DEPT.: Physics
SUBMITTED BY: Jim Lin

2022-2023 Transfer Program Audit Report FALL

PROGRAM QUALITY – TRANSFERABILITY:

1. Discuss how your department determines that the courses offered are still viable and relevant?

   - General Physics (PHYS& 114,115, 116) is offered and required series primarily for biologists and life scientists.
   - Engineering Physics (PHYS& 221, 222, 223) is required for science and engineering per-majors (or AS-T 2 computer science or physics pre-major)
   - Physics for non-science majors (PHYS 110) is for the non-science majors to primarily meet the Associate in Arts and Science laboratory science requirement.

2. Does course curriculum satisfy DTA requirements? How do you know? What needs to change?

   Yes, it does. According to the course catalog 2021-2022, physics courses may be taken as part of the Associate in Arts and Science DTA degree. Within this degree, these courses may be used toward the Natural Science Breadth requirements or for Specified or General Elective credit. Students seeking an Associate in Arts and Science DTA degree will refer to the catalog section "Degrees & Certificates" for a detailed description of the degree, its program outcomes, and courses that satisfy degree requirements.

   There is no major issue that requires change so far.

3. Please construct a table to show all courses offered by your department and how they transfer to CWU, EWU, and WSU. Identify any courses that do not transfer or transfer as general electives.

BBCC Course #	BBCC Course Name	WSU	CWU	EWU	UW
PHYS&110	Physics for Non-Science Majors	PHYSICS 101L (PSCI Lab)	PHYS 106	PHYS100	PHYS 110
PHYS&114	General Physics I w/ Lab	PHYSICS 102L (PSCI Lab)	PHYS 111	PHYS131	No Equivalent
PHYS&115	General Physics II w/ Lab	PHYSICS 111L (PSCI Lab)	PHYS 112	PHYS 132	No Equivalent
PHYS&116	General Physics III w/ Lab	PHYSICS 112L (PSCI Lab)	PHYS 113	PHYS 133	No Equivalent
PHYS&221	Engineering Physics I w/ Lab	See below	PHYS 181	PHYS 161	See below
PHYS&222	Engineering Physics II w/ Lab		PHYS 182	PHYS 162	
PHYS&223	Engineering Physics III w/ Lab		PHYS 183	PHYS 163	
PHYS& 221 AND 222		PHYSICS 211 AND 201			
PHYS& 221, 222, 223		PHYSICS 201, 202, 211, AND 212 (PSCI)			PHYS 121, 122, 123
PHYS& 222 AND 223		PHYSICS 202 AND 212			

4. If some of your courses are not transferring to universities as you expected, what information and/or assistance do your need to help you resolve these transfer issues?

   All courses are transferrable to the universities listed above, as expected. However, if students contact me about a transferring issue they run into, I will contact the specific faculty/staff from that university to help them resolve it ASAP.

ADVISING RESOURCES:

5. Please review your department catalog and website information. Is the information current and accurate? What changes need to be made or would you like to make to better assist students?

   The physics course catalog (2021-2022) was reviewed in Fall 2021. On page 163, the contact number for our division chair, Lindsay Groce, should be updated as 509-793-2157. There is no other major inaccurate information found in the catalog.

   The physics instructor's photo is not shown on the website (link). Additionally, on the Physics Course Description web page (link), the course descriptions for PHYS 114, 115, and 116 are missing and should be updated. Most importantly, the "Advising Maps" tab only shows the course requirement list for the generic (AA&S DTA) path. The map for physics pre-majors (AS&T 2) is lacking (which will be mentioned in problem 6).

6. Has your department developed advising resources/maps to assist students majoring in your discipline or in a related field? Please describe these advising resources/maps. Have you considered developing transfer resources (such as four-year advising maps) for students intending to transfer to CWU, EWU, or WSU and major in your discipline or in a related field? How could BBCC assist you in developing these resources?

   In physics, we use the AST-2 advising map (link) from engineering pre-majors so far, which works for the physics pre-majors. The physics advising map for is not yet available on the Advising Maps webpage, but it can be crafted and provided once we get more familiar with the curriculum flow within these years.

   We do not have specific resources for other universities, and we don't have immediate plans to build them. Since physics majors are on various paths, it is more beneficial to direct them to future universities' physics departments.

   We haven't found any oddity of transferring resources needed for our majors and any of the three universities. However, we will ask BBCC to assist us when we see one.

SCHEDULING:

Please review your course offerings and enrollments over the last three years as well as the FTE information for your department.

7. Discuss how the scheduling for your courses has been evaluated. Describe how scheduling has been altered or maintained to meet the needs of other programs or populations of students.

   In general, our schedule is based on demands. The demand is found out by conducting an in-class survey for students. For example, if results show that PHYS 115 & 116 are highly demanded after PHYS 114 in an academic year, we can offer them in consecutive quarters. Multiple sessions may be opened if a course has large enrollments. PHYS 110 is occasionally offered if other classes are short of enrollments in a specific quarter.

   Additionally, PHYS 114 in the fall and PHYS 221-222-223 sequence are opened yearly since minimum required enrollments are always met.

8. Has this program considered providing other options for offering the program content; such as, online, hybrid, nights, competency-based, weekends, etc? Discuss.
   a. If yes, what is being considered and why?
   b. If no, is this something that should be considered and why/why not?

   Yes, we have considered providing various options. Our in-class survey shows that most students prefer the hybrid setting for physics. This modality will likely remain since some past students show concerns about the online physics courses due to the lack of hands-on approaches, which can significantly impact the

learning effectiveness. Additionally, we provide online modality only if an extreme circumstance prevents us from meeting onsite, such as a new COVID outbreak. The other modalities (night, weekend…etc.) are uncommon but can be applied if future surveys indicate more demands.

9. Discuss future plans for annual scheduling based on this audit review. Please share how annual scheduling will need to change to meet future student needs as well as any department needs you have identified with respect to instruction.

   Annual scheduling has not changed much, so it will likely remain. We will continue offering courses that meet pre-major and DTA requirements. Once again, demands of students vary each year, and we need to continue conducting surveys and academic advising in advance to figure them out.

   Additionally, since PHYS& 114 is mostly offered yearly instead of quarterly, we will contact IC to change MATH 099 prerequisite as a corequisite to provide students more flexibility to complete courses. That means the PHYS& 114 prerequisite statement on page 226 will be changed to:

   Prerequisites: Concurrent enrollment of MATH 099 or a placement in a same-level mathematics course or instructor permission. LS (Sp)

TRANSFER PARTNERSHIPS:

10. Provide information about how this department is involved in building and/or maintaining specific partnerships/relationships with one or more of our three transfer institutions (WSU, CWU, EWU). List and identify the partners/transfer institutions, describe the relationships that have been established, and what is planned for the future to establish better connections with our transfer institutions.

    We currently have no partnerships. We are new faculty hired in the 1st year, and we are focusing on developing the current curriculum flow and getting familiar with the program.

    Our one possible plan is to build a network with WSU Physics and start holding field trips for BBCC students to visit WSU faculties and research labs. This plan can help students get familiar with academic research and see it as a possible career option. Additionally, WSU is the closest research institution to BBCC, which makes this plan more feasible. The field trip can also favor students who plan to transfer to WSU.

CAREER GUIDANCE:

11. How does your department provide career counseling with information on employment trends, wages, and opportunities to assist students plan their education? What resources do you need to assist you in providing career counseling information to your students and advisees?

    We do not have such a service, but we can refer them to Career Services if students ask about it. We may need a computer program or a search engine for entering a career for displaying the counseling information.

DEPT.: Physics
SUBMITTED BY: Jim Lin

2022-2023 Transfer Program Audit Report WINTER

PROGRAM QUALITY – INSTRUCTION:

1. Select all methods that are used by your department to integrate the academic knowledge and skills of your students and ensure that they are taught with the same coherence and rigor as all other students. *Please provide short descriptions of each selection.*

☒Contextualized Instruction
☒Team-Teaching
☐Math-First Initiatives
☐College-Level Core Curriculum
☐College-Wide Student Learning Outcomes
☐STEM Initiatives
☒Tutoring
☒Flipped Classrooms
☐Just in Time Support Instruction/Accelerated Learning
☒Active Learning/Student Engagement Techniques
☐Project Based Learning
☐Industry Standardized Tests/Exams
☐I-BEST Programs
☐Other (Please describe.)

Contextualized Instruction & Active Learning/Student Engagement Techniques:

Some physics activities about real-life scenarios are assigned in class for students in groups to make a hypothesis, discuss, and learn the physics principle behind the question. (For example: Based on the concepts of heat engine, discuss whether one should open the fridge door for a whole day to cool a house during a hot summer.)

Tutoring: Tutoring in math and physics is offered in the BBCC STEM center.

Flipped classroom: Zoom lecture videos are provided for students to watch anytime, while some in-person lectures are held to show hands-on demos and conduct Zoom polls for discussing physics questions in groups.

PROGRAM QUALITY – STUDENT ACHIEVEMENT DATA:
Please use the student achievement data provided to discuss and review how successful students are within your classes. Please use the Overall Success Rates and Course Success Compare tabs in the About BBCC Tableau workbook to gather the data for the courses in your department. These workbooks can be found on the Institutional Research & Planning page in the Portal.

2. Are there certain classes with student success rates below 75%? Within your courses, what achievement gaps do you observe within underrepresented groups taking your courses? Which of these gaps are you focusing your efforts on and what are your next steps? How does this student achievement data intersect with your assessment efforts?

No, all courses have success rate above 75% from the Fall of 2021 until now. Women in physics are the most notable underrepresented group in physics. I observed the notable achievement gaps between the female and male students. Data in all physics classes show that females either withdrew due to low performance, struggle in learning physics, or consistently earned lower test grades.

I am focusing on the female group by reaching out to them often, in order to make sure they are keeping up or have the right learning resources. The next step is to interact with them during the problem-solving session and analyze why they struggle often. The student achievement data indicates the improving success rate over time, which corresponds to the success of my implemented flipped classroom setting in all physics courses.

3. Please describe what you are doing as a department to increase student success, especially within courses that exhibit low success rates or that indicate achievement gaps exist for some student groups? How are you closing the loop to see if your efforts have made improvement or not? What further steps do you plan to pursue?

I am working with other faculty in the STEM department to promote relationship-building between students and us. For example, I let students conduct the "Getting-to-know-you" survey form (the template is provided by Prof. Mariah Whitley and modified by me) to know students' backgrounds. This plan will ensure that the underrepresented groups feel welcome and included. In addition, I reach out to all students after each exam and have them check in with me during the quarter. The loop was closed as I continuously assessed for the grade improvement shown on the data table in question 2.

Starting next quarter, I plan to set up a mini-tour in Building 1200 on the 1st day of class for students to check the resource & tutoring services from the STEM center to make sure they know where to get help and support in college.

4. Are there additional insights you have observed when looking at student grade data within courses? Please highlight one or more of these observations.

Not that I can think of.

		Year Assessed						
Course	Course Name	19/20	20/21	21/22	22/23	23/24	24/25	25/26
ASTR 105	Observational Astronomy	No Plans to Teach						
ASTR& 100	Survey of Astronomy	No Plans to Teach						
ASTR& 101	Intro to Astronomy		IO2				PO5	
PHYS& 110	Physics for Non-Science Majors			IO2				PO5
PHYS& 114	General Physics I W/Lab	PO5			IO2			
PHYS& 115	General Physics II W/Lab	No Plans to Teach						
PHYS& 116	General Physics III W/Lab	No Plans to Teach						
PHYS& 221	Engineering Physics I		IO2				PO5	
PHYS& 222	Engineering Physics II			IO2				PO5
PHYS& 223	Engineering Physics III	PO5			IO2			

PROGRAM QUALITY – ASSESSMENT PLAN:

5. Please review your department's 7-Year Plan and Course Crosswalk for accuracy and completion. Does the course crosswalk accurately reflect the courses offered by your department? Are all courses offered being assessed once within a seven-year span and are all program outcomes included within your department's courses assessed at least once during the plan. Update your plan to include seven years moving forward from this year. Submit your updated plan along with the Winter Quarter Program Audit Report.

Yes, the crosswalk reflects the course offered accurately. The following table shows that all courses being taught are accessed within seven years.

LAB FEES:

6. Does your department maintain a lab fee account?
    a. If yes, please answer the remaining questions regarding lab budgets.
    b. If no, please skip the remaining questions regarding lab budgets.

Yes, it does.

7. Is the lab account balance adequate to cover consumable expenses?
    a. If no, have fees been reviewed? Why/why not? What is needed to ensure consumables are covered. Discuss. (Should this discussion be used to request a fee increase?)
    b. If yes, do fees need to be reduced? Discuss.

Yes, and the fee does not need to be reduced. As a new single-faculty who is starting the 1st year of the BBCC physics program, we have estimated the cost for consumables. The lab fee will be spent on several parts in the future. (For example, the belt for repairing the Van de Graaff generators, the broken part of spectrometers, the fuses for multimeters & power supplies, etc.) In fact, the lab fee may be increased in the coming Spring quarter (S23) since a field trip will be conducted during that term.

8. Is the lab account balance adequate for purchasing needed equipment/technology updates?
    a. If no, do fees need to be increased to help support these? What is needed and what will it cost? How much do the fees need to increase? Discuss. (Should this discussion be used to request a fee increase?)
    b. If yes, what will be purchased and when?

Yes. The balance is around $3400, and half of the lab fee will be used for ordering new physics equipment, such as the new PASCO optics equipment for reflection & refraction & interference & diffraction will be purchased in the middle of Spring 2022.

TECHNOLOGY:

9. Does your department have the technology available that is needed within courses to prepare students for transfer? Discuss.

Yes, for the case of physics, all hands-on technologies except optics equipment (reflection & refraction & interference & diffraction) are available for all general & engineering physics courses. Additionally, each student has a lab computer to access Office Software, Canvas, and web-based simulation labs for conducting group activities, which helps them learn the subject effectively. The credits will be transferrable to universities with students' successful completion of courses.

10. Review your current equipment/technology inventory. Are there equipment/technology purchases that you think that you may need within the next three years. Please discuss equipment/technology where replacement/update is needed or where technology/equipment is obsolete. Have you planned for these purchases within your lab fee account, if you have one? How do you plan to budget for these purchases?

Since the Fall of 2021, several optics equipment sets were missing for some group lab activities (e.g., Ray boxes for reflection & refraction experiments and He-Ne lasers for interference & diffraction experiments). As mentioned, the missing equipment sets will be ordered ASAP in Spring 2022 since they are necessary for conducting the essential physics experiments in PHYS 222 and PHYS 115 at BBCC. The order will be placed by using my departmental lab fee account with an account that has statewide funding.

INTERNAL PARTNERSHIPS:

11. Provide information about how your department is involved in building and/or maintaining specific internal partnerships/relationships. Briefly describe the partnerships you have been working to develop and what the outcome(s) of those partnerships has been. What are you considering or planning to do in the future?

    We currently have no intermal partnerships. We are new faculties hired in the 1st and 2nd years focusing on developing the current curriculum and getting familiar with the program.

2022-2023 Transfer Program Audit Report SPRING

PROGRAM QUALITY – ASSESSMENT:

We are required by our accrediting body, the Northwest Commission on Colleges and Universities (NWCCU), to document our assessment of student learning activities. Specifically, we are expected to assess student learning in our programs, to design and implement changes in our teaching intended to improve student learning, and to use further assessment of student learning to measure the impact of those changes on student learning.

Please review the assessment work you did over each of the past three years and then respond to these questions.

1. Based on your prior assessments, what were the issues (problems) that you were trying to address in an effort to improve student learning?

   (1) Students with a poor grasp of concepts in physics from 2021 – 2023; (2) The female group with unusually poor test performance in physics from 2021 – 2023

2. What changes did you make in your instruction and/or program to address the problems identified in the question above?

   I have gradually developed the flipped-classroom setting in all my physics classes since the Fall of 2021 – Students watch lecture videos online and conduct discussions & labs onsite. The setting is meant to help students learn and engage effectively and to bridge the achievement gap for all groups.

3. After implementing your changes, what impact did the changes have on student learning? How do you know/What did the data tell you?

   The onsite weekly discussion session makes a huge difference in student learning and test grades. Within the 2 and half years, the overall average test grade from each midterm has increased from 70% to 80%, with the standard deviation decreasing from 18% to 15%. The overall success rate for students has increased from 75% to 90%. However, women still struggle more than others even if most of them manage to pass a physics course, and the male-to-female withdrawal ratio is 1:2.

4. What are the implications for your academic program or department? (What are your next steps now?/What will you do to close the loop?)

   Implication: Although the physics courses are taught in BBCC as a Hispanic Service Institution, the most struggling group in physics are women instead of Hispanics & Latinos.

   My next step is to conduct STEM-based learning surveys and interact with female students more often to identify other factors that make the women group struggles.

PROGRAM QUALITY – OUTCOMES:

5. Did your department invest in technology or equipment used to improve content delivery or student performance? If so, please describe the purchase and the impact it has had on content and/or student performance.

   Yes, the department helps us order the optics equipment set for physics courses for the physics program. The order includes

   - 4 sets of He-Ne laser bench with interference diffraction apertures.
   - 4 sets of light-ray boxes with a prism, an optic platform, and a protractor for studying reflecting & refracting rays.

   These essential lab equipment sets will help students conduct experiments to learn and visualize light phenomena and see how lab results are connected to real-world applications. However, the outcome of content delivery and student performance are not yet apparent since students will be using them in the coming Winter 2023 in PHYS 222 and PHYS 115.

6. Please provide examples of any innovative projects, initiatives, or state-of-the-art equipment undertaken in the last year. Please describe and include links to any social media posts and/or press/media coverage, if applicable.

   The most prominent example will be the Science Fair that helps all of the STEM faculty / staff / students learn, interact, and reestablish the community after COVID. For example, one of my engineering physics students, Benjamin Dinkelmann, participated and presented the interference & diffraction of the He-Ne laser for the audience to explore physics phenomena.

   https://www.facebook.com/hashtag/bbccsciencefair

7. What was the most successful or noteworthy development with respect to program quality and/or program improvement this year?

   The innovative semi-flipped classroom setting is implemented in all physics courses this year: Zoom lecture videos are provided for students to watch anytime. In contrast, some in-person lectures are held to show hands-on demos and conduct Zoom polls for discussing physics questions in groups. COVID may be part of the reason for this modified setting. Still, the result is better than expected: This setting improves attendance and enhances the interaction between students and instructors during discussion/lab activities. Although a few students are not yet adapted to the flipped classroom, 90% of my students passed and earned decent grades in physics.

8. What were the most significant challenges (e.g. funding, enrollment, performance, staff retention or turnover, equity, etc.) encountered in the last year? How could BBCC assist in addressing these challenges?

   One challenge is the low enrollment in General Physics, resulting in the cancellation of several physics courses (e.g., PHYS 115 & 116), which makes us teach classes that weren't in our disciplines, such as MATH 141, 142, and 107. We need assistance from the student advising department to heartily advertise this series and emphasize why it is essential for them to take General Physics at their early stage of college life.

   Another challenge is the poor participation from two of my students because of the flipped classroom setting. Both shared their huge concerns about not being able to adapt to the online platform and follow the online lecture. They strongly prefer traditional in-person lecture meetings. One of them developed depression in the Winter of 2022, and his depression may be connected to the fact he stays away from all of the online physics homework and lecture, even if a non-pass grade is earned. In this case, I need help from the student advising to encourage them to adapt to the changes that may frighten them because

changes will be more and more common in the COVID/post-COVID seasons for people to encounter in colleges and workplaces.

FACULTY/STAFF PROFESSIONAL DEVELOPMENT:

9. Please provide brief descriptions and dates of professional development in which you and members of your department have participated in the last year.

   AAPT Virtual Winter Meeting 2022

   This national conference, held by AAPT (American Association of Physics Teachers), is an excellent opportunity to explore sessions and workshops designed with our professional development in mind. The latest research and exchange ideas in teaching and pedagogy are presented. We participate in a wide range of events, activities, plenaries, and so much more, connecting us with peers and colleagues who share our commitment to excellence in physics education.

   ESCALA event (at BBCC)

   This event is held with CTL-HSI final presentations as the capstone activity of a 27-hour course in culturally responsive teaching & learning that began in the Summer of 2021. Presentations summarize what was learned from making changes to instruction or working with students.

10. What was the most successful or noteworthy development with respect to faculty/staff retention and professional development this year?

    The most noteworthy one will be the ESCALA event to me. Several presentations from BBCC faculty have helped me realize many other ways to create a more inclusive environment to build relationships further with students and help them succeed.

11. Select the methods employed to provide professional development opportunities for faculty/staff. Provide a brief description of each selection.

☐New Instructor Conference/Boot Camp	☐Distance Learning Training
☐Deans Academy	☒Technology and E-Learning Tools
☐Return-to-Industry	☒Data and Assessment Workshops
☒Faculty Peer Mentoring	☐Subject Matter Conferences
☐Professional Development Days	☐Other

    Faculty Peer Mentoring – The mentorship is established between the tenure track and the tenured faculty (e.g., Jim Lin mentored by Mariah Whitley) to ensure smooth development and growth.

    Math & Science colloquium: Several workshops are presented by our STEM faculty members to show how to use e-learning tools and platforms. For example, “Using R in Introduction Statistics Courses” and “How to make your own Canvas link buttons” by Johanna Doty, “Edpuzzle tutorial” by Sarah Bauer, “Using Trello to get the ‘to dos’ done” by Tyler Wallace, etc.)

    Assessment workshop: The assessment committee chair, Sean Twohy, conducted a series of workshops during In-service to show how to assess student improvement and submit assessment reports.

K-12 COMMUNITY PARTNERSHIPS:

12. Does your department provide opportunity for College in the High School or CTE Dual Credit with area high schools?
    a. If yes, list the classes and the schools.
    b. If yes, could these offerings be expanded? How?
    c. If no, is this an area that can be developed? How?

    Yes, our BBCC physics department provides Running Start (CTE Dual Credit) opportunities for students from our local high school to attend physics courses. Students are commonly from Ephrata High School, Moses Lake High School, Othello High School, and Quincy High School. Our courses for Running Start students include PHYS& 110, 114-115-116, and 221-222-223. The College in the High School is not implemented by the BBCC physics department.

13. Provide information about how your department is involved in building and/or maintaining specific external partnerships/relationships with K-12 schools and the communities in our service district. What K-12 partners are you working with and what communities are you working in? What was the most successful or noteworthy development with respect to high school partnerships? What are you considering or planning to do in the future?

    One event we have is to set up the engineering tour event for K-12 students to visit our STEM & physics departments. This tour was conducted in mid-April of 2023 for Waluke High School. As a result, we successfully develop an intercampus relationship for more students to know what our department is like and how physics is taught to help students succeed at BBCC, and the partnership may attract more prospective students to attend BBCC. We will explore more similar opportunities with other K-12 schools in the future.

14. Please describe any outreach events you have participated in as a department. What plans do you have in the future to participate in outreach events with our service district communities?

    One outreach plan I participated in is the North Elementary STEM Family Night in April of 2023. We set up a BBCC station and a STEM booth to showcase several science and physics demos. In the future, we plan to organize more STEM tours to several local high schools to advertise our BBCC program.

PROGRAM AUDIT SUMMARY REFLECTION/GOALS:

15. What are some key things you have learned about your program/department as you completed the program audit?

    I have learned that intercampus outreach and partnerships matter because these are some of the most effective methods for growing our program/department.

16. What are the primary actions you have taken over the past three years to improve student outcomes in your program/department? Why were you focusing on these things? How do you know you are making progress?

    The primary action is the newly developed flipped classroom setting for all of my physics courses. I focus on this task because several STEM research shows that a flipped classroom can improve learning and engagement. The improved course grade average and the reduced withdrawal rates from physics courses are the evidence, indicating the success of this action.

17. What goals do you want to accomplish over the next three years to improve your program/department?

    I want to conduct more outreach events and establish more partnerships to grow my program/department.