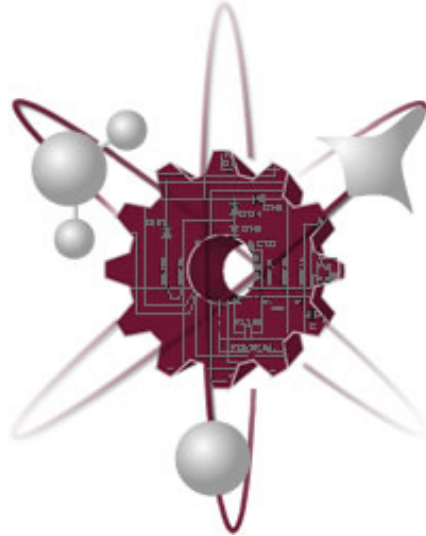


# Criterion 7: Facilities

## Engineering Physics

Bachelor of Science in Engineering Physics



## Self-Study Report

New Mexico State University



June 2012

## CRITERION 7. FACILITIES

### A. Offices, Classrooms and Laboratories

*Summarize each of the program's facilities in terms of their ability to support the attainment of the program educational objectives and student outcomes and to provide an atmosphere conducive to learning.*

**Offices:** Physics faculty members have individual offices in *Gardiner Hall*, on the 2<sup>nd</sup> and 3<sup>rd</sup> floors. Each office is about 190 sq. ft. After the recent renovation of *Gardiner Hall*, all offices have modern furniture, thermostatically controlled HVAC, hardwired internet, and multi-function telephones with teleconferencing, messaging, call-forwarding, etc.

Graduate students have offices either in large office suites broken up into cubicles, or they share smaller faculty-sized offices in various locations in the building.

**Classrooms:** The Department of Physics conducts almost all of its lecture classes in four classrooms in *Gardiner Hall*. All four classrooms have multi-media capabilities.

The largest classroom, *Gardiner 230*, seats about 100 students; this classroom is used for the large engineering classes, such as *PHYS 215* and *216*. The next largest, *Gardiner 229*, seats about 60 students; this is used for the smaller more intensive classes *PHYS 213, 214, 217, and 315*. *Gardiner 218A*, which seats about 20 students, is used for upper-division classes like *PHYS 454, 455, 461, 462, 480*, etc. *Gardiner 218* is a highly flexible multi-media classroom with circular tables and multiple PC displays, more suited for a workshop atmosphere and remote instruction, and it is used for instructional seminars and other somewhat informal instructional support functions.

**Laboratories:** The Department of Physics supports a variety of instructional laboratories. Four large labs, *Gardiner 104, 108, 204, and 206* (each about 1250 sq. ft.) are used for the *Introductory Laboratory* classes *PHYS 213L, 214L, 215L, 216L, and 217L*. The *Modern Physics Laboratory, PHYS 315L*, is run in a dedicated lab space, *Gardiner 132*, which is about 800 sq. ft. in size. The *Advanced Physics Laboratory, PHYS 475*, is operated in several laboratory spaces throughout *Gardiner Hall*, some of which are also research laboratories. In the advanced *PHYS 315L* and *475* labs, the students are required to do some experimental design work, after they have become familiar with the apparatus available. We also have dedicated space for *Physics Education Research* and *Physics Demonstrations (Gardiner 142)*, which was recently used as a laboratory for a capstone project for several Engineering Physics majors.

**Student Societies:** The Department of Physics has two very active chapters of the *Society of Engineering Physics (SEPh)* and the *Society of Physics Students (SPS)*, a national organization operated by the American Institute of Physics. Although independent, the two societies interact with each other, and both have dedicated rooms in *Gardiner Hall*, where they hold meetings, study groups, and other social functions.

Table 7.1 provides a detailed list of all rooms (except for storage facilities) of the Department of Physics in *Gardiner Hall*. Their primary purpose (office space, research, teaching etc) is also indicated.

**Table 7.1. Department of Physics rooms in *Gardiner Hall*; allocation, occupants, number of computer stations, room size and primary purpose. GA, RA and TA indicate graduate, research and teaching assistants, respectively.**

Office Number	Room Allocation	Occupant Name	Capacity	Size (sq.ft.)	Primary Purpose
050	Materials Science Lab	Dr. Bruce	0	224	Research
054	Department Wet Lab	Dr. Zollner	0	186	Research
055	Res. Assist. Office	6 RAs	6	382	Office
057	Research Lab	Dr. DeAntonio	0	188	Research
058	Materials Science Lab	Dr. Urquidi	0	157	Research
060	X-RAY Lab	Dr. Urquidi	0	1559	Research
062	Experimental Lab	Dr. Urquidi	0	92	Research
063	Faculty Office	Dr. Urquidi	1	93	Office
065	Adv. Phys. Lab		10	367	Teaching Lab
065A	Radioactive Storage	Dr. Pate	0	70	Support
066	Adv. Phys. Lab		10	682	Teaching Lab
069	Materials Science Lab	Dr. Urquidi	0	183	Research
102	Emeritus Faculty Office	Dr. Goedecke	1	160	Office
103	Emeritus Faculty Office	Dr. Armstrong	1	119	Office
104	Physics Teaching Lab		20	885	Teaching Lab
106	Class Lab Storage		0	368	Teaching Lab
108	Physics Teaching Lab		20	1050	Teaching Lab
125	Student Society Room	SPS	2	283	Office
131	Physics Teaching Lab		20	496	Teaching Lab
132	Modern Physics Lab		3	286	Teaching Lab
132A	Modern Physics Lab		7	309	Teaching Lab
132B	Modern Physics Lab		0	97	Teaching Lab
142	Outreach		0	428	Outreach
201	Grad Assistant Office	4 TAs	1	151	Office
202	Grad Assistant Office	4 TAs	1	160	Office
203	Emeritus Faculty Office	Dr. Higbie	2	119	Office
204	Physics Teaching Lab		22	986	Teaching Lab
205	Class Lab Storage		0	332	Teaching Lab
206	Physics Teaching Lab		20	998	Teaching Lab
207	Departm. Techn.	Ms. Pennise	1	181	Office
209	Class Lab Storage		2	237	Teaching Lab
216	Grad Assistant Offices	12 GAs	12	524	Office
218	Physics Teaching Lab		24	493	Teaching Lab
218A	Classroom		24	489	Classroom
221	Department Office	Mrs. Chavez	1	332	Office
222	Res. Acc. Office	Mrs. Christensen	1	123	Office
223	Dep. Head Office	Dr. Zollner	5	212	Office
225	Tutoring Room		0	317	Open Lab

229	Lecture Hall		65	897	Classroom
230	Lecture Hall		110	1409	Classroom
231	Class Storage		0	291	Classroom
250	College Faculty Office	Dr. DeAntonio	1	130	Office
250A	Closet		0	31	Office
251	College Faculty Office	Dr. Mi. Burkardt	1	130	Office
254	Faculty Office	Dr. Zollner	1	183	Office
255	Faculty Office	Dr. Urquidi	1	189	Office
256	Faculty Office	Dr. Gibbs	1	193	Office
256A	Faculty Office	Dr. Engelhardt	1	185	Office
258	Faculty Office	Dr. Kanim	1	193	Office
258A	Faculty Office	Dr. Ma. Burkardt	1	185	Office
259	Faculty Office	Dr. Vasiliev	1	187	Office
259A	Atmospheric Optics	Dr. Bruce	1	187	Office
259B	Faculty Office	Dr. Bruce	1	177	Office
260	Atmosph. Optics Lab	Dr. Bruce	0	561	Research
261	Conf. Room & Library		20	835	Office
264	Computer lab & SEPh		14	835	Teaching Lab
265	Optics Research Lab		0	747	Research
266	Office Storage		0	181	Support
267	Post Doc Office	Dr. Jelinek	1	131	Office
268	Emeritus Faculty Office	Dr. Pinnnick	1	141	Office
352B	Faculty Office	(Dr. Wang)	1	196	Office
353	Faculty Office	Dr. Hearn	1	193	Office
354	Faculty Office	Dr. Kiefer	1	194	Office
355	Faculty Office	Dr. Papavassiliou	1	194	Office
356	Faculty Office	Dr. Pate	1	192	Office
357	Faculty Office	Dr. Nakotte	1	194	Office
358	Faculty Office	Dr. Ni	1	193	Office
359	Technician Office	Mr. Tawalbeh	1	167	Office
361	Grad Assistant Office	6 RAs	6	573	Office
362	Research Lab	Dr. Nakotte	0	568	Research
363	Grad Assistant Office	6 RAs	6	568	Office
364	Nuclear Physics Lab	Dr. Pate	0	761	Research
365	Geophysics Res. Lab	Dr. Ni	0	571	Research
366	Geophysics Res. Lab	Dr. Hearn	0	165	Research

## **B. Computing Resources**

*Describe any computing resources (workstations, servers, storage, networks including software) in addition to those described in the laboratories in Part A, which are used by the students in the program. Include a discussion of the accessibility of university-wide computing resources available to all students via various locations such as student housing, library, student union, off-campus, etc. State the hours the various computing facilities are open to students. Assess*

*the adequacy of these facilities to support the scholarly and professional activities of the students and faculty in the program.*

The Department of Physics has 15 computer workstations in our computer laboratory, most with the Linux-operating system but several with the Windows-operating system. These are used in support of the PHYS 150 and PHYS 476 computational physics courses. Physics and Engineering Physics majors can have accounts on these computers for use in other projects. For example, students in the PHYS 315L advanced lab are expected to use a variety of computing tools to collect and analyze data.

Apart from departmental computing resources, it should be noted that wireless access is available throughout Gardiner Hall as well as most the NMSU campus and students can have access to many other computer laboratories across campus.

### **C. Guidance**

*Describe how students in the program are provided appropriate guidance regarding the use of the tools, equipment, computing resources, and laboratories.*

Students, who take any of the instructional laboratories in the Department of Physics, will be given instructions and training on the proper and safe way the usage of the equipment, whenever it is deemed necessary and appropriate. While there are typically negligible (or only minor) safety concerns within the introductory 200-level laboratories, the higher-level laboratories (PHYS 315L and PHYS475) do requires special instructions to protect the student from possible injury. For example, some of the experiments in PHYS 475 utilize ionizing radiation, such as X-rays. In general, students will be given specialized training and safety material on the proper and safe way to use potentially harmful equipment.

New Mexcio State University's *Environmental Health & Safety (ES&H) office* (17 staff members) offers varies safety trainings & programs, publishes safety policies and reviews safety procedures for all of the campus facilities, including research and instructional laboratories. For laboratories that pose potential safety hazards, students are required to review the safety materials, obey with the safety requirements (e.g. safety glasses are a 'must' for any of the Chemistry labs) and take a separate training course, if needed. Documentation and other information from NMSU's ES&H office can be reviewed at <http://www.nmsu.edu/safety/>.

It should also be noted that three of the department's faculty members (Drs Steve Pate, Vassilli Papavassiliou, Jacob Urquidi) are responsible for the use of radioactive sources in the building, and one of them (Dr. Steve Pate) is a member of the University's *Radiation Safety Committee*.

Within the Department of Physics students are offered computing classes, such as *PHYS 150* (optional) and *PHYS 476* (elective) that are available to train students in the use of computers in addressing physics problems. Moreover, all of the Engineering Physics students take computing courses in Engineering as part of the engineering portion of their degree requirements.

### **D. Maintenance and Upgrading of Facilities**

*Describe the policies and procedures for maintaining and upgrading the tools, equipment, computing resources, and laboratories used by students and faculty in the program.*

Gardiner Hall, which hosts the Department of Physics, underwent a major renovation from Fall of 2009 until Summer of 2010, at a total cost of ~13 M\$. During that period, the building was completely vacated, and all offices and laboratories (both research and instructional) were temporarily re-located to other buildings on the NMSU campus. As part of the renovation, all classrooms and offices received new furniture and A/V equipment. Moreover, new desktop computers and color printers (or scanner/fax/printer units) were purchased for all faculty members. NMSU President Coutoure, Provost Wilkins, and Arts & Science Dean Slaton visited Gardiner Hall to establish that the renovation resulted in a building suitable for its purpose, i.e. to house both the Departments of Physics and the Department of Geology. The heads from both departments have been meeting with Arts and Science's Associate Dean Jeff Brown, the NMSU Office of Facilities & Services on a regular basis to plan completion of some remaining items of the renovations, such as a fume hood for a departmental wet lab, ultrapure water for a biophysics lab, non-contact cooling water for the X-ray scattering laboratory, key-card access for the room of the Society of Physics students as well as for the instructional laboratories.

The Department of Physics has two exempt staff members (Chris Pennise, MS in Electrical Engineering, and Tarek Tawalbeh, MS in Physics) who are charged with maintaining and upgrading the instructional laboratories and the computational facilities. They perform minor repairs, upgrades, and maintenance (often in collaboration with undergraduate students in physics or engineering physics), order parts and supplies, and install new equipment. Costs are paid by the Physics Department's operational funds (described in *Criterion 8*).

Twice a year, the institution solicits requests for *Equipment Renewal and Replacement* from the departments. Also, in the Fall semester, there is a call for requests to distribute Student Equipment Maintenance Fees. These funds can be used for equipment, software, maintenance, and supplies. Requests are routed from the Department of Physics through the College of Arts and Sciences to the central administration. Typical allocations to the Department of Physics have been around 10 k\$ per year in recent years.

Ms. Pennise and the Physics Department Head manage the NMSU inventory in the Department of Physics. The department has 571 inventory items for research and instructional purposes. These items are physically located and their barcodes are scanned once a year. Exceptions (items not found and scanned) are reported to the NMSU's *Board of Regents*. By state law, inventory items are defined as items with an acquisition cost of USD 1000 or higher, regardless of age or depreciation. NMSU's risk management includes property insurance with a 5000-dollar deductible for any theft and a 1000-dollar deductible for any loss due another covered occurrence.

To purchase equipment items, the Department of Physics requests funds for specific items from the central administration through the College of Arts and Sciences twice per year. Such items can also be purchased from the department's operational or foundation funds, on a limited basis. The *Dr. Horace Coburn Physics Fund* (annual earnings about 8 K\$ per year) is used to purchase or build lecture demonstration or display equipment. The funds can also be used for engineering physics capstone projects, if the purpose of these projects is to build demonstration of display equipment. One recent example of such a capstone project is the coupled physical pendulum designed by Dr. Kanim and students. Funds for instructional

equipment can also be requested from government funding agencies, such as the *National Science Foundation (NSF)*. A previous *NSF* grant paid for equipment items in our instructional mechanics lab. The Physics Department just received approval from the *Vice President for Research* to submit a *STEP (STEM talent expansion program)* proposal to *National Science Foundation*. We anticipate that this proposal will contain some funds for facilities and equipment. Finally, many of the faculty members engaged in the Engineering Physics program have research grants which pay for equipment and facilities. Usually, these research laboratories can be used for undergraduate instruction on a limited case-by-case basis.

Repairs and maintenance of multimedia equipment in the classrooms are maintained by NMSU *Information and Communication Technologies (ICT)*. The cost of these repairs is paid by the Physics Department's operational funds. The NMSU *Office of Facilities and Services (OFS)* provides janitorial services daily, which is adequate considering the use of the building. OFS also responds to work order requests for routine repairs. Emergency repairs (for example, a leaky faucet) are usually carried out rather quickly. The cost of routine building maintenance and repairs is covered by OFS. Once a year, each department can request *Building Repair and Renewal (BRR) funds* from the central administration through the College of Arts & Sciences. This option has not been exercised recently, because *Gardiner Hall* just underwent a 13 M\$ renovation. It can be exercised in future years, for example for new lecture hall seating, instructional laboratory renovation, or other items attached to the building.

The Department of Physics has a *Laboratory Committee* meets to discuss and prioritize the needs of the instructional labs. If competing requests exceed the available budget, then a decision is made concerning which requests need to be met first.

## **E. Library Services**

*Describe and evaluate the capability of the library (or libraries) to serve the program including the adequacy of the library's technical collection relative to the needs of the program and the faculty, the adequacy of the process by which faculty may request the library to order books or subscriptions, the library's systems for locating and obtaining electronic information, and any other library services relevant to the needs of the program.*

The Library is housed in two large buildings (*Zuhl* and *Branson*) on the central campus. *Branson* contains an extensive scientific collection. Support for journals is good, in both print and electronic access, although there is a steady long-term trend of cuts in journal support. The library maintains a large collection of 1,829,158 items. Of those, about 10.8% comprise the Engineering collection.

Undergraduate students may borrow up to 50 books at a time. Two additional renewal periods are typically available for all faculty and student loans, which may be requested online. Media materials and bound journals have more restricted loan periods.

The majority of the library's resources are online, accessible via the library's web page <http://lib.nmsu.edu/article.shtml>. The figure below shows the total number of full-text serial titles users have access to via the library's subscriptions and/or database aggregators.

Resources may be accessed on campus or remotely by proxy server verification of user status. In addition to general academic databases that serve the needs of the entire campus, the

library provides access to many databases geared specifically toward the research needs of Engineering students and faculty, such as *SciFinder* and *Web of Science*.

The Library participates in inter-library loan services. *Request It!* includes interlibrary loan, document delivery, and related delivery and pick-up services <http://lib.nmsu.edu/depts/accserv/ids.shtml>. Students, faculty, and staff seeking access to information, whether owned by the NMSU Library or another library or organization, may take advantage of *Request It!* Articles and other documents are delivered electronically to the user's account whenever possible. In most cases, *Request It!* is available at no charge to the user. Turnaround times vary depending upon the time of the semester and the availability of the item.

Faculty may place library or personally-owned materials on *Reserve* for improved access to course-related materials. Access and loan periods are determined by the instructor. Whenever possible, materials are scanned, linked, downloaded, or streamed and made accessible through *DocuTek*, the Library's web-based electronic reserves service <http://lib.nmsu.edu/depts/accserv/reserves.shtml>. Reserves and other library staff can assist instructors who wish to create persistent links to electronic library resources in their learning management system (LMS) course page(s).

The first floors of both *Branson* and *Zuhl* were recently redesigned to provide more comfortable and effective learning spaces, offering a mix of quiet individual study areas and group work spaces that feature increased desktop areas, electrical outlets, and mobile tables, chairs and whiteboards to facilitate collaborative work. There are now 68 computers in *Zuhl* Library and 42 in *Branson*, as well as wireless connectivity for mobile devices throughout the facilities. Both libraries circulate DVD players and other peripherals, and have media viewing equipment available on-site. Each building offers networked printers, two black and white photocopiers, and two, no-cost scanning stations where students can scan and e-mail materials or save the images to a flash drive. *Branson* Library has digital microform machines available which allow users to save or deliver content electronically. *Zuhl* has a color photocopy machine.

The library's Reference and Research Services department has 16 full-time staff members; all are familiar with the collection and resources, and available to answer reference requests that come to the desk during operating hours. Questions requiring more in-depth work or subject knowledge are referred to the Engineering Librarian for a personal consultation.

## **F. Overall Comments on Facilities**

*Describe how the program ensures the facilities, tools, and equipment used in the program are safe for their intended purposes (See the 2012-2013 APPM Section II.G.6.b.(1)).*

After the renovation of Gardiner Hall, the quality of the departmental facilities is greatly improved, although the Department of Physics lost ~30% of its pre-renovation space since the Department of Geology was moved into Gardiner Hall as well. Any future infrastructure work in the building will be done by the *University Plant Services*, to make sure all work done is up to code. Even with the loss of space, we believe that the current departmental facilities are superior compared to pre-renovation conditions. As a consequence, we are able to better serve the needs of our students and the different programs.



On many occasions, our Engineering Physics students did indicate that needed facilities in the participating engineering departments rank from 'adequate' to 'excellent', especially for the instructional laboratories.