

## CRITERION 8. INSTITUTIONAL SUPPORT

### A. Leadership

*Describe the leadership of the program and discuss its adequacy to ensure the quality and continuity of the program and how the leadership is involved in decisions that affect the program.*

The *Bachelor of Science in Engineering Physics* (BSEP) is offered jointly by the *Department of Physics* in the *College of Arts & Sciences* and the *Departments of Chemical & Materials Engineering, Electrical & Computer Engineering, and Mechanical & Aerospace Engineering* in the *College of Engineering*. Degrees are awarded by the *College of Engineering*, but EP students have their academic home in the *Department of Physics*.

This EP degree has been approved by the *NMSU Board of Regents* and is supported by the central administration, which promotes interdisciplinary programs and faculty engagement across departmental and college boundaries. Both colleges support the program and provide leadership and advice through interactions with the external *Engineering Physics External Advisory Board* (EPEAB), with the *Physics Department Head*, and through the *Engineering Physics Program Committee* (described later).

At the departmental level, leadership of the BSEP program is shared between the *Physics Department Head* (Dr. Stefan Zollner), the *EP Program Committed Chair* (Dr. Heinz Nakotte), and the *Engineering Physics Program Committee*. Its current members are Drs. Heinz Nakotte, Tom Hearn, Steve Pate, Michael DeAntonio, Igor Vasiliev, all from *Physics*; Dr. Fangjun Shu from *Mechanical & Aerospace Engineering*; Dr. Steve Stochaj from *Electrical & Computer Engineering*; and Dr. Hongmei Luo from *Chemical & Materials Engineering*. The *Physics Department Head*, Dr. Zollner, will be on sabbatical leave during the 2018/19 academic year, and the *Dean of Arts & Sciences* has appointed Dr. Nakotte as the *Interim Department Head* for that period.

The *Physics Department Head* attends department head meetings (or similar events) in the *College of Arts & Sciences* and in the *College of Engineering*. On occasion, the *EP Program Committee Head* may attend the *College of Engineering* meetings on his behalf. When the *Physics Department Head* is absent from campus, he appoints an *Acting Department Head*. The role of the *Academic Department Head* is described in the *NMSU Administrative Rules and Procedures*, especially Section 6.72. The *Physics Department Head* serves at the discretion of the *Dean of the College of Arts & Sciences*, with the concurrence of *NMSU's Executive Vice President & Provost*. The *Physics Department Head* is evaluated annually by the *Dean of the College of Arts & Sciences*, with a more detailed 360-degree review done every three to five years. Items most relevant to the leadership of the *EP Program* are described below.

The responsibilities of the *Physics Department Head* include the following:

- academic leadership in teaching, research, and outreach;
- departmental collegiality;
- managing the budget;
- meeting reporting requirements to the institution and both colleges;
- scheduling of courses to meet the requirements of students enrolled in undergraduate and graduate programs;
- recruiting of undergraduate students and helping them get ready for their first semester;

- analysis of transfer credits from previous institutions;
- performance management of all staff, faculty, and teaching assistants in the *Department of Physics* (including mentoring and retention),
- assessment of the physics undergraduate and graduate programs in the *College of Arts & Sciences*;
- assisting with the assessment of the EP undergraduate program in the *College of Engineering*;
- external representation of the department (college- and institution-wide, national societies, constituents, national laboratories, local industry, government agencies, alumni, donors, prospective students and their parents);
- ruling on academic and personnel appeals and grievances;
- assisting and advising of students, staff, and faculty in compliance with the *NMSU Policies & Procedures*.

The *Physics Department Head* or an appointed representative also performs all exit interviews with EP students and reports his findings to the *EP Program Committee*. Furthermore, he seeks contact with program alumni.

The responsibilities of the *EP Program Committee Chair* include the following:

- assessment and accreditation of the *EP Program*;
- coordination of EP student advising;
- leadership for the *EP Program Committee*,
- representing the *Physics Department Head* at *College of Engineering* events, when needed;
- recruiting and retention of EP students;
- participation in *Aggie Welcome Orientations (AWO)* for new incoming students in the *College of Engineering*.

The *EP Program Committee* is appointed by the *Physics Department Head*, in consultation with the *EP Program Committee Chair*, the department heads of the participating engineering departments, and the *Associate Dean for Academics* in the *College of Engineering*. The *EP Program Committee* is chaired by the *EP Program Committee Chair*, and the *Physics Department Head* and the *Associate Dean for Academics* in the *College of Engineering* are *ex officio* members. The *EP Program Committee* has responsibility for the definition of the EP curricula and its concentrations. Its members assist with EP student advising (including degree checks and course substitutions), assessment and accreditation (continuous improvement of educational programs, courses, laboratory and computational facilities), recruiting, and retention. They update the advising documents, the EP degree pages in the catalog, the course descriptions, and the EP web pages. They also provide advice to other faculty in physics and in the participating engineering departments on their deliverables to the program, especially related to assessment of teaching effectiveness.

The *EP Program Committee* works closely with other committees in the *Department of Physics*, especially the *Curriculum Committee* (chaired by Dr. Vasiliev), the *Undergraduate Recruiting and Retention Committee* (chaired by the *Undergraduate Physics Program Head*, Dr. Pate), the *Computer Committee* (chaired by Dr. Engelhardt), and the *Laboratory Committee* (chaired by Dr. Pate). All departmental committees regularly report back to the *Department Head* and the entire

physics faculty at departmental faculty meetings, which are held at least once a month. Additional faculty meetings may be held for important topics, when needed, for example:

- to review the *Department's Promotion & Tenure* and other governance documents,
- to discuss candidates interviewed for an open faculty position,
- to discuss continuous improvement of outcomes and objectives of educational programs,
- to develop a long-term strategy of the department for future directions, or
- to review the progress of undergraduate and graduate students towards degree completion.

Each semester, a few days before the first day of classes, a half-day departmental retreat is held to allow more in-depth discussion. For example, there were discussions at the Spring 2018 retreat about whether the department should seek a separate ABET accreditation through its ANSAC commission for its *BS in Physics* degree program.

The *EP Program Committee* has established processes for soliciting feedback, collecting data, and communicating findings related to the *EP Program*. All relevant information and findings are documented and records are kept electronically in a single dedicated OneDrive folder, accessible for review by the *Department Head* or other physics faculty members at any time. The content of the OneDrive folder is continuously updated; for example, *Post-Course Instruction Materials* for all relevant courses are uploaded at the end of each semester. With that, the folder contains the *Outcomes Measurements* for every single course, and every faculty member is assigned to provide an *Outcomes Summary* for one outcome every 2-3 years - making use of the information provided in the *OneDrive* folder. These *Outcomes Summaries* are discussed in a special faculty meeting and the findings are used as input for program improvement. This process also provides important feedback for required *Annual Departmental Reviews* due with the *Deans of College of Arts & Sciences*. In addition, some of the non-sensitive information may be made publicly accessible via the program's webpages.

Important strategic decisions are made collegially by the physics faculty and reported to the *College of Arts & Sciences* (or *Engineering*) by the *Physics Department Head*. Tactical and operational details are decided by the *Department Head* following established university, college, and departmental procedures, usually after consulting the relevant *Committee Chairs*.

The *Physics Department Head* and the faculty of the *Department of Physics* embrace shared governance, wherever possible. To promote the shared-governance approach, the physics faculty have an opportunity to meet without the *Department Head* (for example, just prior to the retreat) to discuss their satisfaction with departmental governance. The purpose of this meeting is to communicate to the *Department Head* which decisions should be made by the *Department Head*, which ones by faculty committees, and/or which ones by the entire faculty. The faculty will provide feedback on decisions made over the past year and guidance for the following year. At that meeting, the faculty members can also review which departmental committees are needed and what duties they should fulfill. Moreover, the entire faculty can propose which of its members should serve on various departmental, college, and university committees.

Since EP is highly interdisciplinary, our leadership model ensures that members of all relevant disciplines contribute to the leadership of the program, but there is also a clear chain of command: issues related to courses fall under the responsibility of the *Department Heads* and the *Academic Dean* of academic unit to which the course belongs, and issues related to EP students and degrees are dealt with by the *Physics Department Head* and the *Office of the Dean of Engineering*. The *EP*

*Program Committee Chair* acts in place of the *Physics Department Head*, in case the latter has conflicting responsibilities in both colleges.

## **B. Program Budget and Financial Support**

*Describe the process used to establish the program's budget and provide evidence of continuity of institutional support for the program. Include the sources of financial support including both permanent (recurring) and temporary (one-time) funds.*

NMSU prepares annual budgets for current fund expenditures from unrestricted and restricted revenue sources. The annual cycle begins in November and coincides with the *New Mexico Higher Education Department* (NMHED) submission of the higher education funding recommendation to the state legislature. Funding priorities are established through a review of mandated requirements and strategic investments. The budgets are presented to the *Board of Regents* (BOR) for approval, prior to submission to state authorities.

The budgeting process starts with developing campus budget guidelines that identify sources and uses; priorities are identified through a collaborative and iterative process that begins with upper administration and expands to include the university budget office, *Deans*, and the broader campus community. Feedback from all participants is used to further vet institutional priorities, which are then provided to the *University Budget Committee* (UBC) and the administration for consideration. The *Regents Financial Strategies, Performance and Budget Committee* (RFSPBC) participates through regularly scheduled meetings. While state funding for the budget year is determined, the list of priority investments is aligned to match available resources including tuition and fee adjustments.

The RFSPBC votes (regents abstaining) on proposed guidelines (which include tuition and fees) before they are presented to the full BOR for approval, usually in April. The BOR has final authority to approve budget guidelines, which are used to create the campus operating budget. Budgets are due to the NMHED by May 1<sup>st</sup> and may be 'pending' final approval (no later than May 19) by the BOR. NMHED has one month to review and submit budgets to the *NM Department of Finance and Administration* (DFA). The DFA has one month to review and send approvals to institutions by July 1, the beginning of the fiscal year. Budget office staff continuously monitors current year financial performance against the approved budget, and a *Fiscal Watch Certification* is submitted quarterly to the NMHED. Modifications to the approved budget are allowed throughout the year, using the *Budget Adjustment Request* (BAR) process. The BAR must pass through the BOR prior to NMHED submission.

NMSU's internal financial monitoring process includes a monthly review of budget exhibit fund balances and a comparison of current budget to actuals for revenue, expense and transfers on an aggregated basis for each established budget reporting unit. Colleges and departments are permitted to carry forward a percentage of unused funds from one fiscal year to the next, which provides a source of one-time funding to be used at the discretion of the *College Dean* or *Vice President*. If needed, individual units may be placed under fiscal watch for close monitoring, which includes periodic meetings between unit administrators, the *Senior Vice President for Administration & Finance*, and budget office staff to discuss budget status and other fiscal issues.

NMSU'S budgeted resources support the institution's educational, research and service mission. In addition, NMSU has a strategic planning process that further aligns available resources with institutional priorities, expressed in five goals and operationalized through objectives and key

performance indicators (KPIs). NMSU tracks use of centrally allocated resources to strategic goals, as does each college and major operational area.

In December of 2016, the BOR approved *Six Pillars of Vision 2020*, and eight key metrics associated with these pillars as a special focus of NMSU about planning and budgeting. New investments in the 2018 budget are closely aligned with these pillars.

In 2013 NMSU introduced *President's Performance Funding* for short-term projects with potential for positive impact. Through a competitive application and hearing process, in January of 2014 the *University Budget Committee* (UBC) awarded \$750,000 to finance 19 independent projects that supported various *Vision 2020* objectives. Funding was renewed each year (for up to three years) based on milestone achievements. Current fiscal conditions prevent funding of additional projects, but all initiatives that met performance criteria were financed throughout the three years for which the initial award was intended. One of these funded projects was the *Peer Learning Assistant* (PLA) program, which provided undergraduate student peer mentors as PLAs for many undergraduate (especially STEM) courses. Embedding peer mentors in courses was very successful, but funding for the PLA program was not extended after the end of the three-year cycle and replacement funds could not be found.

NMSU engages in continuous processes to evaluate and improve operations at many levels. Such processes inform fiscal decisions and institutional planning. Examples include the Mercer and Deloitte studies, sustainability improvements, and technology enhancements. Intensive efforts are also recognized through NMSU's *Transforming Exercises*, which by Summer 2017 have resulted in real cost-savings to the university of \$2.7 million, with an overall estimated project cost-savings of \$9.7 million. The more recently developed Team 6 is focused on optimizing NMSU's academic structure to encourage collaboration and reduce administrative costs.

Other planning, budgeting and funding tied to assessment of student learning occurs at a more granular level. Colleges and departments may align resource allocation to student learning assessment outcomes. For example, in Fall 2014 the *Engineering College* revamped the core course for incoming engineering majors, ENGR 100. It is now paired with the freshman composition course (ENGL 111G), and in addition to regular assignments, special engineering design challenge assignments and multiple writing assignments are incorporated into the ENGL 111G class. Not only has fall-to-fall retention improved (from 62% prior to the intervention to an average of 76.8% over the last three years), it appears to be affecting greater retention of engineering students beyond the freshman to sophomore year.

Instructional funding such as faculty lines may be reallocated within the college at the discretion of the *Dean* with the approval of the *Executive Vice President and Provost*. Additionally, the *Dean* determines the new funding priorities for the college and presents the request to the *Executive Vice President and Provost* for consideration. The *Executive Vice President and Provost* may reallocate instructional funding among the Colleges or allocate any new funding in consultation with the *Deans, Chancellor, and/or Administration and Finance*.

### **Departmental Budget**

The recurring total budget of the NMSU *Department of Physics* for the 2017/18 fiscal year (July 1st to June 30th) has four components, as listed below. The *Department of Physics* has 5 different degree programs (3 undergraduate degrees, 2 graduate degrees), i.e. a *BS in Physics*, a *BA in Physics*, a *BS in EP*, a *MS in Physics* and a *Ph.D. in Physics*. The *BS in EP* requires a concentration

to be selected from 4 options (*Aerospace, Chemical, Electrical and Mechanical Engineering* concentrations), the *BS in Physics* provides an option of 5 different concentrations (*Applied Optics, Applied Physics, Computational Physics, Geophysics and Materials Science*), the *BA in Physics* requires a minor in another field, and *MS in Physics* provides an option for a concentration in *Space Physics*. Expenditures towards these different degree programs and their concentrations are not budgeted separately. The *Department of Physics* also teaches general education courses for about 1400 NMSU students each year.

The budget of the *Department of Physics* has been very stable for the past decade, indicating strong continuous institutional support. The biggest budgetary changes over the last six years are an increase in faculty salaries (to bring salaries of full professor to 90% of market salaries determined during a Mercer study) and an increase in teaching assistant stipends (since the cost of some benefits, especially health insurance, had to be cut due to new IRS regulations and were instead paid out as increased graduate assistant stipends). There was no significant decrease in our operational funds since 2011/12. Staff salaries are lower in the 2017/18 budget, because one administrative staff position remained vacant to reduce expenses. The vacancy was filled in spring 2018 with the hiring of Marisela Chavez as the administrative assistant.

Students in the *EP Program* take the same core courses in physics and in the engineering discipline of their chosen concentration that are offered to the majors in each discipline, i.e. no additional instructional expenses are needed to offer the *EP program*. Since the NMSU *Department of Physics* is comparatively small with a total of only 35-50 physics majors (the numbers fluctuate greatly from one year to another), the upper-division physics courses tend to have low enrollment, and offering an *EP program* ensures that those courses have sufficient enrollment (10 or more students are usually needed to offer an undergraduate course). In other words, the two programs (BS/BA Physics and BS EP) would not be viable as separate programs at NMSU, and therefore both undergraduate degree programs are housed in the same department. One obvious benefit of EP students taking the physics core courses together with the physics majors and the engineering core courses with the engineering majors of their chosen concentration is that this better prepares them for advanced (graduate) studies in both physics and engineering, if they desire to pursue them. Moreover, some of our EP students have indicated a stronger affinity with physics than with engineering, while others preferred the engineering portion.

Although the *Department of Physics* does not incur additional instruction costs by offering the *EP Program*, undoubtedly there is an increased administrative burden by offering this additional program. Much of that burden is currently covered by faculty members serving on the *EP Program Committee*, which has members from physics and engineering, as part of their allocated service load (see Criterion 6 – Faculty). On occasion, there may be smaller budget items specifically related to the *EP Program* (for example, costs related to the accreditation) and those are covered by the *Department of Physics* and/or the *College of Engineering*.

#### Recurring budget items in the *Department of Physics*:

- The *Instructional & General (I&G)* budget, which consists of *State of New Mexico* funds, is at \$1.70M in the 2017/18 fiscal year (up from \$1.59M in the 2011/12 fiscal year). The items in this budget contain the salaries of the *Physics Department Head* and staff (\$213k, down from \$229k in 2011/12 because of a vacant staff line), the faculty salaries (\$1087k, up from \$985k due to pay raises), the graduate teaching assistant salary pools (\$337k, up

from \$262k because of a benefits accounting change), and departmental operational funds (\$65k, down from \$80k in the 2011/12 fiscal year due to an accounting change).

- Physics faculty members conduct research funded by external agencies (NSF, DoE, Army, Air Force, NASA, etc.) with annual expenditures of approximately \$1.7M, about \$140k per tenured/tenure-track faculty member. These research funds mostly support the research and graduate education mission of the department. In addition, some of these grants also support undergraduate research, which provide extracurricular learning opportunities for physics and EP undergraduate students. Some grants can be used to purchase equipment, which is available for both research and instructional laboratory use. The undergraduate research funds are supplemented with small grants and scholarships from the *New Mexico Space Grant Consortium*, the *Louis Stokes Alliance for Minority Participation*, the *NMSU Vice President for Research*, and the *Colleges of Engineering and Arts & Sciences*.
- A portion of the *Facilities and Administration (F&A)* costs charged to external research grants by the university is returned to the departments. After subtracting the departmental portion of startup commitments and cost share, the department received about \$12k in 2016/17. This amount is unusually low because five recent tenure-track faculty hires lead to large F&A subtractions in the department's share. This portion of the budget is used to pay a graduate assistant to provide IT support for the department. It also pays for other minor indirect costs, such as automobile insurance or relocation expenses for new hires.
- Finally, the *Department of Physics* receives about \$90k per year in earnings from *NMSU Foundation* endowed accounts (totaling about \$2.5M). These funds are used to pay undergraduate student scholarships (scholarships of \$500 to \$3000 for about 20-30 students, totaling \$55k), hosting physics colloquium speakers, meal and entertainment expenses of candidates interviewing for faculty positions, banquets or picnics for students, faculty, and staff at the end of each semester, a named professorship (*Gardiner Professorship*), and summer research support for graduate students. A very generous alumnus (a former career NASA scientist) has donated nearly one million dollars over the past six years to establish a significant scholarship fund for undergraduate students. This donation, along with others solicited by a *Departmental Newsletter* and institutional and college-wide appeals, has significantly enhanced the departmental scholarships paid out each year. Since EP is a relatively new program, there are currently no significant endowment yet for scholarships in EP, only a very small current use fund. Deserving students in this program must often rely on engineering- or NMSU-wide scholarships or those funded with unrestricted gift funds, since no departmental scholarships are available to students in this program. Dr. Nakotte serves on the *College of Engineering Scholarship Committee*, where he can advocate for scholarships to be awarded to EP students.

The *Department of Physics* I&G budget is established annually by the institution through the *College of Arts & Sciences*. The total I&G funds in the *Department of Physics* have grown by about 7% since 2011/12, see Table 8.1 for details. The institution has continued to support the *Department of Physics* since the 2012 ABET accreditation, for example, by renovating *Gardiner Hall* (which houses the *Department of Physics* and the *Geological Sciences Department*), replacing the *Administrative Assistant*, providing funds to regularize two *College Professors* for teaching, promoting faculty to the next rank, supporting sabbaticals, and by approving a five junior tenure-track faculty hires. Our undergraduate programs in physics and EP compare favorably in quality, enrollment, and graduation rates with similar institutions in the Rio Grande Valley, such as

University of Texas at Brownsville, University of Texas – Pan American, University of Texas at El Paso, New Mexico Institute of Mining and Technology, or in rural West Texas, such as Texas Tech University, Texas A&M Kingsville, Angelo State University, West Texas A&M University, Abilene Christian University, and McMurry University.

**Table 8.1.** Selected annual budget figures of the Department of Physics over the past decade. Estimates are indicated, where precise figures were not available.

Category	FY 01/02	FY 05/06	FY 08/09	FY 10/11	FY 11/12	FY 17/18
<b>Operational Funds</b>	76,270	76,270	80,379	80,649	80,649	65,484
<b>Faculty Salaries</b>	992,947	1,088,768	1,051,328	983,859	985,159	1,087,331
<b>Staff Salaries</b>	~250,000	~250,000	268,566	233,345	229,067	213,741
<b>Teaching Assistants</b>	242,607	265,728	297,401	262,413	262,413	337,485
<b>F&amp;A Return</b>	30,499	20,000	~15,000	~15,000	~15,000	~15,000
<b>Endowments</b>	~60,000	~60,000	~60,000	~60,000	~60,000	~60,000

Research expenditures and F&A returned to the department vary with the success of physics faculty in obtaining external research support and with the portion collected by the *Arts & Sciences Research Center* for departmental commitments (for example, for faculty start-up or mandatory cost-shares). The share returned to the *Department of Physics* was reduced from 24.5% to 16% in the 2004/05 fiscal year. Earnings from *NMSU Foundation* accounts are based on the \$1.5M principal and can vary with the annual return on investments.

In addition to these recurring funds, one-time funds are distributed to the *Department of Physics* by the institution and by the *College of Arts & Sciences* and the *College of Engineering*.

- The *College of Arts & Sciences* and the central administration (through *Enrollment Management*) provide funds for temporary instructors (including graduate teaching assistants) during the fall and spring semester and over the summer. Salary savings from faculty on one-year sabbaticals, on leave, or from research course buy-outs or joint faculty appointments with federal laboratories are returned to the *College of Arts & Sciences*. In the 2017/18 fiscal year, the *Department of Physics* returned \$91k to the *College of Arts & Sciences* as salary savings and received \$82k from the college for temporary instructors.
- Each spring, there is a call from the *Associate Dean for Academics in Engineering* for requests to distribute *Student Fees*. These funds can be used for equipment, software, maintenance, and supplies. Requests are routed from the *Department of Physics* through the *College of Engineering*. Typical allocations to the *Department of Physics* have been around \$15k in recent years.

Recurring and one-time funds in the *College of Engineering* are sometimes used to pay the salaries of instructors to teach the engineering courses and to provide support for the facilities and supplies for these courses. So far, the *College of Engineering* and its departments have had the primary responsibility to develop, teach and support the mandatory *Capstone Design Courses*, and almost all EP alumni took their capstone experience in an engineering discipline. The introduction of an engineering-wide capstone program in Fall of 2018 may offer an opportunity for physics faculty to become more involved in future capstone design courses. The *College of Engineering* also currently supports two *EP Ambassadors* (Pablo Paradis and Scott Mason Walls) as part of their *Engineering Student Ambassador Program*. The *EP Ambassadors* represent the *EP Program* to



the public and they are involved in a variety of recruitment and outreach activities. The college also supports some other recruitment/retention activities for the *EP Program* as well as some student travel, undergraduate research and other awards.

*Describe how teaching is supported by the institution in terms of graders, teaching assistants, teaching workshops, etc.*

NMSU invests approximately \$10M annually in *Graduate Assistantships* for instructional support purposes in the classroom or lab setting to include graders and teaching assistants.

*NMSU's Teaching Academy* provides professional development to NMSU educators. While a variety of programming is provided, the recurring programs include:

- teaching: evidence-based instructional practices, team-based learning, peer coaching, and classroom observations
- leadership: advancing leaders, department head academy, crucial conversation, and strengths finder training
- mentoring: team mentoring for faculty, one-on-one faculty mentoring, getting the edge in academia
- scholarship: publish and flourish, writing groups, scholarly writing retreat
- career: promotion and tenure programs, new faculty orientation

*NMSU's Instructional Innovation and Quality* provides support to faculty in delivering education via the non-traditional formats of ITV, blended, and online. This group provides faculty with professional development and training for best practices in online learning and course consultations, ensures quality in blended and online course design, and provides workshops and consulting on how to effectively utilize the *University's Learning Management System*, CANVAS.

The *Department of Physics* had I&G funds of about \$337k, which equates to 17.3 half-time equivalent *Graduate Teaching Assistants* (TAs) in the 2017/18 fiscal year (fall and spring). Additional funds for teaching assistants are hired from *Facilities & Administrative Rates* (F&A) return or one-time funds from the *Provost*, the *Dean of Arts & Sciences*, or the *Dean of the Graduate School* - which brings the total number of TAs during the 2017/18 fiscal year to 19.3. Most of these teaching assistants are assigned to teach two or three general-education laboratory sections, while a smaller fraction of TAs is employed as graders and/or tutors. Each semester, the *Department of Physics* teaches laboratory sections for about 650 students. TAs also work in the physics tutoring center for about 2-3 hours per week to assist students with their general-education physics homework. International students assigned as lab TAs are required to have passed the *International Teaching Assistant* (ITA) screening administered by the *Office of the Associate Provost of International and Border Programs*. Lab TAs are trained by the *Department of Physics* in an orientation session at the beginning of the semester. The responsibility for hosting the orientation session and the distribution of TA assignments rests with the *Graduate Physics Program Chair*, Dr. Vassili Papavassiliou. Day-to-day supervision for the lab TAs is provided by the *Physics Lab Coordinator*, Mr. Francisco Carreto-Parra, and by a faculty instructor-of-record. TAs who are assigned as homework graders have responsibility to grade for two or three courses, depending on enrollment and workload. In the spring of 2018, 2.5 half-time equivalent graders provided instructional grading support for a total of 8 courses. Since there are not enough graders for all undergraduate courses, some instructors will typically use an online homework software package, such as *Mastering Physics*, in their large lower-division physics courses.

The *Department of Physics* also hires undergraduate physics and EP students as *Peer Learning Assistants* (PLAs). They may provide additional help in the tutoring room, assist with supplemental instruction in the lower-division courses and/or assist with setting up experiments in the introductory 200-level or 300-level modern physics laboratories, under the supervision of Mr. Carreto-Parra or Dr. Pate.

In the summer session, the introductory physics courses, PHYS 211G, 212G, and 215G are usually taught by experienced TAs as lecturers (typically, PhD students with a MS degree and previous TA experience). One of the more demanding (and larger enrollment) summer courses, PHYS 216G, has recently been taught by a faculty member (Drs. DeAntonio or Nakotte). Depending on the number of lab sections needed, another 4-6 graduate students are hired to support the associated labs for the courses above.

NMSU offers several on-campus programs to promote good teaching and enhance of instructional skills, most importantly the *Teaching Academy*. Tenure-system faculty, college (teaching) faculty, and graduate assistants are all eligible to participate in *Teaching Academy* workshops free of charge. Many of our physics faculty participate in *Teaching Academy* events each year. The *College of Arts & Sciences* and the *College of Engineering* encourage their faculty to participate in relevant *Teaching Academy* events. In addition, once or twice a year, the *Department of Physics* also invites an established *Physics Education Researcher* (PER) as a colloquium speaker to inform the faculty about the latest trends in physics teaching.

Over the last six years, several changes were made to improve the support of teaching assistants and their engagement in the classroom:

- With Francisco Carreto-Parra (MS in Physics from UTEP), a new permanent *Instructional Lab Manager* was hired. A lab manager with a graduate degree can better relate to the TAs in the department. Mr. Carreto-Parra has excellent experimental and practical skills.
- Quite commonly, a first-year TA will be paired with an experienced TA in one lab, thereby allowing the new TA to learn faster by observation.
- The responsibility for the lower-division instructional labs was moved from lab manager to a faculty member as instructor-of-record. The instructor-of-record faculty member will preferably teach one lab section himself/herself, thereby getting first-hand experience where improvements or modifications in the various labs are needed. Another task for the instructor-of-record faculty member is to make improvements to laboratory experiments when needed, or to develop new instructional laboratories. For example, in the past year or so, new labs on projectile motion and oscilloscope operation were added. Finally, the instructor-of-record faculty member will chair the weekly TA meetings to prepare for the scheduled labs during the following week.
- In the past two years, the *Physics Department Head* taught the first-year labs for physics and EP majors with the help of a TA, which allowed for more one-on-one mentoring of the new students in a semi-formal environment.
- To address a few severe cases of cheating, all TAs were trained on how to identify and to avoid cheating in instructional-lab final exams and how to address cases of academic and non-academic dishonesty. Syllabi were revised to support TAs in their enforcement of academic integrity and classroom management.

*To the extent not described above, describe how resources are provided to acquire, maintain, and upgrade the infrastructures, facilities, and equipment used in the program.*

In addition to the overall budget process listed above, for many years, NMSU has had various processes in place to provide one-time resources for infrastructure, facilities, and equipment. One method, as part of the state appropriations funding, NMSU sets aside funds for *Building Renewal & Replacement* (BRR) and *Equipment Renewal & Replacement* (ERR). There is an established process used to consider outstanding requests and allocate funds on a prioritized basis, which is routed for review and approval through the *University Budget Committee* (UBC), the university administration, and the *Regents Financial Strategies - Performance and Budget Committee*. Available equipment funds (from state appropriations, central funding, and student fee funding) are reviewed and allocated on an annual basis based upon requests from the colleges and departments, which are reviewed and recommended by the UBC and subsequently approved by the *Chancellor*. Additionally, available equipment funds are provided annually to colleges and departments based upon an allocation calculation accounting for existing equipment inventory. Besides the routine processes that are in place as described, there are also opportunities for colleges and departments to submit proposals to the university administration for off-cycle funding requests. These requests are evaluated and considered in conjunction with a review of potential funding sources.

In the past few years, BRR and ERR funds were extremely limited (largely due to relatively flat or reduced contributions from the *State of New Mexico* to higher education and increased utility/maintenance costs), and the *Department of Physics* and the *EP Programs* did not receive any such allocations or funds from the other sources mentioned in the preceding paragraph. The department managed to cover the most critical and pressing needs through departmental operations funds, earnings from *Foundation* endowments, or from student fees - especially the *Engineering Technology Fee* charged to all *College of Engineering* students.

A two-year renovation of *Gardiner Hall* (home of the *Department of Physics* and the *Geological Sciences Department*) was concluded in the summer of 2010. This renovation included new furniture for faculty offices, classrooms, and student lounges. All classrooms were equipped with a computer, a ceiling-mounted projector, blackboards or white boards, a document camera, a DVD and VCR combo player, and a stereo sound system (standard NMSU smart-room design). One classroom was designed for studio-style and peer-instruction learning based on the latest results from *Physics Education Research* (PER). This PER classroom is used for supplemental instruction in lower-division courses. Each faculty and staff member received a new computer and printer. The classroom technology components were updated again more recently (around 2015) with high-definition projectors and computers. NMSU faculty, staff and student ID cards are equipped with a magnetic strip, which provides access to the building and rooms, for which access was granted.

EP students have access to the building during evening and weekend hours using their student ID cards. They often meet to study or work on homework problems in the EP student lounge, which is also used as our computational physics classroom a few times a week in the afternoon during the fall semesters. The renovation also provided high-quality space for research laboratories, but no laboratory equipment for instructional or research purposes.

The costs for infrastructure repairs (especially maintenance, supplies, and repairs for computer and audiovisual equipment, furniture, appliances, photocopier and printers) and minor facility improvements (such as new network drops, power outlets for laboratories, theft prevention devices, or similar) are paid from the departmental operations budget, except for technology

improvements in centrally scheduled classrooms (GN 229, 230, 218A), which are paid centrally by NMSU's campus-wide *Information & Communications Technology* (ICT) support.

*Assess the adequacy of the resources described in this section with respect to the students in the program being able to attain the student outcomes.*

The resources described above are adequate to meet the needs of the stated *Program Outcomes* and *Educational Objectives* of the *EP Program*. We have many outstanding world-class physicists and engineers as instructors (see *Appendix B – Faculty Vitae*), who are also passionate about undergraduate instruction. Many of the physics faculty are involved in forefront research projects, and they occasionally include their experiences into upper-level physics courses or offer undergraduate research opportunities related to the projects. For example, Dr. Boris Kiefer has gotten involved in a research project in 3D printing, and one of our current EP students is helping with the mechanical testing the printed specimens. An estimated 1 in 3 of our undergraduate students have participated in research or experiential learning activities (experimental or computational) with NMSU faculty or at NSF-funded *Research Experience for Undergraduates* (REU) sites at other institutions, thereby promoting the *Program Outcomes* related to experimental training, design abilities, communication skills, and/or technical know-how.

All physics courses required for the *EP Program* are scheduled at least once per year and are generally taught by a faculty member with a *Ph.D. in Physics*. Occasionally, the *College of Arts & Sciences* will allow us to teach a course below the minimum enrollment threshold of ten students. (Since physics and EP students are pooled into the same courses, this happens at most once per academic year.) Scheduling conflicts for students are resolved by individual meetings with students outside of the regular classroom hours or by setting up independent-study courses, which are taught by physics faculty as an overload without pay. Students are advised as early as possible to find room in required calculus courses during the pre-registration period. Therefore, EP students can graduate in 8 semesters, provided they are ready for MATH 191 (Calculus I) in their first semester at NMSU.

The departmental operating and equipment budgets and resources are sufficient to provide adequate instructional laboratory and computational facilities for our students. Capstone and upper-division laboratory courses are sometimes linked to a faculty's research project, which allow us to leverage our significant external research expenditures for EP instruction. Our operational funds are sufficient to hire undergraduate students as learning assistants, to purchase materials and supplies for lower-division general-education laboratories, and for clerical expenses such as photocopies. We also provide a desk and a computer for every graduate and some undergraduate students.

In the *Senior Student Exit Interviews*, students generally express an overall satisfaction with our institutional resources that are dedicated to the *EP Program*.

### **C. Staffing**

*Describe the adequacy of the staff (administrative, instructional, and technical) and institutional services provided to the program. Discuss methods used to retain and train staff.*

As of spring 2018, the *Department of Physics* currently has 10 full-time tenured faculty members, including the *Physics Department Head*, and 4 tenure-track faculty members. The *Physics Department Head* teaches one half of the average teaching load for the department, reducing the

number of tenured/tenure-track faculty instructors to 13.5 FTE. The typical teaching load for a tenured or tenure-track faculty in the *Department of Physics* is 3 courses per year (spring and fall). However, some faculty members have reduced teaching loads due to research course buy-outs or bridged positions with national labs, sabbaticals or other types of leaves, increased service loads, or because they are in the first year of their appointment. Other faculty members whose research productivity has declined have an increased teaching load. Research buy-outs, sabbaticals and similar will provide salary savings that are used to hire temporary instructors to cover a faculty member's teaching allocation. There are also 2 half-time college-track (teaching) faculty members. When combined, in principle, these 14.5 FTE faculty instructors would be just about enough to provide adequate teaching, advising, and assessment support for all physics programs, including EP. However, the *Department of Physics* lost some faculty lines (due to retirement or similar) in recent years, and current research buyouts and/or bridged faculty positions further reduce the number of full-time faculty available for teaching. Subsequently, some lower-division introductory-physics courses or instructional laboratories are sometimes taught by experienced TAs with an *MS in Physics*. Required courses are offered at least once per year, thus allowing students to graduate in four years, provided they are ready for MATH 191 (Calculus I) in their first semester.

The *Department of Physics* also has three full-time staff members on campus. Rosa Christensen is the (non-exempt) *Administrative & Fiscal Assistant* and Marisela Chavez has been recently hired as the second (non-exempt) *Administrative Assistant*. The two administrative assistants share responsibilities that include faculty and student hiring, I-9 forms and E-Verify, student records, student relations, travel arrangements and reimbursements, campus activities, scholarships, and administration of experimental research grants at the departmental level. Rosa Christensen also supervises spending of departmental I&G funds. The third full-time staff member is Francisco Carreto-Parra, who is the (exempt) instructional lab manager.

Research faculty and staff members hired entirely for research through external grants and contracts are not discussed here, since their interaction with the *EP Program* has been minimal over the past five years. However, such research staff might provide opportunities for future engineering-wide *Capstone Design Projects* that involve EP students.

Training for the non-exempt staff members (*Administrative Assistants* and *Fiscal Monitor*) on NMSU business procedures (hiring procedures, record retention, general employee safety, and similar) is made available by the institution. As part of professional development, the (previous and current) instructional lab managers were encouraged to attend the *American Physical Society March Meeting* over the past six years, paid by the *Department of Physics* operational budget. Such travel allows them to visit lab equipment vendors in the conference exhibit, attend sessions on physics education research, and listen to general physics talks of interest. NMSU also waives tuition for regular employees to enroll in a limited number of courses with permission of the supervisor, which enables employees to continuously improve their skills.

#### **D. Faculty Hiring and Retention**

*Describe the process for hiring of new faculty.*

Faculty lines that become vacant through retirements or resignations are returned to the *Office of the Executive Vice President and Provost*. Once a year, early in the spring semester, the academic departments submit requests for faculty lines to their college. (The *Department of Physics* submits

such requests to the *College of Arts & Sciences*.) The colleges collect all requests and submit some of them to the *Provost's Office* for approval. Departments are notified during the summer if their line requests have been approved. The department's request for a new faculty lines includes a request for start-up funds, determined by the nature of the position and budgetary considerations. Typically, the start-up expenses for physics faculty (graduate student support, faculty summer salary, equipment, supplies, and travel) are shared by the *Vice President for Research* (50%), the *College of Arts & Sciences* (33%), and the *Department of Physics* (17%). The *Department of Physics'* share of start-up expenses (17%) consumes most of the F&A (indirect costs) of external research returned to the department. Vacant faculty lines approved for rehire by the central administration are filled at the *Assistant Professor* level. The institution budgets new positions at the median of a salary study performed by the institution's *Human Resources* department. Recent starting salaries for assistant professors have been around \$65k, significantly lower than at our peer institutions. Nevertheless, we have been able to make five excellent hires recently.

After the approval for a new faculty line has been received from the Office of the Executive Vice President and Provost through the *College of Arts & Sciences*, the *Department of Physics* submits a position request form to the *Office of the Provost* through the *College of Arts & Sciences*. The position request will also include the proposed job ad and a description of the position. The *Physics Department Head* appoints the *Chair of the Search Committee* and both meet with the *Vice President for Research* and the *Associate Dean for Research* in the *College of Arts & Sciences* to sign a firm commitment for start-up for the new faculty member. (For the most recent hire starting in January 2018, an agreement was reached for a start-up package of \$190). After the position request form has been fully approved, advertising can begin and a search committee is appointed by the *Physics Department Head* with concurrence of the *Dean of Arts & Sciences*. Typically, a *Search Committee* will have about 5 members, including one member from a different department and one member from a subfield of physics different from the new faculty member being sought. For faculty searches in the areas of *Applied Optics*, *Applied Physics* or *Materials Sciences*, the external member on the *Search Committee* is typically selected from *College of Engineering* departments participating in the *EP Program*.

The advertisement for the position, approved by *Human Resources*, is distributed as a print ad in publications of relevant professional societies (for example, *Physics Today*) and as an online ad in a variety of jobs databases and email list-servers relevant to the field in question. Applicants are asked to provide a full CV, a statement of research interests, a statement of teaching philosophy, and a list of at least three references. The *Search Committee* reviews the applications and selects the best 4-5 candidates for interview. This short list is presented to the physics faculty, the *Dean of the College of Arts & Sciences*, and the *Office of Institutional Equity* for approval. During the on-campus interview, each candidate will meet with the *Dean* (or an *Associate Dean*), the *Vice President for Research*, and all the physics faculty available during the visit, present a research colloquium to the whole department, teach a lower-division physics lecture assigned prior to the visit, and present a "pizza seminar" to a group of graduate students. The *Chair of the Search Committee* collects feedback about each candidate. Students can make written comments using an anonymous feedback form, while faculty members provide feedback with their name attached. After the conclusion of all on-campus interviews, the *Search Committee* will meet and formulate a set of conclusions about the candidates based on their own experiences in the interviews, informal discussions with other faculty members, and the written comments of the students. The conclusions are presented to a meeting of the *Department of Physics* faculty, and based on the outcome of that meeting a memo is written to the *Dean of the College of Arts & Sciences* expressing the

conclusions of the *Department of Physics* and describing the strengths and weaknesses of each candidate, without giving a ranked ordering. The *Dean* then makes the final decision about whom to make an offer to.

*Describe strategies used to retain current qualified faculty.*

The Department Head and the College Administration strive to sustain an engaging and rewarding professional work environment, such that faculty members remain enthusiastic about remaining with the department. Junior faculty members are provided with opportunities for formal and informal mentoring toward facilitating career success. They are also encouraged to develop areas within departmental academic programs that are of specific interest to them. Numerous professional development courses and workshops are offered on campus at no cost, through the Teaching Academy and the Advance Program, for instance. Faculty and their family members are eligible to take a limited number of NMSU courses free of charge (tuition benefits).

The *College of Arts & Sciences* also has a comprehensive awards program, including awards to stimulate research and to reward outstanding teaching and service. Such awards are available to junior faculty, tenured faculty, and college faculty. Details can be found at the *NMSU Arts & Sciences* web page under the 'Faculty & Staff' menu item. Some awards are funds for research (which can include summer salary), course buy-outs, or funds for development such as travel. There are also awards in the *Department of Physics* (*Gardiner Professorship*, most recently awarded to Dr. Michael Engelhardt) and from the institution (such as the *Distinguished Achievement Professorship* awarded to Dr. Matthias Burkardt). Dr. Jim Ni (emeritus physics faculty) and Dr. Stefan Zollner were recognized by the *NMSU Vice President and Provost* with a *Research Discovery Award* at a commercial time-out at mid-court at a basketball game. Dr. Pate and the nuclear physics research group and Dr. Zollner were recognized by the *Vice President for Research* with a research rally. There is also a *Regents Professor* program at NMSU, but the *Department of Physics* has not had one since 2009.

If a physics faculty member with a strong record of performance receives an offer from another institution, NMSU will make efforts to retain this faculty member. The faculty member presents a written offer from another institution to the *Department Head*, who will make a recommendation to the *Dean* about retaining the faculty member. Retention incentives can include: an increase in base salary, a retention commitment for student support, summer salary, financial support (for travel, equipment, supplies or similar), or accommodation of a spouse or partner. The financial burden for such retention incentives is borne entirely by the *College of Arts & Sciences*. For increases in base salary, the college will typically leave a faculty line vacant and use the funds instead for salary increases to retain qualified faculty members. Retention commitments are paid out of the F&A portion from external research grants paid to the *College of Arts & Sciences* and the *Department of Physics*.

Effective July 1, 2018, there will be an average 2% pay increase for faculty and staff. The pay increase for faculty in the departments of the *College of Arts & Sciences* are solely based on performance over the past two years for annual salaries exceeding \$50k. Using the *Digital Measures* system, each faculty member is required to submit an *Annual Performance Report* (APR), which are due with the *College of Arts & Sciences* around mid-November (faculty not up for promotion) or October (faculty up for tenure and/or promotion). Faculty will submit their APRs to the *Department of Physics* typically about a month prior to the college's deadlines. To evaluate faculty performance, two tenured faculty members are selected at the first faculty meeting in the

fall semester. These faculty members are to consult with the *Department Head* about performance ratings (exceeds, meets, or does not meet expectations) in the areas of teaching, research, service, and outreach (if applicable). The overall performance rating, once approved by the *Dean of the College of Arts & Sciences*, will be considered in determining raises and other reward system elements.

## **E. Support of Faculty Professional Development**

*Describe the adequacy of support for faculty professional development, how such activities such as sabbaticals, travel, workshops, seminars, etc., are planned and supported.*

All tenured faculty members are eligible for sabbaticals as described in *NMSU Administrative Rules and Procedures*. It is stated that “*The purpose of a sabbatical leave is to promote professional growth.*” After at least 12 semesters of full-time service, faculty members apply for a sabbatical during the spring semester, requiring approval from the *Department Head*, the *Dean of Arts & Sciences*, and the *Executive Vice President and Provost*. Sabbatical leaves are for one semester at no reduction in salary or for a year at 60% of salary. (The other 40% of salary plus travel expenses are often covered, at least in part, by a host institution visited by the faculty member on sabbatical, such as *Los Alamos National Laboratory*, *University of New Mexico*, *Jefferson Laboratory*, *Sandia National Laboratories*, or *Fermilab*, in recent history).

The *Department of Physics* has a vibrant weekly colloquium speaker series. Typically, about two thirds of colloquium speakers are external. In addition to giving a colloquium about their research, the colloquium speakers also meet individually with faculty and students throughout the day to exchange ideas about topics of common interest (teaching, research, service). Both the colloquium and the individual meetings contribute to faculty development. The speakers often meet with undergraduate students to talk about employment, graduate school, and internship options at their home institution.

Most tenured and tenure-track physics faculty members (all except three) have significant external research grants (typically, more than \$100k per year per faculty member). Their research grants typically contain funds for travel to conferences or other institutions. While primarily for research (and to update faculty knowledge in their area of specialty), many conferences (such as the *March Meeting of the American Physical Society*) also have sessions contributing to professional development in physics education, which are attended by our faculty members.

The *Department of Physics* (from its operational I&G funds) and the *College of Arts & Sciences* provide travel support for college faculty (i.e., non-tenured lecturers) to attend a regional or national meeting on *Physics Education* (such as the annual meeting of the *American Society of Engineering Education*, ASEE, or the *American Association of Physics Teachers*, AAPT). Sometimes, such attendance is also supported by the conference organizers. The *Department Head* and other departmental leaders attend physics leadership conferences, such as the biennial physics department chair conference (organized by APS and AAPT) and meetings intended to increase STEM education and enrollment or physics teacher education. The *Department Head* shares learning obtained at such conferences and workshops with relevant physics faculty members. New faculty members attend workshops for new faculty organized by AAPT. The *EP External Advisory Board* and the *Physics External Advisory Board* also provide valuable information, advice, and recommendations to the physics faculty, both in their reports and in meetings with individual faculty or with groups of faculty members.