Please attach a narrative (not to exceed 4 pages, excluding appendices) addressing the following:

- What are the student learning outcomes? Please provide a numbered list.

1. Graduates of the program are expected to be successful in pursuing careers in the direct practice of physics or further education in more advanced programs in physics or related fields.

2. Graduates of the program are ready to be team contributors or leaders, capable of collaboration and thinking independently.

3. Graduates of the program are trained to be effective communicators (both orally and in the written word) professionally and socially.

4. Graduates of the program are prepared through coursework and cutting-edge research to be professional problem solvers.

5. Graduates are expected to possess the ability to work in the laboratory, understand how to take and analyze experimental data and/or generate
theoretical data, and to have familiarity with practical laboratory equipment such as oscilloscopes, voltmeters, and spectrometers.

☐ Which learning outcomes were assessed?  All outcomes were assessed (1-5).

☐ How were they assessed?  (Programs must use at least one direct assessment of student learning.) Our primary tools of assessment lie in the Physics 413 (Intermediate Laboratory) and Physics 493 (Senior Thesis) courses. Performance in Physics 413 is used to assess learning outcomes 2-5. Performance in Physics 493 is used to assess learning outcomes 1-5. We also conduct an exit interview with all of our students to partially-assess outcome 1 and via subsequent contact with the students after graduation.

☐ For the introductory laboratory course (Phys 180-182), we use a laboratory practicum exam which is 50 percent of their grade. The instructors specifically determine the students’ proficiency of practical laboratory skills (e.g. setting up/connecting to a circuit and making measurements with an oscilloscope). A small committee consisting of the Chair, laboratory coordinator Tom Hurst, and assorted faculty examine the relevance of the chosen tasks that the students are asked to perform to judge their laboratory skills (learning outcome 5).

☐ Undergraduate programs should assess at least one University Undergraduate Learning Outcome (UULO) each year, which may or may not overlap with a program learning outcome. We assess the following three UULO’s: 1. Intellectual Breadth and Lifelong Learning, 2. Inquiry and Critical Thinking, and 3. Communication.

☐ Graduate programs should assess at least one outcome related to one of the following graduate level requirements each year:
   6. student engagement in research, scholarship, creative expression and/or appropriate high-level professional practice.
   7. activities requiring originality, critical analysis and expertise.
   8. the development of extensive knowledge in the field under study.

Not applicable as this is an undergraduate degree.

☐ What was learned from the assessment results?

   The physics faculty continue to make great strides in improving the quality and articulated expectations of Physics 493 (senior thesis). Professors who supervise students are expected to attend the oral presentations (for all students presenting) which occur on the same day (typically the last Friday of the semester) and ask questions of the students during their presentations and shortly afterward during a question/answer session. The presentations are held consecutively and members of the public are invited to attend. Questions from the audience are encouraged. After the presentations are completed, the professors present remain to discuss grading in private. It is during these conversations (which of late have been increasingly lengthy) that the faculty assess what each student learned in performing their research project, how well how well they communicated (both orally and in written form as their written reports are made available for the faculty on the prior evening). Grades are assigned during this time by mutual agreement of the faculty present which include the Chair of the Physics and Astronomy department. As the assessment coordinator, I attended both sessions in 2016 (May and December). I also had students who completed their senior theses with me in both semesters and was thus also duty-bound to attend the presentations anyway. During the faculty discussions, I have sought to expand our
discussions to include the learning outcomes with the faculty as part of the effort to make the faculty better-aware of them as we seek to improve the educational experience and quality of instruction for our students. In the opinion of the faculty, we have been consistently improving the quality of the Physics 493 projects and that our students are improving in their ability to communicate their results (in part due to encouraging them to give practice talks beforehand) and, with better supervision, generate interesting results which inspire them to learn more. One topic discussed at length during the most recent Ph 493 presentations was how to reward students for performing research on their own initiative rather than a professor’s directive even if the research performed by the independently-minded student was not as successful as one performed by a student who was more directed by his/her advisor. We plan to incorporate this into future grading rubrics.

Our department has continued instituting a policy to have the Assessment Coordinator interview all graduating undergraduates one-by-one. Questions from a standard template are asked and recorded for future analysis and faculty discussion.

From the exit interview data gathered, students have complained about the lack of offerings of important upper-level courses that they need to graduate. This is in part due to a paucity of physics professors as a number have either retired or passed away (e.g. Prof. Lon Spight). There was also some criticism of the varying level of teaching and supervisory quality with some professors (allegedly) leaving class early (e.g.). As result, some students didn’t feel that they learned as much as they should have for some classes. Some students explained that they like professors who teach via the blackboard rather than powerpoint. Some courses used math which some of students explained that they had not formally studied yet. Various textbooks were criticized as being too outdated.

On the positive side, students in general felt that by having significant research experience and exposure as an undergraduate, they were well prepared for pursuing graduate studies and lifelong learning. All students interviewed felt that their UNLV physics education would help them succeed. In general, the students felt that their UNLV physics undergraduate education was excellent and were all largely satisfied. We also are developing a tremendous track record of having our students continue on to further their studies via graduate school (both here at UNLV and elsewhere) and/or other training.

The High Pressure Science and Engineering Center (HiPSEC) within our physics and astronomy department continues to receive feedback from the US Department of Energy (DOE)/NNSA on our efforts to train the next generation of America’s weapons scientists based on regular site visits/reviews. The feedback has in general been very positive. The NNSA reviewers suggested that we expand our efforts to expose students to national facilities and NNSA problems of interest by encouraging them to seek internships and fellowships outside of UNLV. We have been doing this. We have had a number of students (e.g. Melanie White) who have participated in DOE-sponsored workshops at Lawrence Livermore National Laboratory and Los Alamos National Laboratory to expose them to research and “real world” problems that are of interest to the DOE. Many of our students regularly travel to national and international laboratories such as the Advanced Photon Source and Canadian Light Source. Faculty members are explicitly encouraged to bring students with them to conduct experiments. In fact, due to a recent increase in HiPSEC-wide competition for beamtime at the Advanced Photon Source, faculty have a much higher chance to receive beamtime if they bring students with them. This gives faculty an incentive to involve students in research.
How did the program respond to what was learned?

The Assessment coordinator has met with the Chair to discuss results of the exit interviews. We have also hired a tenure-track experimental condensed matter physicist (Ashkan Salamat) who is aiding in absorbing some of the burden for Physics 413 (Intermediate lab I). A tenure-track astrophysicist (Jason Steffen) and tenure-track theorist (Quiang Zhu) have joined the faculty. These hires were instituted to replace retired or deceased faculty.

Due to the suggestions made by the NNSA reviewers, we have made more efforts encourage our students to apply for research-based internships (e.g. at Los Alamos or Lawrence Livermore National Labs) as well as summer school workshops. One of Professor Pravica’s students (Ryan Phung) attended a summer workshop at Lawrence Livermore National Laboratory last summer (e.g.). We feel that the efforts will aid the students in making positive contacts with scientists at these DOE-run facilities which may aid them when later seeking employment.

It should be noted that during the post-presentation phase of the Ph 493 course last December 2016, a vigorous discussion followed pertaining to formally training students on public speaking and the process of researching, reading and digesting peer-reviewed papers. The late Prof. Lon Spight taught a one credit graduate-level seminar in the past but has since passed away. Prof. Ashkan Salamat organizes a “Condensed Coffee” for students (mostly from his research group) where the latest state-of-the-art research papers are presented by one of the students once a week and discussed. HiPSEC also organizes a seminar every week where, barring an invited speaker, one student talks about a paper or topic. The problem with these efforts is that they are voluntary and often students don’t participate. We are actively discussing means to encourage student participation in these types of educational events.

Finally, my Chair, Prof. Stephen Lepp informed me of an apparent registration-related problem/glitch. This was discovered when a student who has failed a large number of upper-division physics courses apparently was able to take them despite having received a “D” grade in Physics 181 but for unknown reasons, the online registration system allowed him to do so. Normally, he would not have been allowed to take upper level physics courses under these circumstances as a “C” grade (or higher) is considered a passing grade for undergraduate physics majors. We are actively working with the registrar to rectify this problem.

Please limit the narrative portion of your report to no more than four pages. You may attach appendices with data, tables, charts, or other materials as needed. Please explain the relevant conclusions from any appendices in your narrative. Please contact the Office of Academic Assessment if you have questions or need assistance.