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Application for Approval as University Studies Explorations Course

Strand G – Sciences: Biological, Physical, Computer

Course Number SC120/120L Course Title Concepts in Science: Light & Sound

Name(s) of Proposer(s) Dr. Ellen Siem

In what term/year will this course first be offered? Likely Summer or Fall 2020

Instructional Delivery Method (check one): ☐ Classroom ☐ Hybrid ■ Online ☐ All

The purpose of this application form is to allow the University Studies Committee to determine whether the proposed course meets the criteria for an Explorations course appropriate to this University Studies strand, and to understand how the course will align with TracDat levels of instruction (Introduce, Teach and Assess, Refine and Apply – see hints embedded with checkboxes below).

Strand Description: G – Sciences

Understand the fundamental concepts, methods, and applications of the sciences and their impacts on human experience. SOU defines the sciences as those disciplines that focus on a systematized body of knowledge derived through methodologies involving repeatable experimentation, observation, verification, and study.

Course Requirements

At least one goal must be a primary focus of the class, with all proficiencies clearly present in the assignments and design of the course. Addressed goals introduce students to proficiencies but receive less emphasis.

Please indicate which goals and proficiencies are primary and which are addressed. For each goal or proficiency, briefly explain what students will do to demonstrate understanding or mastery. Proficiencies should be developed through course assignments to optimize students' appreciation for the sciences and their role in human experience.

Please also indicate the TracDat level of instruction for each goal.

Strand Goals and Proficiencies

Goal 1. Understand the scientific method and major concepts, principles, and theories of the sciences. Proficiencies - Students will be able to:

- Distinguish among scientific data, ideas, hypotheses, and theories.
- Apply critical thinking, quantitative reasoning, and problem-solving skills to interpret scientific evidence and to evaluate hypotheses and theories.
- Explain the broad historical development of the scientific worldview and important theories.

Emphasis on Goal 1 (check one): ■ Primary ☐ Addressed

Level of Instruction for Goal 1 (check one): ☐ Introduce ☐ Teach & Assess ■ Refine & Apply

List and briefly describe or explain the assignments that will be used to assess students' proficiency for each part of the goal. Please include one example assignment in full, either by pasting it into the text box below or by attaching hard copy. If appropriate, the same example assignment may be used for more than one goal.

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This course is a learner-centered lab science course with a focus on science as a way of learning through objective observation and experimentation, as applied, specifically, to the development of our scientific models of waves, light, and sound.

At the simplest (knowledge/comprehension-based) levels, proficiencies 1.a. and 1.c. will be evaluated through weekly quizzes, in which students will be asked to identify important scientific data and ideas that led to the development of specific theories that apply to waves (e.g., the principle of superposition), to light (wave-particle duality and its support, the law of reflection), and to sound (simple harmonic motion and resonance, the Doppler effect, etc.).

Through weekly experimentation and lab reports, students are required to formulate hypotheses, record experimental data, and analyze their data to evaluate their hypotheses and learn new information. This gives the instructor a chance to

Goal 2. Understand science as a means of learning about and understanding the natural world. Proficiencies - Students will be able to generate and test scientific hypotheses by:

- Designing and carrying out experiments and systematic observational studies. In some cases this may include a laboratory or field setting.
- Using appropriate tools to analyze results.
- Communicating results orally and in writing in accordance with established standards of scientific communication, including appropriate use of tables, figures, and graphs.

Emphasis on Goal 2 (check one): ■ Primary ❑ Addressed

Level of Instruction for Goal 2 (check one): ❑ Introduce ❑ Teach & Assess ■ Refine & Apply

List and briefly describe or explain the assignments that the instructor will use to assess students' proficiency for each part of the goal. Please include one example assignment in full, either by pasting it into the text box below or by attaching hard copy. If appropriate, the same example assignment may be used for more than one goal.

Students conduct weekly experiments, in which they develop hypotheses, manage the experimental setup, and conduct the experiment, recording their observations and data. They then complete weekly lab reports in which they analyze the data, sometimes with simple calculations and sometimes organizing the results visually through graphs, identify trends, compare their hypothesis to their results, and interpret any insights or discrepancies through guided questions. Occasionally, an experiment will ask that they pose a second or third question that can be tested using a slight modification of the experimental set up, form a hypothesis to accompany the new question, and test the new hypothesis using the appropriate modification.

To assess their progress toward goal 2, they are required to submit a photo journey (documentation) of their work in the lab report. The video/photo documentation serves two purposes: it provides verification that the students completed the lab, and

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Goal 3. Apply scientific knowledge and methods to societal issues. Proficiencies - Students will be able to apply scientific data to:

- Inform decision-making on social, political, and economic issues.
- Explain interrelationships between society and the sciences.
- Investigate impacts of technologies on segments of society and investigate plausible solutions to adverse impacts.

Emphasis on Goal 3 (check one): ☐ Primary ■ Addressed

Level of Instruction for Goal 3 (check one): ■ Introduce ☐ Teach & Assess ☐ Refine & Apply

List and briefly describe or explain the assignments that the instructor will use to assess students' proficiency for each part of the goal. Please include one example assignment in full, either by pasting it into the text box below or by attaching hard copy. If appropriate, the same example assignment may be used for more than one goal.

In this class, students study the generation, transmission, and perception of light and sound. Goal 3 presents and exciting opportunity to explore applications of light and/or sound to areas that may impact society, for example, in medicine, communications, or warfare. It also provides the opportunity to address issues related to, for example, climate change, wildlife, or the environment.

To address this goal, the instructor will provide a case study, analyzing an issue associated with creating/distributing auditory or visual information, and students will be asked to research a different example that interests them. Over time, this goal might gain greater emphasis and the case studies may evolve into larger projects or be incorporated experimentally. It is very easy, and even exciting, to imagine an experiment that is designed to test the impact of dyes on water quality or a living system!

Building on Foundational Strands

Because Explorations Strands build on the skills and knowledge developed in the Foundational Strands, it is important that students continue to have opportunities to develop these areas. Briefly describe specific assignments or classroom activities that will allow students to hone their skills in each Foundational Strand.

Foundational Strand A - Communication. Students will be able to communicate effectively in various ways: written, oral, and visual.

Through multimedia assignments, students have an opportunity to augment their communication skills orally as well as visually. With an ever-growing online community, this will serve many of them in their career and life goals.

Through student-run discussion forums located in each module, students are encouraged to post insights, photos of their experiments they are proud of,

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Foundational Strand B - Critical Thinking. Students will be able to use appropriate modes of inquiry, including identifying and framing problems, investigating and supplying evidence, and conceptualizing.

The multimedia assignments ask students to encourage students to reflect more thoroughly on a selected portion of material from the reading or results from an experiment that they found interesting, counterintuitive, and/or insightful. Students are thereby required to reflect on their own understanding, identify their own (correct/incorrect) assumptions and struggles with the material, come to a better understanding, and learn from this process to develop an effective presentation. Likewise the assignment that asks students to consider the impact of light/sound

Foundational Strand C - Information Literacy. Students will be able to access and use information resources effectively and ethically.

Students are required to discuss material learned in the course through multimedia assignments and lab reports. In each case, students are asked to identify and report their sources clearly. In the multimedia assignments, students are asked to do external research and, likewise, report their sources.
In addition, students will be introduced to source credibility in the sciences and asked to choose credible sources for, for example, multimedia assignments. They

Foundational Strand D - Quantitative Reasoning. Students will be able to effectively formulate and use mathematical models and procedures to address abstract and applied problems.

The experiments and lab reports require the students to obtain and then analyze (often numerical) data. Through the analysis, students work to identify trends in the data and extract further information or make conclusions based on these trends. The trends often involve a mathematical relationship, students are sometimes asked to determine the relationship (e.g., increasing or decreasing, linear or exponential) or compare the data to a known relationship or accepted value. Students are often asked to calculate the percent error between their results and a known value.

Condensed Syllabus

A condensed version of the syllabus should contain the following elements. Specific class schedule and similar details are not required, but may be included if you wish.

- Course description (same as catalog copy or longer, as needed)
- Learning objectives of the course
- Required texts or other media
- Other – please add any other relevant materials needed to explain the goals and teaching methods of this course to the University Studies Committee.

Please attach a condensed syllabus.

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Complete Syllabus

Please attach a complete course syllabus, as it will be provided to the students.

Signatures

Instructor 1-9-20

Instructor Date

Reviewed and approval signatures

Chair/Program Director Date

University Studies Director Date

This course is a learner-centered lab science course with a focus on science as a way of learning through objective observation and experimentation, as applied, specifically, to the development of our scientific models of waves, light, and sound.

At the simplest (knowledge/comprehension-based) levels, proficiencies 1.a. and 1.c. will be evaluated through weekly quizzes, in which students will be asked to identify important scientific data and ideas that led to the development of specific theories that apply to waves (e.g., the principle of superposition), to light (wave-particle duality and its support, the law of reflection), and to sound (simple harmonic motion and resonance, the Doppler effect, etc.).

Through weekly experimentation and lab reports, students are required to formulate hypotheses, record experimental data, and analyze their data to evaluate their hypotheses and learn new information. This gives the instructor a chance to evaluate, on a regular basis, proficiency 1.b. (Importantly, students are given the following consistent message: Some of the greatest joys in and opportunities for learning in science are when results counter expectations or provide more insight than what was expected. In each experiment, just before creating a hypothesis, students are given the following message: IMPORTANTLY, doing science is NOT about being right. Doing science is about guessing and experimenting, observing, remarking on the results with one of the two most important words in science: "aha!" or "huh!", and trying to understand.)

Students conduct weekly experiments, in which they develop hypotheses, manage the experimental setup, and conduct the experiment, recording their observations and data. They then complete weekly lab reports in which they analyze the data, sometimes with simple calculations and sometimes organizing the results visually through graphs, identify trends, compare their hypothesis to their results, and interpret any insights or discrepancies through guided questions. Occasionally, an experiment will ask that they pose a second or third question that can be tested using a slight modification of the experimental set up, form a hypothesis to accompany the new question, and test the new hypothesis using the appropriate modification.

To assess their progress toward goal 2, they are required to submit a photo journey (documentation) of their work in the lab report. The video/photo documentation serves two purposes: it provides verification that the students completed the lab, and it allows students to demonstrate their ability to meet proficiency 2.a. In regards to managing the experimental setup and implementing new questions to explore, I'd like to say that, based on my experience in SC110L, students engage their creative thinking to improvise and problem-solve! In addition, each module contains a student-run discussion forum in which students are encouraged to post insights, photos of their experiments they are proud of, questions, trouble-shooting ideas and technical difficulties. This not only helps foster community in the course, it also allows students to practice communicating their work with one another, addressing proficiency 2.c. Lab reports are required for each experiment.

The reports allow students to demonstrate their proficiency in 2.b. by including a section that shows the analysis of their experimental data. Students demonstrate their proficiency in 2.c. by communicating their results in writing and through the use of tables, figures, and/or graphs. When communicating in

writing, students answer a series of questions that guide them in the analysis and interpretation of their results.

Then, they reflect on the significance of the experiments and their results in a short writing assignment that includes what they have identified as the most important aspects of the experiment, how the results relate to what they know and have learned in class, and what they have learned in the process.

An example of an experiment and the lab report are included as an attachment. Those students who choose to discuss their experimental results in a multimedia assignment will demonstrate their ability to communicate results orally to fully meet proficiency 2.c.

Through multimedia assignments, students have an opportunity to augment their communication skills orally as well as visually.

With an ever-growing online community, this will serve many of them in their career and life goals. Through student-run discussion forums located in each module, students are encouraged to post insights, photos of their experiments they are proud of, questions, trouble-shooting ideas and technical difficulties.

This not only helps foster community in the course, it also allows students to practice communicating their work with one another. Students also develop their skills in writing scientific laboratory reports. This helps them become acquainted with scientific communication and thus the diversity in communication among disciplines, develop more compact writing based only on observation and analysis, develop their ability to communicate data analysis through written means, and develop skills in presenting information through tables and graphs. The multimedia assignments ask students to encourage students to reflect more thoroughly on a selected portion of material from the reading or results from an experiment that they found interesting, counterintuitive, and/or insightful.

Students are thereby required to reflect on their own understanding, identify their own (correct/incorrect) assumptions and struggles with the material, come to a better understanding, and learn from this process to develop an effective presentation. The experiments and lab reports require that students identify a problem or question, assemble (and in one or more cases modify) an experiment to search for answers, troubleshoot technical obstacles, carry out the experimental procedure, observe and record data suspending judgement or assumption, analyze the data using appropriate skills and tools, confront prior assumptions (if results were not as anticipated) or errors in thinking or technique, and connect how a concept learned in the class/lab drove the observations at hand. These experiments are inherently different from those conducted in a formal lab class setting, as the student prepares the materials, performs the full experiment, and records and analyzes data on their own.

This level of involvement might inspire a greater degree of investment, engagement, and critical thinking.

The student-run discussion forums located in each module allow students to think through observed phenomena, creative experimental designs, and technical difficulties together.

The multimedia assignments ask students to encourage students to reflect more thoroughly on a selected portion of material from the reading or results from an experiment that they found interesting, counterintuitive, and/or insightful.

Students are thereby required to reflect on their own understanding, identify their own (correct/incorrect) assumptions and struggles with the material, come to a better understanding, and learn from this process to develop an effective presentation. Likewise the assignment that asks students to consider the impact of light/sound generation or transmission using a particular example requires that they consider implications and take the issue further by posing their own follow-up questions. Likewise, the experiments and lab reports require that students identify a problem or question, assemble (and in one or more cases modify) an experiment to search for answers, troubleshoot technical obstacles, carry out the experimental procedure, observe and record data suspending judgement or assumption, analyze the data using appropriate skills and tools, confront prior assumptions (if results were not as anticipated) or errors in thinking or technique, and connect how a concept learned in the class/lab drove the observations at hand. These experiments are inherently different from those conducted in a formal lab class setting, as the student prepares the materials, performs the full experiment, and records and analyzes data on their own.

This level of involvement might inspire a greater degree of investment, engagement, and critical thinking.

The student-run discussion forums located in each module allow students to think through observed phenomena, creative experimental designs, and technical difficulties together.

Students are required to discuss material learned in the course through multimedia assignments and lab reports. In each case, students are asked to identify and report their sources clearly. In the multimedia assignments, students are asked to do external research and, likewise, report their sources. In addition, students will be introduced to source credibility in the sciences and asked to choose credible sources for, for example, multimedia assignments.

They will be required to include a brief explanation qualifying the credibility of the sources they chose.

The experiments and lab reports require the students to obtain and then analyze (often numerical) data. Through the analysis, students work to identify trends in the data and extract further information or make conclusions based on these trends. The trends often involve a mathematical relationship, students are sometimes asked to determine the relationship (e.g., increasing or decreasing, linear or exponential) or compare the data to a known relationship or accepted value. Students are often asked

to calculate the percent error between their results and a known value. The explain-a-figure multimedia assignments require that a student spend time studying a figure/graph/diagram to come to a greater level of comprehension or find further meaning in the information presented. In the majority of cases, this pushes the student to recognize behavior that is by nature mathematical—they may notice the slope, the curvature, the scale, the intercept, etc., and before they know it, they have embarked on a rich story about the information that integrates these mathematical concepts.

Attachment: Goal 3 of University Studies G-Strand Template for SC120/120L
Date: January 9, 2020

In this class, students study the generation, transmission, and perception of light and sound. Goal 3 presents and exciting opportunity to explore applications of light and/or sound to areas that may impact society, for example, in medicine, communications, or warfare. It also provides the opportunity to address issues related to, for example, climate change, wildlife, or the environment.

To address this goal, the instructor will provide a case study, analyzing an issue associated with creating/distributing auditory or visual information, and students will be asked to research a different example that interests them. Over time, this goal might gain greater emphasis and the case studies may evolve into larger projects or be incorporated experimentally. It is very easy, and even exciting, to imagine an experiment that is designed to test the impact of dyes on water quality or a living system!

Example Case Studies

As an example, the chosen case study might explore the impact of noise pollution in the oceans, which has been referred to as "acoustic bleaching", on marine life. During another quarter, the case study might investigate thermal and chemical water pollution that accompanies the use of dyes and pigments on clothes, particularly those which have been designed to be non-biodegradable. And, for another quarter, the case study might compare the reduction in cost and fossil fuel emissions that accompanied the switch to energy-efficient lighting sources in a facility (such as a concert hall, athletic stadium, hospital, airport) or on a larger scale (such as a small town). It is important to leave the actual topic of the case study open so that it can be adapted to a current interesting societal, political, and economic issue or set of issues.

Student Activity

After the case study is introduced and discussed, students will be asked to find another example (as an article or video from a reliable source) that connects the class material to a larger issue. One student might research the impact of art and music on the treatment of Alzheimer's or another medical issue. Another student might investigate the economic benefits of (or the reduction in fossil fuel emissions involved with) the use of LEDs in an urban skyscraper. Others might explore new policies being developed to address noise or light pollution in certain applications or regions, and so on.

Assignment Example

Consider the case study presented in this module. Ask yourself whether there are other ways that our use of light, color, and sound impact society. Are there applications that might provide benefits in the area of medicine? Are there applications that might have environmental consequences, positive or negative? Can you think of examples in which light or sound are byproducts of human activity? What are the implications of light/sound in these situations? Are there more efficient technologies that could provide economic benefits while supporting efforts of sustainability? Use such questions as these to inspire your own curiosity, and find an example from a reliable source that connects light, color, and/or sound to a larger issue impacting society or the environment.

For this assignment, you will have a choice of medium: You are allowed to submit the assignment in writing (300-500 words) or as an audio or video recording (3-5 minutes). In your assignment, include the following:

- the title, author, type, and location of your source(s)
- an explanation indicating why the source(s) can be considered reliable

- a summary of the important features your example that relates it to class concepts of light, color, and/or sound
- the connection of the above concepts to a larger issue, and a clear description of this issue
- a suggestion that might lead to an improvement (for example, perhaps using LED lights would save money, calming colors and soft lighting at the DMV would lead to better customer satisfaction, or chemical dyes for consumables should be banned)
- one question you now have, related to this issue
- (for fun) one or more unexpected things you found to be very interesting while working on this assignment

Assignment Logistics

This will likely replace the 2nd discussion question assignment.

ORIGINAL

Application for Approval as University Studies Explorations Course

Strand G – Sciences: Biological, Physical, Computer

Course Number SC120/SC120L Course Title Concepts in Science: Light & Sound

Name(s) of Proposer(s) Dr. Ellen Siem

In what term/year will this course first be offered? Spring 2020 (or Winter, if possible!)

Instructional Delivery Method (check one): ☐ Classroom ☐ Hybrid ■ Online ☐ All

The purpose of this application form is to allow the University Studies Committee to determine whether the proposed course meets the criteria for an Explorations course appropriate to this University Studies strand, and to understand how the course will align with TracDat levels of instruction (Introduce, Teach and Assess, Refine and Apply – see hints embedded with checkboxes below).

Strand Description: G – Sciences

Understand the fundamental concepts, methods, and applications of the sciences and their impacts on human experience. SOU defines the sciences as those disciplines that focus on a systematized body of knowledge derived through methodologies involving repeatable experimentation, observation, verification, and study.

Course Requirements

At least one goal must be a primary focus of the class, with all proficiencies clearly present in the assignments and design of the course. Addressed goals introduce students to proficiencies but receive less emphasis.

Please indicate which goals and proficiencies are primary and which are addressed. For each goal or proficiency, briefly explain what students will do to demonstrate understanding or mastery. Proficiencies should be developed through course assignments to optimize students' appreciation for the sciences and their role in human experience.

Please also indicate the TracDat level of instruction for each goal.

Strand Goals and Proficiencies

Goal 1. Understand the scientific method and major concepts, principles, and theories of the sciences. Proficiencies - Students will be able to:

- Distinguish among scientific data, ideas, hypotheses, and theories.
- Apply critical thinking, quantitative reasoning, and problem-solving skills to interpret scientific evidence and to evaluate hypotheses and theories.
- Explain the broad historical development of the scientific worldview and important theories.

Emphasis on Goal 1 (check one): ■ Primary ☐ Addressed

Level of Instruction for Goal 1 (check one): ☐ Introduce ☐ Teach & Assess ■ Refine & Apply

List and briefly describe or explain the assignments that will be used to assess students' proficiency for each part of the goal. Please include one example assignment in full, either by pasting it into the text box below or by attaching hard copy. If appropriate, the same example assignment may be used for more than one goal.

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Through weekly experimentation and lab reports, students are required to formulate hypotheses, record experimental data, and analyze their data to evaluate their hypotheses and learn new information. This gives the instructor a chance to

Goal 2. Understand science as a means of learning about and understanding the natural world. Proficiencies - Students will be able to generate and test scientific hypotheses by:

- Designing and carrying out experiments and systematic observational studies. In some cases this may include a laboratory or field setting.
- Using appropriate tools to analyze results.
- Communicating results orally and in writing in accordance with established standards of scientific communication, including appropriate use of tables, figures, and graphs.

Emphasis on Goal 2 (check one): ■ Primary ❑ Addressed

Level of Instruction for Goal 2 (check one): ❑ Introduce ❑ Teach & Assess ■ Refine & Apply

List and briefly describe or explain the assignments that the instructor will use to assess students' proficiency for each part of the goal. Please include one example assignment in full, either by pasting it into the text box below or by attaching hard copy. If appropriate, the same example assignment may be used for more than one goal.

Students conduct weekly experiments, in which they develop hypotheses, manage the experimental setup, and conduct the experiment, recording their observations and data. They then complete weekly lab reports in which they analyze the data, sometimes with simple calculations and sometimes organizing the results visually through graphs, identify trends, compare their hypothesis to their results, and interpret any insights or discrepancies through guided questions. Occasionally, an experiment will ask that they pose a second or third question that can be tested using a slight modification of the experimental set up, form a hypothesis to accompany the new question, and test the new hypothesis using the appropriate modification.

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Goal 3. Apply scientific knowledge and methods to societal issues. Proficiencies - Students will be able to apply scientific data to:

- Inform decision-making on social, political, and economic issues.
- Explain interrelationships between society and the sciences.
- Investigate impacts of technologies on segments of society and investigate plausible solutions to adverse impacts.

Emphasis on Goal 3 (check one): ❑ Primary ❑ Addressed

Level of Instruction for Goal 3 (check one): ❑ Introduce ❑ Teach & Assess ❑ Refine & Apply

List and briefly describe or explain the assignments that the instructor will use to assess students' proficiency for each part of the goal. Please include one example assignment in full, either by pasting it into the text box below or by attaching hard copy. If appropriate, the same example assignment may be used for more than one goal.

These proficiencies do not seem clearly addressed by any assignments. However, I would be happy to modify some of the course content and assignments to do so if required by the committee.

Building on Foundational Strands

Because Explorations Strands build on the skills and knowledge developed in the Foundational Strands, it is important that students continue to have opportunities to develop these areas. Briefly describe specific assignments or classroom activities that will allow students to hone their skills in each Foundational Strand.

Foundational Strand A - Communication. Students will be able to communicate effectively in various ways: written, oral, and visual.

Through multimedia assignments, students have an opportunity to augment their communication skills orally as well as visually. With an ever-growing online community, this will serve many of them in their career and life goals.

Through student-run discussion forums located in each module, students are encouraged to post insights, photos of their experiments they are proud of,

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Foundational Strand B - Critical Thinking. Students will be able to use appropriate modes of inquiry, including identifying and framing problems, investigating and supplying evidence, and conceptualizing.

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Foundational Strand C - Information Literacy. Students will be able to access and use information resources effectively and ethically.

Students are required to discuss material learned in the course through multimedia assignments and lab reports. In each case, students are asked to identify and report their sources clearly. In the multimedia assignments, students are asked to do external research and, likewise, report their sources.

Foundational Strand D - Quantitative Reasoning. Students will be able to effectively formulate and use mathematical models and procedures to address abstract and applied problems.

The experiments and lab reports require the students to obtain and then analyze (often numerical) data. Through the analysis, students work to identify trends in the data and extract further information or make conclusions based on these trends. The trends often involve a mathematical relationship, students are sometimes asked to determine the relationship (e.g., increasing or decreasing, linear or exponential) or compare the data to a known relationship or accepted value. Students are often asked to calculate the percent error between their results and a known value.

Condensed Syllabus

A condensed version of the syllabus should contain the following elements. Specific class schedule and similar details are not required, but may be included if you wish.

- Course description (same as catalog copy or longer, as needed)
- Learning objectives of the course
- Required texts or other media
- Other – please add any other relevant materials needed to explain the goals and teaching methods of this course to the University Studies Committee.

Please attach a condensed syllabus.

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Complete Syllabus

Please attach a complete course syllabus, as it will be provided to the students.

Signatures

7.19.19

Instructor Date

Reviewed and approval signatures

Chair/Program Director Date

University Studies Director Date

This course is a learner-centered lab science course with a focus on science as a way of learning through objective observation and experimentation, as applied, specifically, to the development of our scientific models of waves, light, and sound.

At the simplest (knowledge/comprehension-based) levels, proficiencies 1.a. and 1.c. will be evaluated through weekly quizzes, in which students will be asked to identify important scientific data and ideas that led to the development of specific theories that apply to waves (e.g., the principle of superposition), to light (wave-particle duality and its support, the law of reflection), and to sound (simple harmonic motion and resonance, the Doppler effect, etc.).

Through weekly experimentation and lab reports, students are required to formulate hypotheses, record experimental data, and analyze their data to evaluate their hypotheses and learn new information. This gives the instructor a chance to evaluate, on a regular basis, proficiency 1.b. (Importantly, students are given the following consistent message: Some of the greatest joys in and opportunities for learning in science are when results counter expectations or provide more insight than what was expected. In each experiment, just before creating a hypothesis, students are given the following message: IMPORTANTLY, doing science is NOT about being right. Doing science is about guessing and experimenting, observing, remarking on the results with one of the two most important words in science: "aha!" or "huh!", and trying to understand.)

On a perhaps deeper level, students will use multimedia assignments (these are peer-to-peer video* submissions) that are designed to encourage students to reflect more thoroughly on a selected portion of material, enabling the instructor to gauge student comprehension and integration (transfer) of knowledge. These are moments through which the students have an opportunity to teach and highlight their own misconceptions or relationship to the material. These assignments are developed to address proficiencies 1.b. and/or 1.c. An example of one of these multimedia assignments is included as an attachment. *Students are given the option to submit audio in place of video.

Students conduct weekly experiments, in which they develop hypotheses, manage the experimental setup, and conduct the experiment, recording their observations and data. They then complete weekly lab reports in which they analyze the data, sometimes with simple calculations and sometimes organizing the results visually through graphs, identify trends, compare their hypothesis to their results, and interpret any insights or discrepancies through guided questions. Occasionally, an experiment will ask that they pose a second or third question that can be tested using a slight modification of the experimental set up, form a hypothesis to accompany the new question, and test the new hypothesis using the appropriate modification.

To assess their progress toward goal 2, they are required to submit a photo journey (documentation) of their work in the lab report. The video/photo documentation serves two purposes: it provides verification that the students completed the lab, and it allows students to demonstrate their ability to meet proficiency 2.a. In regards to managing the experimental setup and implementing new questions to explore, I'd like to say that, based on my experience in SC110L, students engage their creative thinking to improvise and problem-solve! In addition, each module contains a student-run discussion

forum in which students are encouraged to post insights, photos of their experiments they are proud of, questions, trouble-shooting ideas and technical difficulties. This not only helps foster community in the course, it also allows students to practice communicating their work with one another, addressing proficiency 2.c.

Lab reports are required for each experiment. The reports allow students to demonstrate their proficiency in 2.b. by including a section that shows the analysis of their experimental data. Students demonstrate their proficiency in 2.c. by communicating their results in writing and through the use of tables, figures, and/or graphs. When communicating in writing, students answer a series of questions that guide them in the analysis and interpretation of their results. Then, they reflect on the significance of the experiments and their results in a short writing assignment that includes what they have identified as the most important aspects of the experiment, how the results relate to what they know and have learned in class, and what they have learned in the process. An example of an experiment and the lab report are included as an attachment.

Those students who choose to discuss their experimental results in a multimedia assignment will demonstrate their ability to communicate results orally to fully meet proficiency 2.c.

These proficiencies do not seem clearly addressed by any assignments. However, I would be happy to modify some of the course content and assignments to do so if required by the committee.

Through multimedia assignments, students have an opportunity to augment their communication skills orally as well as visually. With an ever-growing online community, this will serve many of them in their career and life goals.

Through student-run discussion forums located in each module, students are encouraged to post insights, photos of their experiments they are proud of, questions, trouble-shooting ideas and technical difficulties. This not only helps foster community in the course, it also allows students to practice communicating their work with one another.

Students also develop their skills in writing scientific laboratory reports. This helps them become acquainted with scientific communication and thus the diversity in communication among disciplines, develop more compact writing based only on observation and analysis, develop their ability to communicate data analysis through written means, and develop skills in presenting information through tables and graphs. The multimedia assignments ask students to encourage students to reflect more thoroughly on a selected portion of material from the reading or results from an experiment that they found interesting, counterintuitive, and/or insightful. Students are thereby required to reflect on their own understanding, identify their own (correct/incorrect) assumptions and struggles with the material, come to a better understanding, and learn from this process to develop an effective presentation.

The experiments and lab reports require that students identify a problem or question, assemble (and in one or more cases modify) an experiment to search for answers, troubleshoot technical obstacles, carry out the experimental procedure, observe and record data suspending judgement or assumption, analyze

the data using appropriate skills and tools, confront prior assumptions (if results were not as anticipated) or errors in thinking or technique, and connect how a concept learned in the class/lab drove the observations at hand.

These experiments are inherently different from those conducted in a formal lab class setting, as the student prepares the materials, performs the full experiment, and records and analyzes data on their own. This level of involvement might inspire a greater degree of investment, engagement, and critical thinking.

The student-run discussion forums located in each module allow students to think through observed phenomena, creative experimental designs, and technical difficulties together.

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The student-run discussion forums located in each module allow students to think through observed phenomena, creative experimental designs, and technical difficulties together.

Students are required to discuss material learned in the course through multimedia assignments and lab reports. In each case, students are asked to identify and report their sources clearly. In the multimedia assignments, students are asked to do external research and, likewise, report their sources.

The experiments and lab reports require the students to obtain and then analyze (often numerical) data. Through the analysis, students work to identify trends in the data and extract further information or make conclusions based on these trends. The trends often involve a mathematical relationship, students are sometimes asked to determine the relationship (e.g., increasing or decreasing, linear or exponential) or compare the data to a known relationship or accepted value. Students are often asked to calculate the percent error between their results and a known value.

The explain-a-figure multimedia assignments require that a student spend time studying a figure/graph/diagram to come to a greater level of comprehension or find further meaning in the information presented. In the majority of cases, this pushes the student to recognize behavior that is by nature mathematical—they may notice the slope, the curvature, the scale, the intercept, etc., and before they know it, they have embarked on a rich story about the information that integrates these mathematical concepts.

CONDENSED Syllabus for

Concepts in Science: Light and Sound

SOU Catalog Description

Imagine using light, color, sound, and music to develop and apply scientific thinking and experimentation skills. We will do just that in this course, which is designed for those who might benefit from or enjoy a better understanding of the properties, perceptions, and applications of light and sound, specifically through the lens of optics, color. and music. Though a science course, it is developed for both scientists and non-scientists alike, and has no prerequisites. We will use readings, free online resources, and hands-on experiments to develop a conceptual framework for the physical properties of light and sound. Though online, this course builds a strong and very welcoming, supportive community through short video assignments and shared forums for experiments.

Hopefully approved for University Studies (**Explorations - Strand G, Science with a Lab).**

Prerequisite(s): None

Corequisite(s): SC120L

Course Introduction

Course Concepts

In this course, we will recognize the enduring relevance and importance of science and the scientific method and identify light and sound as physical manifestations of waves, a fundamental manner in which energy (and information) are carried. There four main ideas in our course, the first of which is the most important. The ideas are: (1) science is a powerful way of learning that hinges on objective observation, experimentation, and a willingness to be open; (2) light and sound are physical manifestations of waves and are interpreted through their wave characteristics (such as frequency or pitch) and wave behavior (such as interference and resonance); and (3) light and sound have direct (and delightful) applications in geometric optics, color, and music.

As the course unfolds and we study the four major ideas, we will pay close attention to the following concepts:

- ☐ Science is a study of natural phenomena using observation and experiment.
- ☐ Waves are a natural phenomena that occur all around us.
- ☐ All waves can be thought of as a disturbance that transfers energy.
- ☐ Light is an electromagnetic wave, and sound is a mechanical wave.

- ☐ In common terminology, light is the visible portion of the eleectromagnetic spectrum.
- ☐ The polarization, reflection, refraction, and dispersion (into its colors) of light give rise to many observable natural phenomena and are regularly harnessed in society.
- ☐ When interacting with objects, light can be absorbed, reflected, and/or transmitted and refracted.
- ☐ Both the camera and the eye use lenses to redirect light and create images.
- ☐ Cones in the retina of the eye give rise to the perception of color (when the light is not too dim).
- ☐ Color can be defined in terms of hue, saturation, and brightness.
- ☐ The color of an object depends on several factors, including the color and intensity of the lighting, the color of surrounding objects, and substances in the path of the light.
- ☐ There are two main types of color mixing: additive (wavelengths add, as in mixing lights of different colors) and subtractive (some wavelengths are absorbed and thus subtracted, as in mixing pigments).

- ☐ Oscillations (or vibrations) include the vibration of violin strings and the vibrations of strings and air columns in musical instruments.
- ☐ Oscillations that decay over time are damped; oscillations that build over time are driven.
- ☐ Resonance occurs when external forces driving an oscillation occur at a frequency that matches the natural frequency of a system. When resonance occurs, the amplitude of the oscillation reaches a maximum!

- ☐ Reflection and interference of sound play an important role in, for example, concert hall acoustics.
- ☐ Beats (a wavering sound) can be heard when two sounds differ slightly in frequency.
- ☐ Sound can be described in terms of pitch, loudness, and timbre.
- ☐ When a string fixed at both ends vibrates, only certain frequencies are allowed. Likewise, when columns of air oscillate, only certain frequencies are allowed.
- ☐ The lowest allowed frequency is known as the fundamental frequency; other allowed frequencies are integer or odd integer multiples of the fundamental.
- ☐ When a string vibrates, many of its allowed frequencies play at once (superposition), creating overtones. Higher frequencies tend to decay faster, and certain frequencies can be highlighted with strategic damping.
- ☐ To play a tune, one must be able to change the frequency of a sound. This can be achieved in different ways for different musical instruments.

Course Outcomes[1]

By the end of this course, students will be able to do the following things.

1. Think, investigate, and communicate scientifically
   - ☐ recognize and demonstrate science as a way of learning and distinguish scientific and nonscientific ways of thinking and communicating
   - ☐ formulate hypotheses and test them experimentally
   - ☐ develop experimental techniques and skills in data collection
   - ☐ develop skills in data analysis by identifying important patterns and trends in experimental data
   - ☐ develop the ability to ask "a next question" based on conclusions from the data
   - ☐ develop scientific communication skills through report-writing and discussion

2. Define light and sound as physical manifestations of wave behavior, and
   - ☐ identify wave properties such as wave amplitude, wavelength, period and frequency, and wave speed
   - ☐ describe light as a transverse wave and sound as a longitudinal wave
   - ☐ associate light and color with the visible portion of the electromagnetic spectrum
   - ☐ describe and apply the law of reflection; conceptually describe and examine the refraction of light, the index of refraction, and the disperson of white light into its colors
   - ☐ distinguish between convex and concave lenses and describe images created by convex lenses
   - ☐ identify and summarize the importance of the main parts of the eye, including the light-sensitive retina
   - ☐ describe color, color-generating mechanisms, color perception, and color mixing (both additive and subtractive)
   - ☐ describe oscillations and, specifically, the relationship between the length of a simple oscillator and its natural frequency
   - ☐ illustrate the difference between damped and driven oscillations; explain resonance
   - ☐ describe specific cases of sound interference
   - ☐ describe standing waves and relate them to harmonics in strings and air columns
   - ☐ describe the perceptions of sound, particularly in musical terms, the generation of tunes in instruments

3. Communicate complex concepts visually and orally through multimedia
   - ☐ reflect on one's own understanding to identify parts of a concept or a figure or graph that are clear, unclear, or incorrectly or incompletely integrated
   - ☐ learn from this process to develop a greater awareness
   - ☐ with improved awareness, determine how to best convey the concept to other members of the class

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[1] See the more general language for the goal and proficiencies for Explorations Strand G — Science on the last page of the syllabus. Note that goal 1 is the primary focus of the course, and goal 2 is the primary focus of the lab.

- ☐ successfully create and share video and/or audio to present the concept to the class

Required Texts

Gilbert, P., & Haeberli, W. (2012). *Physics in the arts.* Amsterdam: Academic Press.

Other Required Materials

1. The experiments require students to purchase materials for completion. A materials list can be found here.
2. Access to a video (or voice) recorder and camera (cell phones often do the trick!) to complete the multimedia and lab assignments.

Syllabus for

Concepts in Science: Light and Sound

General Course Information

Title:	Concepts in Science: Light and Sound
Prefix:	SC120 (course) / SC120L (lab)
CRN:	xxxx/xxxx
Term:	Spring 2020
Medium:	Moodle, YouTube, html
Notes:	This course is fully online. There is one combined grade for SC120 and SC120L.

Instructor Information

Name: Dr. Ellen Siem (please call me "Ellen")
Office: Science 179
Email: sieme@sou.edu
Office Hrs*: TBD

SOU Catalog Description

Imagine using light, color, sound, and music to develop and apply scientific thinking and experimentation skills. We will do just that in this course, which is designed for those who might benefit from or enjoy a better understanding of the properties, perceptions, and applications of light and sound, specifically through the lens of optics, color. and music. Though a science course, it is developed for both scientists and non-scientists alike, and has no prerequisites. We will use readings, free online resources, and hands-on experiments to develop a conceptual framework for the physical properties of light and sound. Though online, this course builds a strong and very welcoming, supportive community through short video assignments and shared forums for experiments.

Hopefully approved for University Studies **(Explorations - Strand G, Science with a Lab)**.

Prerequisite(s): None

Corequisite(s): SC120L

Course Introduction

Course Concepts

In this course, we will recognize the enduring relevance and importance of science and the scientific method and identify light and sound as physical manifestations of waves, a fundamental manner in which energy (and information) are carried. There four main ideas in our course, the first of which is the most important. The ideas are: (1) science is a powerful way of learning that hinges on objective observation, experimentation, and a willingness to be open; (2) light and sound are physical manifestations of waves and are interpreted through their wave characteristics (such as frequency or pitch) and wave behavior (such as interference and resonance); and (3) light and sound have direct (and delightful) applications in geometric optics, color, and music.

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Course Outcomes[1]

By the end of this course, students will be able to do the following things.

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   - ☐ recognize and demonstrate science as a way of learning and distinguish scientific and nonscientific ways of thinking and communicating
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Other Required Materials

1. The experiments require students to purchase materials for completion. A materials list can be found here.
2. Access to a video (or voice) recorder and camera (cell phones often do the trick!) to complete the multimedia and lab assignments.

Assignments and Grade Scale

There is one grade for the course (SC120+SC120L).
Student can achieve a maximum of 200 points, distributed as follows:

SC120	Multimedia assignments (4): 30 pts Discussion forums (2): 20 pts Weekly quizzes (8): 40 pts Final exam: 10 pts
SC120L	Lab reports (8): 100 pts

Total: 200 pts

Grade Scale:

A 200-190, **A-** 189-180, **B+** 179-174, **B** 173-166, **B-** 165-160, **C+** 159-154,

C 153-146, **C-** 145-140, **D+** 139-127, **D** 126-114, **D-** 113-101, **F** 100-0

Course Structure

During the ***first week***, you are required to complete 2 introductory assignments: **1.** The multimedia assignment will help you prepare for later assignments while giving you a chance to introduce yourself to me and everyone in the class. **2.** The first discussion question assignment is not graded for accuracy, so please do not worry. It will serve as a way for me to assess what you have learned between the first and last week of the course.

The core of the course (***Weeks 2-10)*** is divided into 8 modules, with the intent that the modules be completed sequentially. Students are expected to complete roughly one module per week for the duration of the term.

Module Assignments

All module assignments include a quiz over readings and/or video and lab reports for one or more experiments. Some modules also require the submission of a multimedia assignment, and the last one includes a graded discussion question assignment.

Module	**First Assign-ments**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Final Assign-ments**
Items due....	**Sun. of Week 1 (4/5)**	**Sun. of Week 2 (4/12)**	**Sun. of Week 3 (4/19)**	**Sun. of Week 4 (4/26)**	**Sun. of Week 5 (5/3)** **next due date in 2 wks**	**Sun. of Week 7 (5/10)**	**Sun. of Week 8 (5/17)**	**Sun. of Week 9 (5/24)**	**Sun. of Week 10 (5/31)**	**FRIDAY of FINALS WEEK (6/12)**
Multi-media Assign. (4 per student, **30 pts)**	✓ (**all** students; **5 pts**)			✓ (**If** your **LAST NAME** begins with **A-L 10 pts)**	✓ (**If** your **LAST NAME** begins with **M-Z 10 pts)**		✓ (**If** your **LAST NAME** begins with **M-Z 10 pts**)	✓ (**If** your **LAST NAME** begins with **A-L 10 pts**)		✓ (**all** students; **5 pts**)
Disc. Questions (2 total, **20 pts)**	✓ (**5 pts** awarded if completed on time)								✓ **(15 pts)**	
Quizzes (8 total, **40 pts)**		✓	✓	✓	✓	✓	✓	✓	✓	
Final* (10 pts)										✓
Lab Reports (100 pts)		✓	✓	✓	✓	✓	✓	✓	✓	

200 total points possible in SC120 + SC120L

Modules are organized such that ALL Module 1 assignments are due at the end of Week 2, ALL Module 2 assignments are due at the end of Week 3, etc.[2], so that students do not find themselves in a situation where they have delayed the completion of assignments in earlier modules until the end.

Lab Reports:

- ☐ Each module includes two laboratory experiments that you can complete at home using a lab kit!
- ☐ As a guide, instructions for each experiment include several photos as well as a short video.
- ☐ Lab reports generally require the following:
  - your hypothesis or hypotheses (1-2 sentences)
  - the data you collected, often in a table
  - your quantitative analysis of the data (simple graphs or calculations, as needed)
  - answers to a series of short questions
  - comparison of your hypothesis (hypotheses) to the experimental results
- ☐ Each experiment will require that you document a portion of your work using one or more photos.
- ☐ Both an example report and a rubric will be available to you on Moodle as a guide. Use them! In addition, before submitting a response, ask yourself the following questions:
  - Did you include and clearly label your introduction, hypothesis, data section, analysis, and summary?
  - Are your ideas logically organized and written clearly and concisely?
  - Do some of your sentences or words simply fill space? (Eliminate these, if so.)
  - Can a reader easily read and understand your data and analysis sections?
  - Are spelling, punctuation, and grammar correct?
  - Are all required tables and graphs included, and are all properly labeled with a main title, column/axes labels, and appropriate SI units?

Quizzes:

- ☐ You will have a 20-minute quiz available on Moodle in every module.
- ☐ The quizzes will open sequentially, so that, for example, once you've completed the Module 2 quiz, you can take the Module 3 quiz.
- ☐ The quizzes will be based on the reading, notes, and/or video posted on Moodle for that module.

Multimedia Assignments:

- ☐ Each student is required to submit 4 multimedia assignments!
- ☐ Assignments ask for short video, but you can be creative—please let me know if you are considering another medium (e.g., making an animation, using an audio file)!
- ☐ In the **1st assignment**, you will introduce yourself to the class.
- ☐ For the **2nd assignment**,
  - IF your LAST NAME begins with a letter between A-L, you will post a summary of material you have read and chosen to discuss. A week later, IF your LAST NAME begins with a letter between M-Z, you will provide feedback to one of the summaries.
- ☐ For the **3rd assignment** the roles switch:
  - IF your LAST NAME begins with a letter between M-Z, you will post a summary of material you have read and chosen to discuss. A week later, IF your LAST NAME begins with a letter between A-L, you will provide feedback to one of the summaries.
- ☐ In the **4th assignment**, you will provide a "summing up" of the course.
- ☐ Please use the rubrics I have provided to organize the content and delivery of your submissions!

Discussion Questions:

- ☐ You will have 2 sets of discussion questions to answer.
- ☐ The 1st is due at the end of the first week and graded only on effort, so don't panic!

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[2] Note that there is a break after week 5: Module 6 assignments are not technically due until Week 7 so that you can catch a breath after midterms. *Yay!* Take it if you need it; otherwise, my advice is to work ahead so that your last few weeks of the term are easier!

- The 2nd will occur in the last module and will require responses that demonstrate your synthesis of the material.
- Your responses for the 2nd should be relevant, accurate, and original. They should also be clear, comprehensible, coherent, and organized. **If I cannot understand the writing, I cannot give full credit to a response!**
- On Moodle, you will have access to the rubric that will be used to grade the 2nd set of discussion questions. Please use the rubric as a guide! In addition, before submitting response, ask yourself the following questions:
  - Does your response thoroughly address the question or drift to other topics?
  - Are your ideas logically organized and written clearly?
  - Are all ideas in your response constructive and concise, or are do some simply fill space?
  - Can a reader (myself and your classmates) easily determine the main point(s)?
  - Does your contribution provoke further thought?
  - Are spelling, punctuation, and grammar correct?
  - If you used sources, did you reference them?

Final Exam:

- You will have a 120-minute final exam, available on Moodle during finals week.
- It will be due the Friday of Finals week, by midnight.
- The final exam will be cumulative, so it is important that you stay on top of the material!

Explanation of Assignments in Detail and Dates Each is Due

Assignment explanations and detail will be found on Moodle. Assignments and their due dates are indicated in the course schedule. Some grades will be assigned on a scale of **plus** (exceeds expectations, 100% of the maximum score for assignment), **check** (meets expectations, 70% of the maximum score for assignment), **minus** (does not meet expectations, 0-50% of the maximum score for assignment).

Above all, remember: You GOT This.

Schedule of Topics

	Topics	Experiment 1	Experiment 2
Introductory Assignments	Light & Light Waves	Color and Temperature	-
Module 1	Reflecting & Bending Light	Rough & Smooth Reflections	Lasers in Jello
Module 2	Seeing: The Eye & the Camera	Peripherial Vision & Blind Spots	Personal Lenseless Camera
Module 3	What is Color?: Color & Color Vision, Color-Generating Mechanisms	Color Perception	Rose Colored Glasses, & other Filters
Module 4	Color Mixing	Spectral Color Mixing (Additive)	Pigment Color Mixing (Subtractive)
Module 5	Oscillations, Oscillations that Dwindle, & Oscillations that Grow	How to Influence the Period of an Oscillation	When Oscillators Resonate
Module 6	Sound Waves, Adding Sound Waves	Seeing Sound	Speed of Sound
Module 7	Perceiving Sound: Pitch, Loudness, Timbre, & the Ear	Sound Amplification, Sound Damping	Frequency & Pitch
Module 8	Playing Strings and Pipes	Vibrations of Strings	Vibrations in Pipes
Final	Musical Instruments	-	-

Assignments			

Policies and Guidelines

1. **SOU Cares Reports**

SOU has a wide range of resources to help you succeed. Our faculty, staff, and administration are dedicated to providing you with the best possible support. The SOU Cares Report allows us to connect you with staff members who can assist with concerns, including financial, health, mental health, wellbeing, legal and/or family matters, harassment, assault, study skills, time management, etc. You are also welcome to use the SOU Cares Report to share concerns about yourself, a friend, or a classmate at http://www.sou.edu/ssi. These concerns can include reports related to academic integrity, harassment, bias, or assault. Reports related to sexual misconduct or sexual assault can be made anonymously or confidentially. Student Support and Intervention provides recourse for students through the Student Code of Conduct, Title IX, Affirmative Action, and other applicable policies, regulations, and laws.

4. **Statement on Academic Honesty and Code of Student Conduct**

Students are expected to maintain academic integrity and honesty in completion of all work for this class. According to SOU's Student Code of Conduct: "Acts of academic misconduct involve the use or attempted use of any method that enables a student to misrepresent the quality or integrity of his or her academic work and are prohibited".
Such acts include, but are not limited to: copying from the work of another, and/or allowing another student to copy from one's own work; unauthorized use of materials during exams; intentional or unintentional failure to acknowledge the ideas or words of another that have been taken from any published or unpublished source; placing one's name on papers, reports, or other documents that are the work of another individual; submission of work resulting from inappropriate collaboration or assistance; submission of the same paper or project for separate courses without prior authorization by faculty members; and/or knowingly aiding in or inciting the academic dishonesty of another.
Any incident of academic dishonesty will be subject to disciplinary action(s) as outlined in SOU's Code of Student Conduct: http://arcweb.sos.state.or.us/pages/rules/oars_500/oar_573/573_076.html
In case of loss, theft, destruction or dispute over authorship, always retain a copy of any work you produce and submit for grades. Retain all written work that has been graded and handed back to you.

5. **Statement on Title IX and Mandatory Reporting**

Federal law requires that employees of institutions of higher learning (faculty, staff, and administrators) report to a Title IX officer any time they become aware that a student is a victim or perpetrator of gender-based bias, sexual harassment, sexual assault, domestic violence, or stalking. Further, Oregon law requires a mandatory report to law enforcement of any physical or emotional abuse of a child or other protected person, including elders and people with disabilities, or when a child or other protected person is perceived to be in danger of physical or emotional abuse.

If you are the victim of sexual or physical abuse and wish to make a confidential disclosure please contact any of SOU's confidential advisors (http://www.sou.edu/ssi/confidential-advisors.html), or use Southern Oregon University's Anonymous Harassment, Violence, and Interpersonal Misconduct Reporting Form (https://jfe.qualtrics.com/form/SV_7R7CCBciGNL473L)

6. **Statement on Academic Support/Disability Resources at SOU**

To support students with disabilities in acquiring accessible books and materials and other reasonable accommodations, SOU requires all professors to include a statement on Academic Support and Disability Resources on course syllabi. It is the policy of Southern Oregon University that no otherwise qualified person shall, solely by reason of disability, be denied access to, participation in, or benefits of any service, program, or activity operated by the University. Qualified persons shall receive reasonable accommodation/modification needed to ensure equal access to employment, educational opportunities, programs, and activities in the most appropriate, integrated setting, except when such accommodation creates undue hardship on the part of the provider. These policies are in compliance with Section 504 of the Rehabilitation Act of 1974, the Americans with Disabilities Act of 1990, and other applicable federal and state regulations that prohibit discrimination on the basis of disability.

If you are in need of support because of a documented disability (whether it be learning, mobility, psychiatric, health-related, or sensory) you may be eligible for academic or other accommodations through Disability Resources. Call Academic Support Programs at (541)552-6213 to schedule an appointment with Disability Resources. The Academic Support Programs office is located in the Stevenson Union, lower level. See the Disability Resources webpage at inside.sou.edu/dr for more information. If you are already working with Disability Resources, make sure to request your accommodations through them for this course as quickly as possible so that you have the best possible access.

Disclaimer: This syllabus is an important document and will be followed as closely as possible. However, the universe has a way of changing even the best of plans! For this reason, it is important to note that the instructor may modify aspects of the syllabus if the need arises. Please don't worry! If there are changes to the syllabus, students will be notified as soon as possible and given adequate time to complete remaining assignments.

Exploration Learning Goals (E, F, G) stress acquiring a broadly informed knowledge of the various disciplines and becoming familiar with the kinds of inquiry that occur within the aesthetic, social, and scientific worlds.

Strand G: Sciences – Physical, Biological, and Computer

Understand the fundamental concepts, methods, and applications of the sciences and their impacts on human experience.
SOU defines the sciences as those disciplines that focus on a systemized body of knowledge derived through objective methodologies involving repeatable experimentation, observation, verification, and study. A lab class will include a practical laboratory component that accompanies lecture and course material. We define a lab as a controlled setting where scientific experiments are performed.

1. **Understand major concepts, principles, and theories of the sciences.**
   Proficiencies: Students will be able to
   1. Apply critical thinking, quantitative reasoning, and/or problem-solving skills to evaluate scientific evidence, theories, and hypotheses.
   2. Use language and concepts of a science discipline.
   3. Understand the broad historical outline of the development of the scientific worldview and important theories.
2. **Understand science as a means of learning about and understanding the natural world.**
   Proficiencies: Students will be able to generate and test scientific hypotheses by
   1. Designing and carrying out experiments and systematic observational studies. In some cases this may include a laboratory or field setting.
   2. Using appropriate tools to analyze results.
   3. Communicating results orally and in writing according to established standards of scientific communication, including appropriate use of tables, figures, and graphs.
3. **Apply scientific knowledge and methods to societal issues.**
   Proficiencies: Students will be able to
   1. Inform decision-making on social, political, and/or economic issues.
   2. Explain interrelationships between society and the sciences.
   3. Investigate impacts of technologies on segments of society and investigate plausible solutions to adverse impacts.

(from: https://www.sou.edu/universitystudies/index.html)

Attachment 1: An example assignment for Goal 1.

Multimedia Assignment 3.

Preface

In *this* assignment, **Students with a last name between M-Z** will submit an initial video, and **Students with a last name between A-L** will submit a video response.
Once again..... please don't be nervous! This is actually very fun, and it is meant to help you:

- better integrate material you have learned
- further develop your ability to communicate complex ideas
- further develop your ability to learn from another
- further develop your ability to provide constructive feedback

Your Assignment: Students with Last Names M-Z

DUE DATE: Sunday, ...
MAXIMUM SCORE: *10 points*

The **PURPOSE** of this assignment is to:

- help you think critically about the material!
- have you work together. We are working *together* in this course!

REQUIREMENTS
From *any* chapter we have covered or experiment you have conducted for the course, choose one of the following:

- a historically significant scientific development (for example, the debate over the *dual nature of light* discussed in Chapter 1, or the flaws in Seurat's ideas of color mixing discussed Chapter 7)
- any scientific data, idea, hypothesis, or theory presented in the text that seemed counterintuitive to you, significant for your major or intended career, or that you would like to know more about
- any experimental observations or data that supported or did not support your hypothesis in an experiment, with a deeper reflection about the discrepancy. For example, what did you learn from the experiment? What was unexpected? Does the discrepancy between your hypothesis and the results make sense? If so, explain! Perhaps the phenomenon was counterintuitive, or, perhaps there was a unique or systematic error in the observations or experimental technique.

Then, **read, re-read,** and **reflect** on the chosen text, any figures from this text, or your lab hypothesis, procedure, data, and results.
In a YouTube video do the following **5 things:**

1. Clearly state ***which*** section, subsection, experiment, *etc.*, that you chose.
2. Tell us ***why*** you chose this.
3. ***Summarize*** the main points of the text you chose. If there are figures associated with this portion of the text, select at least one and ***explain*** clearly what it shows to us. **OR, *summarize*** your

hypothesis and findings in the experiment you chose, and **describe** your new insights, giving physical evidence or ideas based in scientific theory to support your insights.

4. ***Answer*** the following questions:
    1. What ideas and concepts does this portion of the text want us to *remember*? **OR**, what ideas and concepts did you learn in this experiment and would like to remember?
    2. What examples or specifics were important for helping *you identify* and *remember* these ideas and concepts?
5. Take us **deeper**, now.

    For example: *How did this reading or experiment change what you thought you knew? What connections did you make between this material and other disciplines? What connections did you make between this material and your life? How will this information impact the way you think?*

Keep the video **less than 5 min.**
Don't speed through the information! ***Pause*** in the video to drive home salient points.
Be sure that the information you present is **clear** and **organized**.

Your Assignment: Students with Last Names A-L

DUE DATE: Sunday, ...
MAXIMUM SCORE: *10 points*

The **PURPOSE** of this assignment is to:

- help you think critically about the material presented by another student.
- encourage you to work together. We are working *together* in this course!

A comment. Your job is to provide feedback regarding what they did well and what they could improve, as tactfully and kindly as possible. That is, be professional! You want your colleague (here, your peer) to walk away feeling as though they did a good job and, simultaneously, wanting to do better next time! (That's one secret to being a good employee, team leader, coach, or even parent!)

REQUIREMENTS
Watch the video from a student who has submitted an initial video, preferably for a student who has not yet received a response.
Then **re-read** and **reflect** on the chosen text and any figures from the text they chose or the experiment that they are referring to, your hypothesis, your results, and your own insights.
Finally, do about **2 minutes of research online** about the topic or experiment they have discussed, and find something additional interesting to share, preferably something that offers greater insight!
Make a new YouTube video and respond to this student's video. In your response, do the following **5 things:**

1. Discuss **how *their* video** (or re-reading and reflecting) **helped with your own understanding or** helped you further develop your own **insights** regarding the chosen text and/or figures or

experiment. If it did not help, say that, *tactfully*.

2. Share **what you learned** in your outside research.

3. Share **one thing they did well** in the video. (Consider their clarity, organization, emphasis on main points, simple message, presence, etc.)

4. Share **a suggestion for improvement** for next time. That is, provide feedback that you think will help them improve their organizational, speaking, or presentation skills!

5. Finish with something **positive or something that you appreciate about them**. (Always end on a high note!)

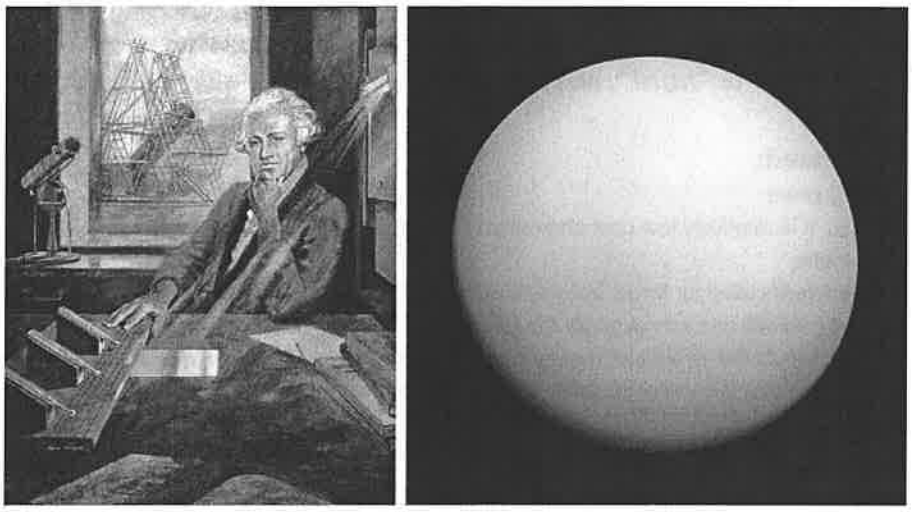
Keep the video **less than 5 min.**
Pause in the video to drive home salient points.
Be sure that the information you present is **clear** and **organized**.

Attachment 2: An example assignment for Goal 2.

Experiment 1: Light and Temperature

Let's talk about Hershey's.... I mean Herschel. We'll save the chocolate bar experiment for determining the speed of light later.... *really*.

Sir Frederick William **Herschel** (1738-1822) was born in Hanover, Germany, and became well-known as both a musician and an astronomer. He moved to England in 1757 and, **with his sister** Caroline, constructed telescopes to survey the night sky. Their work resulted in several catalogs of double stars and nebulae. Herschel is famous for his **discovery of the planet Uranus** in 1781, the first new planet found since antiquity.



Left: Portrait of Sir William Herschel, pictured with the experiment that enabled him to discover infrared light. *Right:* Uranus, as seen by NASA's Voyager 2. (Credits: NASA/IPAC).

Herschel made another dramatic discovery in 1800. He noticed that, when observing sunlight through colored filters, the different colors seemed to pass on different amounts of heat. Herschel wondered if the colors of light themselves carried different temperatures, and so he devised a clever experiment to investigate using sunlight and a prism.

You will repeat this experiment!

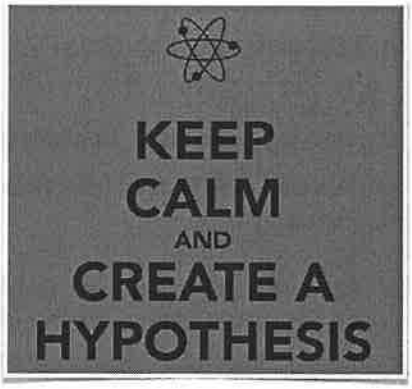
Before we begin the experiment, play this guessing game!

No peeking! Just guess!

Do you think that different colors of light transfer different amounts of energy as heat?
If so, which colors do you think transfer the most energy as heat?
Which do you think transfer the least energy as heat?

Your answers will be your hypothesis!

In the lab report, use the space provided for your **hypothesis** to indicate whether you expect different colors of light to carry different amounts of energy as heat, and, if so, which colors you expect to carry more and which you expect to carry less.



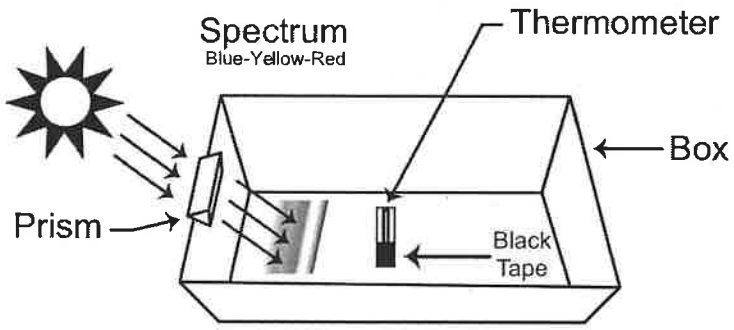
IMPORTANTLY, doing **science is NOT about being right**.
Doing science is about guessing and experimenting..... observing.....
and remarking on the results with one of the two most important words in science:
"aha!" or ***"huh!"***, and then striving to understand what you see.

Materials you will need:

- a glass (not plastic!) prism
  - I suggest this one. It is relatively low cost and refracts light well enough. We will use it again, so keep it around!
- an alcohol thermometer.
  - The original experiment called for three, but we're going to do this with one. I suggest this thermometer. Keep this handy because we will use it throughout the term!
  - Alternatively, if you would like to take all measurements at once and speed up the experiment, try this set. That said, I recommend the first thermometer listed for other experiments.
- black tape
  - I used electrical tape, but you could also color some tape black with a permanent marker.
- scissors
- a cardboard box
  - I suggest this size.
- 1 blank sheet of white paper

You will also need a sunny day!
The experiment should be conducted outdoors on a sunny day!
Variable cloud conditions, such as patchy cumulus clouds, or heavy haze will diminish your results.

Experimental Setup



- **Darken the Bulb.**
  - To make the experiment work more effectively, the thermometer needs to absorb as much heat from the light as possible. We can make this happen by covering the outside of the bulb with something black!
  - Take a small piece of black tape (perhaps 1/2 or 1 inch in length; I used electrical tape), and place it across the bulb of the thermometer. Don't go overboard; you don't need to wrap the bulb, just lay the piece of tape across the bulb!
- **Mount the Prism.**
  - Next, you will need to mount the prism on the upper lip of the box.
  - To do this, cut out an area from the top edge of the box.
  - The cutout notch should hold the prism snugly, while permitting its rotation about the prism's long axis.
  - In other words, the vertical "side" cuts should be spaced slightly closer than the length of the prism, and the "bottom" cut should be located slightly deeper than the width of the prism. Next, slide the prism into the notch cut from the box.
- **Add Paper.**
  - Place the white sheet of paper at the bottom of the box.
- **Adjust the Prism and the Box.**
  - Rotate the prism until the widest possible spectrum appears on a shaded portion of the white sheet of paper at the bottom of the box.
  - The Sun-facing side of the box may have to be elevated (tilted up) to produce a sufficiently wide spectrum.
- **Take a Photo.**
  - Every lab report will require at least one photo of your experiment and, if you are working in a group, all members present (group photo ops!). Take a photo to include in the report.

That was easy! Now for the experiment....

Experimental (Observations)

- **Take the Temperature in the Shade.**
  - After the prism is secured in the notch, place the thermometer in the shade, wait a few minutes, and record then record the temperature reading (use degrees Celsius, always!). This will be the ambient air temperature.
- **Get Sun.**
  - Place the thermometer in the box, laying it in the blue portion of the spectrum created by the prism. Wait about 5 minutes, and record the temperature in Celsius.
  - Now, move the thermometer to the yellow portion of the spectrum, wait about 5 minutes, and record the temperature again.
  - Then, move the thermometer to the red portion of the spectrum, wait about 5 minutes, and record the temperature there.
  - Finally, move the thermometer ever so slightly out of the spectrum to the just beyond red, or in the *infra*-red, area. Don't worry---you can't actually *see* infrared. However, some animals can!
- **Take another Photo**.
  - Include at least one more photo in the report.
- **Complete and Submit the Lab Report!**
  - Make a copy of the lab report template on Moodle and complete the template using either Google Docs (which is so cool and versatile) or another software such as Microsoft Word.

Color and Temperature

Name:

Hypothesis

Complete your hypothesis by typing "the same" or "different" in the space below.

If light from the sun has been divided into its colors by a prism, a thermometer placed in different color regions of the spectrum will give _____ temperature readings.

If you typed "different" above, complete the remainder of your hypothesis by indicating which color of the spectrum you expect to give the highest temperature reading and which color you expect to give the lowest temperature reading in the spaces below.

The thermometer will give the highest temperature reading for the color _____, and it will give the lowest temperature reading for the color _____.

(Remember, a hypothesis is not graded on whether it agrees with the experimental observations! Hypotheses are sometimes correct, and sometimes incorrect. If you were graded on whether it was correct or not, your freedom of thought would be severely limited, and there is no fun in that!)

Data

Table. Temperature and Color Data				
_____ °C	← Record the temperature (in degrees Celsius) given by the thermometer after being in the shaded area for 5 minutes..			
	Blue	Yellow	Red	Just beyond Red
Temperature (°C)				

Create a Simple Graph

Instructions for your Scientific Graph

1. Using color on the horizontal axis (from left to right: blue, yellow, red, just beyond red), plot the temperature in °C on the vertical axis. Want additional notes to help, and an example graph? See the notes on Moodle.
2. You can sketch the graph carefully and upload a photo, or you can make the graph using a graphing program and upload the resulting picture!*
3. For this graph and graphs in future assignments:
    - Give the graph a **title.**
    - **Label your axes** (including numbers and units as appropriate; for example, 30°C)
    - Be certain that the picture of your graph is not missing any labels or points and that the picture is large and clear enough to be readable.

*To make a graph by hand:
http://astro.uchicago.edu/cara/outreach/resources/other/howtograph.html

INSERT a PICTURE of your graph HERE.

Questions

1. Did the results agree with your hypothesis?

2. Did you see any trends?

3. If there was variation, where was the highest temperature?

4. Which light sources other than the sun would you like to test?

5. Would you propose any modifications to this experiment?

6. If you had any difficulties with the experiment, please describe them, here.

Summary

In 1 page or less, please clearly and concisely identify the experiment's:

- Objective (Summarize the lab in 1-2 sentences, identifying what was most important in the process.)

- Context (Why did we do this experiment? To test an idea from the course or a known theory? Why are the results significant? Do they provide insight into the nature of the energy carried by light)

- Results (Did you see any trends? Did the results agree with your hypothesis? Why/why not? Were there any experimental challenges that may have affected your results?)

- Conclusions (Do your results seem to make sense? Do they uphold a commonly accepted theory or idea? How are the results relevant to class? What did you learn?)

INSERT the PICTUREs of your experiment (as requested in Moodle instructions) **HERE.**

New Course Proposal

Submit completed form electronically

1. **Course prefix and course number:**
   SC 120/120L

2. **Course title:**
   Concepts in Science: Light and Sound

3. **Abbreviated title for class schedule** (30 characters or less):
   Science: Light & Sound

4. **Credit hours:** 4
   SC120 (4 cr.) / 120L (0 cr.)

5. **Catalog description:**
   Imagine using light, color, sound, and music to develop and apply scientific thinking and experimentation skills. This course, designed for both scientists and non-scientists alike, provides a better understanding of the properties, perceptions, and applications of light and sound, specifically through the lens of optics, color and music. We will use readings, hands-on experiments, and free online resources to develop a conceptual framework for the physical properties of light and sound. Though an online course, we build a strong and very welcoming, supportive community through short video assignments and shared forums for experiments.

6. **Prerequisites (*to add each additional prerequisite, start a new line*):**
   None.

7. **Co-requisites (including labs, if any):**
   A. (course prefix, (space) and number): SC 120 and 120L are co-requisite.

8. **Major/Class restrictions: Please indicate any class or major restrictions:** None

9. **Is course repeatable?**
   No
   If Yes, list maximum credits:

10. **Labs requirements:**
    If course includes a lab: # of hours lecture: 30**; # of hours lab:** 20
    The lab requires that students obtain materials on a materials list. Most will be common household/dorm items but a few will likely require purchase at minimal cost (*e.g.* a laser pointer, colored ink, a recorder or other simple wind instrument).

11. **Fees: List any course fees:**
    None.

12. Grade Mode:
Option

13. CIP Code: Six-digit CIP code (check with your Division Director): 40.0801

14. Special qualifications; Is course proposed for (yes/no):
- **A. University Studies?** Y **If yes, list Strand(s):** G
- **B. Honors?** N

15. Cross-listing: List any cross-listing (and please complete the Cross-list proposal form at https://inside.sou.edu/provost/curriculum.html):
None

16. Strategic justification for proposed course:
- **A. Rationale**: What is the overall strategic rationale for offering this course?

This course has 4 primary strategic rationales that, together, promote student access, retention, and success.

1. It will be offered online, increasing student accessibility while reducing space (lab access and classroom lecture halls) and energy loads on campus.
2. As a second online G-strand course with a lab component, it will allow students to complete their G-strand requirement online. This will be very useful for students completing their studies at a distance and/or with schedules or transportation issues that do not easily accommodate weekly lab sections.
3. It has been designed using the same welcoming and supportive approach as SC110/110L.[1] As such, it is a student-centered lab science course that focuses on topics that are likely interesting, relevant, and accessible to students who enjoy science and, more importantly, those who have not yet developed a sense of enjoyment or ability in the area of science.
4. The core concepts explored in this course (light, color, sound, music, and experimentation) are important across a number of SOU disciplines (*e.g.*,

[1] The instructor of SC110/110L has received multiple student comments in evaluations that are the lines of "I didn't like science until I took this course." For example, from the most recent 3 terms having offered the course: **Spring 2019**, *Most understandable science class I have taken, keep everything!*; **Summer 2018**, *One of the best science classes I've ever taken*; **Spring 2018**, 1. *This course is well thought out and appeals to learners of every type. [instructor..] is thoughtful in her feedback and very supportive of the class. I never thought I would enjoy Science; now I am eager for more.*, 2. *I liked this course the way it is currently, I would retain the entire course. I learned a lot in this course from why it's so important to use science and how science is used in everything we do in life. The course Made learning "Fun" through using experiments to observe the reaction of how energy transfers, transforms, and degrade energy when conserved from one form to another, but is never destroyed.*, 3. *Effective course gives a great understanding of the needed aspects of science*, 4. *I liked the entire course the way it is currently. the course was very informative and offered many different ways to express myself through science, while teaching me how to preform the experiments gave me new insight to why science is so important to our lives*….. there are many more!

biology, music, art, theater arts, communication, EMDA, psychology) and will likely have a wide appeal.

B. Alignment:

1. How does this course align with the unit's mission plan?
   This course is designed to support efforts to increase access to integrated STEM courses that engage students and stress hands-on, investigative learning through meaningful experiments. Also, the assessment of the course contributes to the development of the following LEAP knowledge and skill outcomes:
   - *Knowledge:* the enduring relevance and importance of science and the scientific method; light and sound as physical manifestations of waves, a fundamental manner in which energy (and information) are carried
   - *Skill development:* scientific inquiry as a means of learning, observation and analysis, critical thinking, and elementary quantitative literacy (through carefully constructed readings, questions, and lab reports); information literacy and written and oral communication (through lab reports and multimedia (video or audio) assignments); and reading comprehension (through assigned readings evaluated with quizzes and multimedia assignments). The course also offers student forums each week in which students are encouraged to share insights, post photos, or ask questions of one another when working through the experiments for the week. This has been successful in SC110/110L.

   At the institutional level, this course meets goals of the University Studies G-Strand using innovative, learner-centered methods. The nature of the course content, combined with specific assignments, will help the students make meaningful connections between the physical properties of light and sound and their everyday experiences. The emphasis of the course is (1) science as a way of learning that hinges on objective observation, experimentation, and a willingness to be open; and (2) waves and their importance to the creation, modification, and propagation of light and sound; and (3) applications in geometric optics, color, and music. Students will also become more aware of the connection between the fundamental properties of waves and their use (and limitations) in communicative, creative, and technological applications.

   Importantly, students are given the following consistent message: Some of the greatest joys in and opportunities for learning in science are when results counter expectations or provide more insight than what was expected. In each experiment, just before creating a hypothesis, students are given the following message: *IMPORTANTLY, doing science is NOT about being right. Doing science is about guessing and experimenting, observing, remarking on the results with one of the two most important words in science: "aha!" or "huh!", and trying to understand the results based on what you know.*

   Students are engaged in weekly scientific experimentation and reporting, 4 multimedia (video or audio) submissions, 2 discussion question sessions (one during the first week of class as a pre-test, and the second highlighting the gains for each

student over the term), and weekly testing to assess the quality of knowledge integration and skill development.

The physical experiments are unique for this course, as they are performed outside of the University and the student is fully involved throughout the process—it is the student who prepares the materials from the materials list, performs the full procedure, and records and analyzes data. The student documents their work visually and communicates the results with standard written lab reports. The students also have the opportunity to discuss their experiments with each other, each week in a forum designated for this purpose. There, they are encouraged to share: their creative approach to one or more experiments, particularly cool photos (our so-called experimental photojournalism), interesting results, insights that might help other students proceed, points of confusion, and technical difficulties. Though they are encouraged to confer with one another before contacting the instructor, the instructor is always available and willing to respond to student questions, input, and (particularly fun) enthusiasm.

With the multimedia assignments, the students are asked to teach a concept or explain a figure from an array of choices. This teaching technique has been successfully employed in SC110, and it requires that the students reflect on their own understanding, identify individual (correct/incorrect) assumptions and struggles with the material, come to a better understanding, and develop an effective presentation from this process. Students are required, at least once in the term, to respond to another student's video to discuss how the video helped them see the material differently, share additional information they found with external research (either through experimentation or another source of reading / video / etc.), and provide feedback for the student they are responding to by emphasizing both one thing the student did well and one thing they could improve.

With the above design, the course aligns with goals to increase STEM accessibility while providing students with quality instruction that increases their scientific awareness; their valuation of experiments; their experimental skills; and their critical thinking, information literacy, and communication skills.

2. How does the course fit into the rest of the unit's curriculum?
   There is an increasing need for G-strand lab courses at the University, following retirements and reductions in STEM programs. This course will help meet that need. Importantly, this course will also allow students who cannot complete their G-strand requirement on campus.

C. **Enrollment**: What is the new course's estimated enrollment each time it is offered over a three-year period?
   Year 1: 30-45 (winter or spring) + 45-60 (summer)
   Year 2: 45-60/term, to alternate with SC110/110L and other online offerings
   Year 3: If successful, the goal is to offer an online G-strand offering multiple times per academic year, including summer, when many students are away from campus but would like to work on their University Studies science requirements.

D. **Resource evaluation:** What resources – faculty, equipment, lab space, etc. -- will be needed to offer this course and how will those resources be obtained?

1. *Faculty*:
   a. Who will teach the course?
      Ellen Siem has developed this course and would like to teach it as a way to make science more accessible and less daunting to our general student body.
   b. Evaluate unit's faculty availability and/or needs and the impact on other teaching obligations.
      The course will fold into other G-strand offerings in STEM and be staffed accordingly. The online offering reduces congestion for lab offerings.
   c. If additional faculty members are needed, how will that need be met?
      This course should not require more than one instructor at the rate it is expected to be offered.
2. *Facilities*: Cite any additional need for classrooms, equipment or lab space; explain how that need(s) will be met.
   As an online course, it is not expected to not have additional needs for classrooms, equipment, or lab space.
3. *Other*:
   a. Are Hannon Library resources sufficient to meet the needs of this course?
      Yes. Students may, on their own, opt to use the Hannon Library for materials to provide further insight, but (at this point) it will not be required that they do so.

   b. Are any other resources needed to support this course?
      There may be a greater need in this course relative to others for IT support because it an online offering.

      If so, please explain how they will be obtained.
      Students will be instructed to contact the SOU Helpdesk. If excessive (or regularly incurred) technological needs are found, the course will be modified to meet students where they are, providing additional instruction through the course "classroom" or another means of sharing information.

E. **External impact**:

1. What is the expected effect of this course on existing programs elsewhere in the university?
   This course is not expected to affect existing programs.
   NOTE: Please document your contact with other academic programs which may be affected by this new course and the response you received.

2. Will any of your prerequisites affect other academic programs?
   No.
   NOTE: Please document your contact with other academic programs which may be affected by this new course and the response you received.

17. Syllabus (condensed)

*(Attach an accompanying, condensed syllabus, which should include the following items. Schedules and similar details are **not** required.)*

1. **Course description (same as Catalog description, above)**

2. **Learning objectives of the course**

3. **Required texts**

4. **Course format**

5. **Other – any other relevant materials needed to explain the goals and teaching methods of this course.**

   See the linked syllabus, here.

Approvals:

_____ _____

Signature of Division Director Date

4/29/16