	Appendix	Vectors Appendix Pages 192 to 195	Hand out – Vectors Parallelogram Method	Vectors "Vector Addition"	Quiz Newton's Laws (On-Line MP) (Available Thurs.)
Oct. 7 - 9	3	Momentum & Impulse Pages 69 - 78	<b>MP</b> assignment #6 Momentum	Work & Power "Power of a Student"	Quiz Vectors (Thursday) In lab
Oct. 14 - 16	3	Energy & Work Pages 78 - 89	<b>MP</b> assignment #7 Energy	<b>No lab This week Seminar</b>	
Oct. 21 - 23	1-3	Review for Mid-Term	<b>Study for Mid – Term Exam</b>	<b>No Lab this week Mid-Term Exam</b>	<b>Exam (Thursday)</b>
Oct. 28 - 30	4	Law of Gravity Pages 104 - 111	<b>MP</b> Assignment #8 Law of Gravity	Gravity, Free Fall "Reaction Time"	
Nov. 4 - 6	4	Projectile Motion Pages 111 - 125	<b>MP</b> Assignment #9 Projectile Motion	Projectile Motion	Quiz Gravity (On-Line MP) Available Thurs.
Nov. 11*-13	Appendix	Circular Motion, Torque Appendix , Pages 186 - 189	Hand Out – Circular Motion, Torque	<b>No Lab this week Veteran's Day seminar</b>	
Nov. 18 - 20	5	Thermal Energy (heat) Pages 135 - 140	<b>MP</b> Assignment #10 Heat Energy	Balanced Torques	Quiz Circular Motion Thursday
Nov. 25 – 27*	5	Specific Heat Capacity Pages 141 - 148	<b>MP</b> Assignment #11 Specific Heat	<b>No Lab this week Thanksgiving</b>	
Dec. 2 - 4	6	Heat Transfer, Pages 158 - 167	<b>MP</b> Assignment #12 Heat Transfer	Heat Capacity of Water "What is a Calorie"	Quiz Heat (On-Line MP) Available Thurs.
Dec. 9	6	Change of Phase Pages 168 - 174	<b>MP</b> Assignment #13 Change of Phase		
Dec. 11-17		<b>Semester Exam Period</b>	<b>Final Exam</b> <b>Wednesday December 17</b> <b>2:30 am – 4:30 pm</b>		

**Legend:** MP Mastering Physics online resources found at [www.masteringphysics.com](http://www.masteringphysics.com) Copies of needed Lab Instructions and course materials can be found on Black Board, in the course documents section.

J. Dignam, Geo./Physical Sciences Dept.

Fitchburg State University, MA

## K.23 PHYS 2300 General Physics I

General Physics I - Syllabus

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### Physics 2300 - General Physics I

4 undergraduate credits

Fall 2014

Professor: Dr. Jiang Yu, Dept. of Geo/Physical Sciences  
Office: Condiike Science 340  
Telephone: 978-665-3380  
E-mail: [jyu@fitchburgstate.edu](mailto:jyu@fitchburgstate.edu)  
Office Hours: 10:00 – 11:00 am, Mon, Tue, Wed; Thu by appointment.

#### Why take PHYS 2300?

PHYS 2300, or General Physics I, is designed to provide a foundation in physics for students of science, tech, and related majors (non-engineering/physics).

#### What is the Course?

Physics 2300 is the first course in a sequence of two in general college physics. The mathematical language required is algebra/trigonometry. The physics principles explored are of Newtonian Mechanics and Mechanical Waves. The course encompasses core scientific principles, theories, and processes that cut across subject boundaries and provide a broad way of thinking about the mechanical physical world. The following are the big ideas<sup>1</sup> binding the course together:

- 1) Objects and systems have properties such as mass and charge. Systems may have internal structure.
- 2) Fields existing in space can be used to explain interactions.
- 3) The interactions of an object with other objects can be described by forces.
- 4) Interactions between systems can result in changes in those systems.
- 5) Changes that occur as a result of interactions are constrained by conservation laws.
- 6) Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomena.

The method to study the Newtonian Mechanics and Mechanical Waves reflects and requires the following disciplinary practices<sup>1</sup>:

- Use representations and models to communicate scientific phenomena and solve scientific problems;
- Use mathematics appropriately;
- Engage in scientific questioning to extend thinking or to guide investigations within the context of physics;
- Plan and implement data collection strategies in relation to a particular scientific question;
- Perform data analysis and evaluation of evidence;
- Work with scientific explanations and theories; and
- Connect and relate knowledge across various scales, concepts, and representations in and across subject domains.

#### What is the Prerequisite of the course?

Math 1300, Pre-calculus, or equivalencies in Algebra and Trigonometry.

**General Physics I - Syllabus**

**2 of 4**

What Resources and Materials will be used?

1. Textbook: OpenStax College Physics, Urone et al, Rice University, eText
2. Homework Site: Sapling Learning, <http://saplinglearning.com> (See page 4 for enrollment instructions)
3. Internet Resource: [phet.colorado.edu](http://phet.colorado.edu)
4. A scientific or engineering calculator (Calculators on cell phones/tablets will not be allowed during tests.)
5. A three-ring binder for collecting class notes, in-class exercises, labs, etc.

How will the class run and What will I do to succeed?

The class meets two times a week: one for 75-min (short meet) and one for 3 hours and 15 min (long meet, which includes a 15-min break). In the short meet of each week, you will be surveyed first for the content knowledge of the chapter (see Class Schedule and Topic Outline in a separate document), after that the scientifically acceptable answers will be displayed and discussed so you will know where your starting point is for the topics. Following that, the content knowledge of the chapter will be outlined and the associated scientifically accepted laws and theories will be introduced. This should make clear what you need to study to bring your understanding of the material to the level of your desire. The long meet will be a couple days later, which will focus your attention for in-depth discussions, tasks, hands-on-activities, and labs, all will let you to exercise your understanding of the material and your explanation by reasoning upon studying the textbook material, aided by online materials, tutorials, exercises, assigned homework tasks and problems. Between the short meet and long meet is the critical time in which you'll actively study the textbook, work on the assignments (see Sapling Homework Site instruction below), and prepare for further discussions in the long class meet there you can be helped on questions and difficulties that you come with from your own study. This course runs on a "flipped" style – you actively study the material at your own time/style and class time is used for you to clarify your understanding of what you studied and ask questions. Physics is not an easy subject and the course is not designed to be an easy one. The key to your success lays in your effort and diligence - How seriously you take the course and how determined you are to do well will be the ultimate determinants of your success! Work hard, ask lots of questions, persevere, and you will be rewarded. Note: laboratory experiments are an essential component of the course that reinforce the essential knowledge and develop skills in the science practices. As such, laboratory investigations are imbedded with the study of the content knowledge and they are the main hands-on activities during class meetings throughout the semester, short or long, along with other class activities.

What will be graded?

1. Study notes and questions (5%): You should take notes by hand while study the textbook. When you come to the long meet, you need to have three questions highlighted in your notes that you may require clarification (concepts, laws, or a problem scenario), discussion (strategies and techniques), and/or help (reasoning and mathematical thinking) on the physics you just studied at home. This can help you and the class to address the very questions you have.
2. Chapter homework (bonus, up to 20% into respective test scores): This will be submitted online at the Sapling Learning website (<http://saplinglearning.com>); each question is allowed to be tried and submitted three times for credit. It is crucial for you in the course to do well that you practice applying your knowledge and problem solving skills by completing the homework assignments. The only way to learn physics is to do physics! Completing the assignments allows you to find your strengths/weaknesses as well as allowing you to address and re-study the content for improvement. As for the class contribution, doing homework makes in-depth class discussion possible and hence makes the class better.

3. In-class assignments (10%): During class discussions, sense-making tasks such as qualitative ranking, drawing graphs, filling charts, making logical arguments, or quantitatively solving problems, etc. may be assigned to let you exercise and demonstrate the knowledge and skills you have acquired or are developing. This should keep the class checked and attention focused. Throughout the course, emphasis is placed more on the concepts and method of solution or analysis, and less on the actual final product or answer.
4. Quizzes (15%): Throughout the semester at appropriate junctures in the material you will be quizzed on your knowledge and understanding. The quizzes will be completed in class, but will not consume a lot of time. The quiz questions will be largely multiple-choice, but could be free response as well.
5. Labs (25%): As the physics material is being covered throughout the semester, labs are done at a time to best reinforce the relationships and concepts currently being studied. Some labs will be presented to you with an objective and a clear procedure to follow; however others will not be this straightforward. Oftentimes you will be presented with a problem and some equipment and you will be expected to develop your own procedure, method for collecting data, and analysis of the data to find a logical solution/answer – this is called guided inquiry. Labs will help to familiarize you with the science practices and require you to apply practical, logical, and mathematical skills through a hands-on/visual approach. You are required to keep a lab notebook and write lab reports to present problems/objectives, background/theory, lab design, equipment, procedures, observations, data and data tables, analyses/graphs/calculations, results and conclusions.
6. Unit tests (30% = 3 x 10% on each test): Three unit tests are scheduled (see Class Schedule and Topics Outline). Unit test questions will be similar to the quiz and homework questions as well as in-class assignments and problems. If you miss a test with a legitimate reason (by a written document, such as a police report of an accident or a doctor's statement of a medical emergency), you should contact me ASAP for a make-up. Note: You should expect a slightly higher level of difficulty, for you will have the knowledge of the original test as well as more time for preparation.
7. A cumulative and comprehensive post-test (MBT, 15%) will be given near the end of the semester, which consists of multiple choice questions mainly and a few open response questions possibly.

#### How will my grade be determined?

All scores will be expressed in percentages of correct to possible points (method A). All compounded final scores (of all three course sections combined) will also be ranked by percentiles (method B). Your course grade will be determined based on your scores in A or rank in B, whichever yields you a higher grade.

#### Method A:

Final Score (%)	90	85	80	75	70	65	60	55	50	45	40	35	30	
Grade	4.0	3.7	3.5	3.3	3.0	2.7	2.5	2.3	2.0	1.7	1.5	1.3	1.0	0.0

#### Method B:

Final Rank (%)	90	85	80	75	70	65	60	55	50	45	40	35	30	
Grade	4.0	3.7	3.5	3.3	3.0	2.7	2.5	2.3	2.0	1.7	1.5	1.3	1.0	0.0

#### What else do I need to know?

1. If you miss a class, it is your responsibility to submit all assignments by deadline as well as keep yourself abreast with the class work. You should expect no reviews of class work during office hours, excuses for any late submissions, or make-up any missed class work while absent.
2. Late homework will earn no credit.



**General Physics I - Syllabus**

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3. All lab reports are expected to be turned in by the beginning of the next class meet, short or long. A late lab report may be accepted with a 50% grade reduction after the deadline and earns no credit beyond 7 calendar days after the lab is performed. A revision will be allowed to recapture 50% maximum of the unearned points, if your original report was not submitted late.
4. All your submitted work – lab reports and tests, for example – will be returned to you in the next class meeting after they are collected. Sometimes returned work may be recollected for grade recording purpose, then they will be returned to you in the following class meeting.
5. Cell phones, iPods/tablets, personal laptops are not allowed in class, unless I ask you to use it for class work. At default, they should be turned off and stowed away. Should any offenses occur, I reserve the right to reduce your next in-class assignment grade by 20%.
6. Food and drink are not allowed to enter the labs according to the university's lab safety regulations. You will have to leave them outside of the classroom at all times.
7. If you missed a class due to a legitimate reason proved by a written document, you should get in touch with me ASAP to have a make-up plan.
8. If you require academic accommodations for disability, please contact Disability Services as soon as possible and provide me with a copy of your established accommodation agreement so we can discuss your specific needs. Any information you share with me will be held in the strictest confidence, unless you give me permission to do otherwise.
9. I give my trust to you on following the university's established policy on academic honesty and plagiarism. While peer discussion is encouraged, each one of you is expected to do your own work including homework, lab reports, and tests. For lab reports, partners share data but not analysis and/or write-ups.
10. You earn your grade by demonstrating your understanding but not by your desire or effort alone. There will be no extra-credit work granted for the purpose of making up missed credits under any circumstances. I also reserve the right to alter grade calculation formula.

Sapling Learning enrollment instructions:

1. Go to <http://saplinglearning.com> and click on "US Higher Ed" at the top right.
- 2a. If you already have a Sapling Learning account, log in and skip to step 3.
- 2b. If you have a Facebook account, you can use it to quickly create a Sapling Learning account. Click "Create an Account", then "Create my account through Facebook". You will be prompted to log into Facebook if you aren't already. Choose a username and password, then click "Link Account". You can then skip to step 3.
- 2c. Otherwise, click "Create an Account". Supply the requested information and click "Create My Account". Check your email (and spam filter) for a message from Sapling Learning and click on the link provided in that email.
3. Find your course in the list (you may need to expand the subject and term categories) and click the link.

Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. During sign up or throughout the term, if you have any technical problems or grading issues, send an email to [support@saplinglearning.com](mailto:support@saplinglearning.com) explaining the issue. The Sapling Learning support team is almost always faster and better able to resolve issues than your instructor.

Reference:

<sup>1</sup>[http://media.collegeboard.com/digitalServices/pdf/ap/ap\\_physics1\\_2page\\_course\\_overview.pdf](http://media.collegeboard.com/digitalServices/pdf/ap/ap_physics1_2page_course_overview.pdf)

# General Physics I – Class Schedule & Topic Outline

1 of 1

Date	Textbook Material	Topics	Homework on Sapling Learning	Possible Activities and Labs	Focus questions to answer	Unit Test
9/4-10	Intro Chapter 1	Math Review Nature of Science Studies	Practice Assignment Math Review Nature of Science	FCL, Math Diagnose		
9/11-17	Chapter 2	Kinematics: 1D	1D Kinematics	Lab 1: Free fall: Measurement of g	How to describe an object in motion? Example: how to describe a free fall by concepts, graphs, and equations?	
9/18-24	Chapter 3	Kinematics 2D	2D Kinematics	Lab 2: Projectile Motion: Measurement of initial speed	How to describe an object in a 2D motion? Example: What are the characteristics of the motion of a baseball after thrown and left your hand?	
9/25-10/1	Chapter 4	Dynamics: Forces, Newton's Laws of Motion, Application of Newton's Laws	Dynamics	Lab 3: Atwood's Machine: Measurement of g	What does a force do to an object in motion? What is changed and how to describe the change? What factors affect the result of the change?	
10/2-8	Chapter 5	Dynamics with friction	Further applications of Newton's laws	Lab 4: Newton's 2 <sup>nd</sup> law	What is friction? What would it look like in a frictionless world?	
10/14-16				Tom's Tests		I: 2-4
10/9-22	Chapter 6	Universal Gravitational Law Circular Motion	Circular Motion and Gravitation	Lab 5: Circular Motion: Measurement of g	Why does Earth revolve around Sun? What causes a moving object to go in circles?	
10/23-29	Chapter 7	Work & Mechanical Energy Conservation of Mechanical Energy	Work and Energy	Lab 6: Work, Energy, and Power	What is added to or taken away from an object by a force? What has changed?	
10/30-11/5	Chapter 8	Impulse & Momentum Conservation of momentum	Linear Momentum	Lab 7: Ballistic Pendulum	What does Newton's 2 <sup>nd</sup> Law say about "inertia"? Do things really change when they are in motion?	
11/6-13	Chapter 9	Torque & Statics	Statics and Torque	Lab 8: Measurement of the mass of a rod	What keep an object static?	II: 6-8
11/17-24	Chapter 10	Rotational kinematics, Torque & rotational dynamics Newton's laws in rotation, Rotational energy and angular momentum, Conservation of energy and angular momentum	Rotational Motion	Lab 9: Measurement of rotational inertia	Am I able to apply all the concepts/laws that I have learned so far to a new situation called rotation? What new concepts do I need to add on?	
11/24-12/3	Chapter 16	Simple Harmonic Motion: Simple pendulum Mass-spring oscillations Mechanical waves	Oscillations and Waves	Lab 10: SHM: Spring-Mass Oscillation, Simple Pendulum	What natural systems can help us to keep time?	
12/4-10	Chapter 17	Sound as a mechanical wave, Hearing	Hearing	Lab 11: Speed of Sound	We could hear before we were born. How do we describe Sound?	III: 9-10 & 16
12/15-17						IV: MBT & 17

## K.24 PHYS 2400 General Physics II

General Physics II - Syllabus

1 of 3

### Physics 2400 -- General Physics II

4 undergraduate credit hours

Spring 2013

Sections 240001 & 240002

Professor: Dr. Jiang Yu, Dept. of Geo/Physical Sciences  
Office: Condi Science 310E  
Telephone: 978-665-3380  
E-mail: [jyu@fsc.edu](mailto:jyu@fsc.edu)  
Office Hours: Tuesday, Wednesday, Thursday, 1000 – 1100

Course: Physics 2400 is the second course of a sequence of two in college physics employing algebra/trigonometry and deals with electricity/magnetism, oscillations /waves, and light.

Objectives: (1) Study the established principles and laws, (2) learn the methods of observing/ measuring and analyzing physical reality, and (3) apply the laws and methodology of physics to solve physical problems.

Prerequisite: PHYS 2300, General Physics I. **Note: If you don't satisfy this prerequisite, you will be dropped from the class unless you have my permission.**

Textbook: College Physics, 2<sup>nd</sup> ed., by Knight & Jones, Pearson Educational Inc, 2010.

Ancillaries: A scientific or engineering calculator, Blackboard and Mastering Physics (Course code: MPYU20130102).

Attendance: Attendance to all lectures and laboratory sessions is expected. **The percentage of you attendance will be used to weigh your non-test scores (quizzes, class participation, homework, lab and report) in calculating your final course grade.** Should you miss a class, you should understand that it is your responsibility to complete and submit all assignments by deadlines as well as keep yourself abreast with the class work. You should not expect reviews of class work during office hours, or acceptance of any late submissions.

Textbook Material: Your success of this course lies on your study and understanding of the textbook material and active participation in the class/lab discussions. The classroom and lab are grounds where you seek help, perform, and interact with others. Remember: Group interaction is encouraged as a means of the course, while individual understanding is the goal of study.

Reading Quiz/Tutorial: A textbook reading quiz/tutorial will be given on Mastering Physics for each chapter prior to class discussion. Reading quiz/tutorials are graded for credit.

Homework: Problems from each chapter will be assigned for homework, giving on Mastering Physics. You can ask questions about homework in class, but you should start with an explanation of what concepts, laws, or math concerning a particular item is troubling you.

Lab Exercise: Lab exercises are experiments performed by two to four students as lab partners. Lab experiments are designed to help deepen your understanding of the theories, and so study the lab material before coming to the lab is important and expected. Lab material will be posted on Blackboard and a lab quiz will be given on Mastering

Physics based on it. Upon completion of the lab you will complete a report individually. All lab reports are expected to be printed and submitted in the beginning of the next class meeting after the lab is performed. A late lab report may be submitted, but a 20% grade reduction will be counted for each calendar day. Missed labs cannot be made up due to practical reasons, however in calculating your lab grade for the semester one lowest scored lab will be dropped, which includes missed labs. **Note: PHYS 2400 is a lab science course; lab component is mandatory. To receive a non-zero course grade, a minimum of 8 labs must be completed.**

Tests: Two tests will be given, one on Electricity and Magnetism and the other on Oscillations/Waves and Light. Test questions will be drawn from or similar to reading quiz questions, homework problems, and textbook/lecture examples. If you miss a test with a legitimate reason (which means you presented a written proof, such as a police report of an accident or a doctor's statement of a medical emergency), you may take a make-up test. However, since you will have more time to prepare for the make-up, you should expect it at a slightly higher level of difficulty than the original test.

Proficiency: A comprehensive proficiency test will be given at the end of the semester, which consists of multiple choice questions only.

**In Addition:**

Disability Assistance: If you require academic accommodations for disability, please contact Disability Services as soon as possible and provide me with a copy of your established accommodation agreement so we can discuss your specific needs. Any information you share with me will be held in the strictest confidence, unless you give me permission to do otherwise.

Academic Integrity: I give my trust to you on following the college's established policy on academic honesty and plagiarism. **While peer discussion is encouraged, each one of you is expected to do your own work including homework, lab report, and tests. For lab reports, partners share data but not analysis and/or write-ups.**

Laptop, Cell phone And food: Laptops are not allowed in lectures or labs, unless I permit you to in special cases. Cell phones must be turned off and stowed away; no texting is permitted. Food and drinks are not allowed to enter the labs according to the college's lab safety regulations.

Grade Calculation: See next page

**General Physics II - Syllabus****3 of 3**

Grade Calculation:

Performance	Credit Weight (%)	Note
Textbook study:		One chapter per week.
Study Quiz/Tutorial	10	A quiz will be given on Mastering Physics.
Class participation	20	Your active participation is anticipated, which will demonstrate your preparation for the class and lab including studying, problem solving, etc.
Homework Problems	20	Chapter problems are assigned each week; submission is on Mastering Physics.
Lab quiz, participation, and report	20	Lab material will be posted on Blackboard
Tests	20	Individual performance; closed book/notes, equations provided.
Final comprehensive	10	Closed book/notes, no equations given, calculators allowed.

## K.25 PHYS 2000 Astronomy

# Astronomy (Physics 2000) Fall 2014

## Syllabus

Bruce Duncan, Geo/Physical Sciences Dept.

Office: 220A in the Condiike Science Building Phone: 3228

Office hours: Monday 12:30-2:00, Tuesday 10:00-11:30 and by appointment

Email: [bduncan2@fitchburgstate.edu](mailto:bduncan2@fitchburgstate.edu)

Class sessions are Monday, Wednesday and Friday starting at 11:00 a.m. in Condiike 350. What laboratories we will have will take up class time and will probably be held here, as well. This is a three credit hour class.

### Description

The description of this course is as follows:

After a brief introduction to the history of astronomy in Western civilization we discuss at an elementary level how light is produced and how telescopes work with light. In turn we then examine the solar system (comparative planetology) and stars (stellar interiors and stellar evolution), and in the end consider the birth and death of the universe (introductory cosmology).

### Prerequisite

None. Any math past arithmetic will be taught (and learned!) during the term. You should immediately let me know when the math gets tough. **This is a Quantitative course, so there will be quantitative exercises in every exam!**

### Some interesting websites (there are many more!)

[hubblesite.org](http://hubblesite.org)

[skyandtelescope.com](http://skyandtelescope.com)

[NASA](http://NASA)

[Harvard-Smithsonian Center for Astrophysics](http://Harvard-Smithsonian Center for Astrophysics)

[American Astronomical Society](http://American Astronomical Society)

[U. of Washington Intro Astronomy](http://U. of Washington Intro Astronomy) and their [new site](#)

[National Maritime Museum/Royal Observatory Greenwich](http://National Maritime Museum/Royal Observatory Greenwich)

or you can download GoogleEarth and look at the moon and at Mars.

## Resources

Text: The Cosmic Perspective: Stars & Galaxies, 7th ed., Bennett, Donahue, Schneider and Voit, plus the accompanying cd.

The access code to masteringastronomy, which is how homework will be done. Our courseid is nnnnnnnnn.

A scientific/engineering calculator is useful. We will provide you with one for use during class time.

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## Disability policy

Fitchburg State encourages the full participation of individuals with disabilities in all aspects of campus living and learning.

To support access and inclusion, Fitchburg State offers reasonable accommodations to students who have documented disabilities (e.g. psychical, learning, psychiatric, sensory, etc.). If you require accommodations for this class, please provide me with a copy of your Accommodation Agreement as soon as possible so that we can discuss your specific needs. Any information that you share with me will be held in the strictest confidence, unless you give me permission to do otherwise.

If you require academic accommodations but do not have an Accommodation Agreement, please contact Disability Services as soon as possible to establish your eligibility for services. For more information, or to schedule an appointment, please call 978.665.4020 (voice/relay). Disability Services is located in the Academic Support Center on the third floor of the Hammond building.

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## Fire policy

These steps must be followed whenever the fire alarm in your building sounds:

1. All occupants must exit the building.
  2. Do not use the elevator as a means of exit.
  3. No one may reenter the building until proper authorization is received and communicated by Campus Police or a public safety official.
- 

## The Rules

**Rule #0:** Phones, Blackberries, iPods and the like are to be turned off. Computers are to be used only with my permission.

**Rule #1:** The grading scheme:

course grade =  $0.20 \times$  (homework average out of 4)  
+  $0.10 \times$  (lab average out of 4)  
+  $0.10 \times$  (presentation out of 4)  
+  $0.36 \times$  (midterm average average out of 4)  
+  $0.24 \times$  (final exam out of 4)

I reserve the right to change the grading structure. Although no separate grade is assigned to the lab component of the course, you must have a passing grade in the labs in order to pass the course as a whole. The final exam will be in the class's assigned final slot (whenever that may be; currently scheduled for Thursday Dec. 11 from 12:20 to 2:20), and it will look a lot like the mid-term exams, except longer. There are no special projects, and there is no way to improve a grade.

**Rule #2:** All quizzes and exams should be considered comprehensive. The presentations will be short (about 15 minutes in duration plus an additional 2 minutes for questions). A list of sample projects will be provided early in the term; see below for a preliminary list. All students should see me for advice on their topics. A student who prefers to present a topic not on the list should speak with me for my approval. Those topics not chosen by the class either I will cover or they will be omitted.

- 01 Astronomical distances
- 02 Kepler's Laws and Newton's form of Kepler's Third Law
- 03 Calendars
- 04 Light
- 05 Telescopes
- 06 Special Relativity 1
- 07 Special Relativity 2
- 08 Sun's conversion of mass-energy: proton-proton chain, CNO process
- 09 Stellar interior and atmosphere
- 10 Mercury
- 11 Venus
- 12 Moon
- 13 Earth?
- 14 Mars
- 15 Jupiter
- 16 Saturn
- 17 Uranus & Neptune
- 18 Pluto & Eris & Ceres & asteroids & comets & ...
- 19 Solar system formation
- 20 Stellar luminosity, magnitude and distance
- 21 Wien's Law, Stefan-Boltzmann Eqn.
- 22 General Relativity, especially the Correspondence Principle
- 23 Quantum Mechanics, especially the Heisenberg Uncertainty Principle
- 24 Evolution of stars of less than 2 solar masses
- 25 Evolution of stars of 2 to 8 solar masses



- 26 Evolution of stars of greater than 8 solar masses
- 27 White dwarfs and neutron stars
- 28 Black holes
- 29 Dark matter
- 30 Galaxy formation, galaxy clusters
- 31 Birth of the universe, part 1: Planck Era through Nucleosynthesis
- 32 Birth of the universe, part 2: Recombination to the present
- 33 Cosmic Microwave Background Radiation
- 34 Death of the universe, part 1: curvature
- 35 Death of the universe, part 2: dark energy

**Rule #3:** Homework will be handled electronically through "Mastering Astronomy." The exams will prove extremely formidable to students who have not done the homework. Difficult problems may be worked out in class.

**Rule #4:** You are expected to attend every meeting of this course, although attendance itself does not figure into your grade. Take notice: sometimes I discuss topics not included in the text. Because the Registrar likes to know these things, attendance will be taken every class for the first few weeks and again beginning around Week 9, in addition to other random samplings. If you know that you are going to miss an exam or lab, please let me know at least a day or two in advance. Be forewarned: a make-up test is likely to be more difficult than the regular test.

**Rule #5:** No cheating. Please read the appropriate documents on academic honesty and plagiarism; you may find this link useful: [Academic Integrity](#). An honest low grade is better than a dishonest high one. I may require on tests that you write out the following: "I neither gave nor received aid." The situation with labs is complicated. Usually all lab partners would have the same data; however, each student should perform the analysis and write-up **individually**.

**Rule #6:** There is NO Rule 6!

**Rule #7:** Email communication will be through your Fitchburg State accounts. If you email me on or after Friday afternoon, do not expect a prompt answer. Also check out the class pages on Blackboard on a regular basis.

**Rule #8:** Until you have your degree in your hand do not throw anything away; stick it in a folder, stick it in a box, put it in a pile in your room, but do not throw anything away.

**Rule #9:** If something is worth doing, it's worth doing on time, even if badly...but don't do it badly! Late material without written permission from me will penalized one whole grade for each week of tardiness. Other humiliations may be meted out, as well.

**Rule #10:** I treat my students as responsible persons, which means it is your responsibility to learn the astronomy, no matter how awful you think I am as a teacher or the book as a text. Furthermore, it is your responsibility to learn the ideas and master the skills introduced here, turning in all work in a timely fashion, whether you've attended a particular meeting or not. It is my responsibility to guide you through your learning, i.e., I create situations in which you can teach yourself.

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## Great Expectations

1. As this is a Q class, there is a certain level of mathematical skills used. Every skill beyond simple arithmetic will be demonstrated once in class and will probably be used at least once in homework before being used in the midterm evaluations. **These skills include converting from one set of units to another, using powers and roots, and logarithms.**

2. Our college is located in a city and thus subject to urban light pollution; furthermore, Fitchburg seems to have a lot of cloudy nights. These conditions conspire to limit our ability to view the night sky, and yet one cannot pass an introductory astronomy course without knowing some celestial objects. Thus we will use a computer ephemeris to display what we *would* see if we had dark, dry skies. **Students will learn several important stars and constellations.** In addition students will learn to use that rather specialized tool, the star globe.

3. There is no writing component to the class; however, there is a substantial nomenclature which must be mastered. **Studying science requires students to acquire a specialized vocabulary** at the rate they would if they were studying a foreign language. New terms should be learned immediately.

4. One goal of instruction in any discipline is to bring students to the point of being independent learners. In this course that means **being able on one's own to read and understand the text**, acquiring the skills used therein.

## **K.26 PHYS 2600 Calculus-based Physics I**

# **Calculus-based Physics I (Physics 2600) Spring 2012 Proposed Syllabus**

Bruce Duncan, Geo/Physical Sciences Dept.

Office: C-310C in the Condiak Science Building Phone: 3228

Office hours: M 9:00-10:30 and W 9:00-10:30 and by appointment Email: [bduncan2@fitchburgstate.edu](mailto:bduncan2@fitchburgstate.edu)

Class sessions and laboratories will be scheduled at mutually agreeable times.

### **Description**

A description of this course:

The principles and applications of classical mechanics and heat are studied using the language of calculus. SMT

### **Prerequisite**

Prerequisite: Math2400. You should immediately let me know when the math gets tough.

### **Resources**

Text: Physics for scientists and engineers, 2nd ed., Randall Knight. The goal is to learn chapters 1 through 19 (probably skipping Ch. 14) this semester.

The access code to masteringphysics, which is how homework will be done.

A scientific/engineering calculator is useful. Don't get the \$80 variety but rather the \$15 to \$20 kind. If you already have the \$80 kind, that's fine.

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### **Disability policy**

Fitchburg State College encourages the full participation of individuals with disabilities in all aspects of campus living and learning.

To support access and inclusion, FSC offers reasonable accommodations to students who have documented disabilities (e.g. physical, learning, psychiatric, sensory, etc.). If you require accommodations for this class, please provide me with a copy of your Accommodation Agreement as soon as possible so that we can discuss your specific needs. Any information that you share with me will be held in the strictest confidence, unless you give me permission to do otherwise.

If you require academic accommodations but do not have an Accommodation Agreement, please contact Disability Services as soon as possible to establish your eligibility for services. For more information, or to schedule an appointment, please call 978.665.4020 (voice/relay) Disability Services is located in the Academic Support Center on the third floor of the Hammond building.

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## Fire policy

These steps must be followed whenever the fire alarm in your building sounds:

1. All occupants must exit the building.
  2. Do not use the elevator as a means of exit.
  3. No one may reenter the building until proper authorization is received and communicated by Campus Police or a public safety official.
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## The Rules

**Rule #0:** No food or drink is allowed in this room or the laboratory. Phones, Blackberries, iPods and the like are to be turned off. Computers are to be used only with my permission.

**Rule #1:** The proposed grading scheme:

course grade =  $0.06 \times$  (homework average out of 4)  
+  $0.50 \times$  (average out of 4 of two or three midterm exams)  
+  $0.30 \times$  (final exam out of 4)  
+  $0.14 \times$  (lab average out of 4)

I reserve the right to change the grading structure. Although no separate grade is assigned to the lab component of the course, you must have a passing grade in the labs in order to pass the course as a whole. An as yet undetermined number of unannounced quizzes may be given. The final exam will be in the class's assigned final slot, and it will look a lot like the mid-term exams, except longer. There are no special projects and no way to improve a grade.

**Rule #2:** All quizzes and tests should be considered comprehensive.

**Rule #3:** Homework will be handled electronically via [www.masteringphysics.com](http://www.masteringphysics.com). The problem sets and their due dates are set electronically and cannot be altered once a set has been made available. The exams will prove extremely formidable to students who have not done the homework. Difficult problems may be worked out in class.

**Rule #4:** You are expected to attend every meeting of this course, although attendance itself does not figure into your grade. If you know that you are going to miss a quiz, exam or lab, please let me know at least a day or two in advance. Be forewarned: a make-up assignment is likely to be more difficult than the assignment.

**Rule #5:** No cheating. Please read the appropriate documents on academic honesty and plagiarism; you may find this link useful: [Academic Integrity](#). An honest low grade is better than a dishonest high one. I may require on assignments that you write out the following: "I neither gave nor received aid." The situation with labs is somewhat complicated. Certainly all lab partners should have the same data; however, each student should perform the analysis and write-up **individually**.

**Rule #6:** There is NO Rule 6!

**Rule #7:** Email communication will be through your Fitchburg State accounts. If you email me on or after Friday afternoon, do not expect a prompt answer.

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in a box, put it in a pile in your room, but do not throw anything away.

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**Rule #10:** I treat my students as responsible persons, which means it is your responsibility to learn the physics, no matter how awful you think I am as a teacher or the book as a text. Furthermore, it is your responsibility to learn the ideas and master the skills introduced here, turning in all work in a timely fashion, whether you've attended a particular meeting or not. It is my responsibility to guide you through your learning, i.e., I create situations in which you can teach yourself.

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## **Great Expectations**

1. As this is a Q class, and as you can tell from the class's title, there is a certain level of mathematical sophistication expected. Most skills beyond simple algebra will be demonstrated once in class and will probably be used at least once in homework before being used in the midterm evaluations. These skills include converting from one set of units to another, using powers and roots, solving quadratic equations, solving simultaneous equations, logarithms, differentiation and integration.

2. The writing component to the class is rather minor, mostly in the form of two or three (or zero) formal lab reports; however, there is a substantial nomenclature which must be mastered. Studying science requires students to acquire a specialized vocabulary at the rate they would if they were studying a foreign language. New terms should be learned immediately.

3. One goal of instruction in any discipline is to bring students to the point of being independent learners. In this course that means being able on one's own to read and understand the text, acquiring the skills used therein.

## **K.27 PHYS 2700 Calculus-based Physics II**

### **Calculus-based Physics II (Physics 2700) Fall 2012 Proposed Syllabus**

Bruce Duncan, Geo/Physical Sciences Dept.

Office: C310-C in the Condike Science Building Phone: 978-665-3228

Office hours (tentative): Monday and Wednesday from 9:00 to 10:30, after class and by appointment

Email: [bduncan2@fitchburgstate.edu](mailto:bduncan2@fitchburgstate.edu)

Class sessions are Monday, Wednesday and Friday at 9:30 a.m. in Condike 307; laboratories (Tuesday and Thursday at 8:00) will sometimes be held in Condike 305, sometimes in 307. This is a four credit hour class.

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#### **Required stuff**

Text: Physics for scientists and engineers, 2nd ed., Randall Knight. The goal is to learn chapters 14, 20-23 and 26-36 this semester.

The access code to masteringphysics, which is how homework will be done. If you had a code in the spring, it should still be valid.

A scientific/engineering calculator is useful. Don't get the \$80 variety but rather the \$15 to \$20 kind.

The catalog description of this course is as follows:

The principles and applications of classical electricity, magnetism and optics are studied using the language of calculus.

This of course doesn't tell you much. In essence we'll discuss the same topics as the general physics course:

This second-semester general college physics course consists of studies and applications of wave motions, sound, electricity, magnetism, light and optics. Typical topics include Coulomb's law, electric force and field, potential and capacitance, electric circuits, magnetic force and field, magnetic forces on moving charges, electric induction, laws of reflection and refraction, mirrors and lenses, optical instruments, interference and diffraction of light. Q Prerequisite: PHYS 2600.

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To support access and inclusion, Fitchburg State offers reasonable accommodations to students who have documented disabilities (e.g. physical, learning, psychiatric, sensory, etc.). If you require accommodations for this class, please provide me with a copy of your Accommodation Agreement as soon as possible so that we can discuss your specific needs. Any information that you share with me will be held in the strictest confidence, unless you give me permission to do otherwise.

If you require academic accommodations but do not have an Accommodation Agreement, please contact Disability Services as soon as possible to establish your eligibility for services. For more information, or to schedule an appointment, please call 978.665.4020 (voice/relay) Disability Services is located in the

Academic Support Center on the third floor of the Hammond building.

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  3. No one may reenter the building until proper authorization is received and communicated by Campus Police or a public safety official.
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## The Rules

**Rule #0:** No food or drink is allowed in this room or the laboratory. Phones, Blackberries, iPods and the like are to be turned off. Computers are to be used only with my permission.

**Rule #1:** The proposed grading scheme:

$$\begin{aligned}\text{course grade} &= 0.06 \times (\text{homework average out of 4}) \\ &\quad + 0.50 \times (\text{average out of 4 of two or three midterm exams}) \\ &\quad + 0.30 \times (\text{final exam out of 4}) \\ &\quad + 0.14 \times (\text{lab average out of 4})\end{aligned}$$

I reserve the right to change the grading structure. Although no separate grade is assigned to the lab component of the course, you must have a passing grade in the labs in order to pass the course as a whole. An as yet undetermined number of unannounced quizzes may be given. The final exam will be in the class's assigned final slot, and it will look a lot like the mid-term exams, except longer. There are no special projects and no way to improve a grade.

**Rule #2:** All quizzes and tests should be considered comprehensive.

**Rule #3:** Homework will be handled electronically via [www.masteringphysics.com](http://www.masteringphysics.com). The problem sets and their due dates are set electronically and are difficult to alter once a set has been made available. The exams will prove extremely formidable to students who have not done the homework. Difficult problems may be worked out in class.

**Rule #4:** You are expected to attend every meeting of this course, although attendance itself does not figure into your grade. If you know that you are going to miss a quiz, exam or lab, please let me know at least a day or two in advance. Be forewarned: a make-up assignment is likely to be more difficult than the assignment.

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### **Great Expectations:**

1. As this is a calculus-based class, a certain level of mathematical sophistication is expected of the students; however, every skill beyond simple arithmetic will be demonstrated once in class and will probably be used at least once in homework before being used in the midterm evaluations.
2. The writing component to the class is rather minor, mostly in the form of two or three formal lab reports; however, there is a substantial nomenclature which must be mastered. Studying science requires students to acquire a specialized vocabulary at the rate they would if they were studying a foreign language. New terms should be learned immediately.
3. One goal of instruction in any discipline is to bring students to the point of being independent learners. In this course that means being able on one's own to read and understand the text, acquiring the skills used therein.



ὥσπερ ξένοι χαίρουσι πατρίδα βλέπειν,  
οὕτως καί τῳς κάμνουσι βιβλίου τέλος.

As aliens rejoice to see their homeland,  
so also to those who labor is the end of a book.

*a common colophon of medieval copyists.*