Course Overview: What is Physical Science all about?

There are laws of nature that govern the actions of objects on all size scales - from the smallest “bits” of atoms to the most enormous of galaxies - and in all time frames - from the most fleeting moments to the Age of the Universe!! Physical Science is the place to uncover and decode these laws! We will do so by looking at curious phenomena, actively questioning what we see, thinking deeply about their implications, and publicly sharing our thoughts with one another to make sense of the world around us ... and the Universe at large!

Units and Activities: What will we be learning about and doing in this course?

<table>
<thead>
<tr>
<th>Unit</th>
<th>Main Ideas of the unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1 - The origins of the Periodic Table of Elements</td>
<td>Students begin their Physical Science study by looking at the stars and their life-cycles. We owe our very existence to the death of some long-dead, high-mass star.</td>
</tr>
<tr>
<td>Unit 2 - From Micro to Macro</td>
<td>Students will dive deeply into the structure of the periodic table and explore bonding between atoms. In addition, students will look closely at the interactions between molecules and use the nature of those interactions to understand a wide variety of physical properties - surface tension, solubility, boiling point, etc. In this unit we will focus how molecular-level knowledge can explain the human-level world around us.</td>
</tr>
<tr>
<td>Unit 3 - Chemical Reactions</td>
<td>Here students will explore the conservation rules that govern chemical reactions (mass, charge, and energy). Typical ideas covered in this unit would be balancing equations, calculating limiting reactants, and the prediction of endo- and exothermic reactions.</td>
</tr>
<tr>
<td>Unit 4 - Newton’s Laws with objects in motion</td>
<td>Newtonian Physics is the focus here with a look at the deep underlying connection between Newton’s’ laws of Motion and the Conservation of Momentum. In addition, this unit will feature Newton’s Law of Universal Gravitation which will lead into the concepts of fields.</td>
</tr>
</tbody>
</table>
Unit 5 - Fields and Particles

From gravitational fields to electric fields and from Newton’s Law of Gravitation to Coulomb’s Law of Electric Forces. Here, students will investigate the induction ideas of Maxwell and the connection between electricity, magnetism, and light! A brief additional sequence is expected to be electromagnetic energy.

Unit 6 - The Big Bang Theory

Students will end the year investigating the major predictions of the BBT and the corresponding observations which make it the most successful scientific explanation for the origin and evolution of the universe.

Standards: What knowledge and skills will I gain by the end of this course?

Anchor Standards: This course will assess the knowledge and skills students build in key Anchor Standards. A student will have multiple opportunities to show their proficiency in each Anchor Standard. Below, each Anchor Standard for this course is named and described.

Modeling - Students will make their mental models public and subject to revision. We will work on recognizing the ways that our understanding of science concepts grows and becomes more sophisticated over time.

Investigating - Students will explore the natural world through the manipulation of real-world materials and via computer simulations (for those cases that warrant such explorations).

Analyzing - Students will consider data and evidence and use scientific principles to contextualize their evidence.

Explaining - Many of the other Anchor Standards will inform a student’s ability to explain the natural world. Our efforts will be to develop our understanding from simplistic to sophisticated.
**Course Standards:** This course builds student knowledge and skill using the NGSS standards. The course standards for Physical Science are:

### The Chemistry Semester (Bolded codes are the identifying codes for Next Generation Science Standards)

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(HS-ESS1-1)</td>
<td>Develop a model based on evidence to illustrate the life span of the Sun and the role of nuclear fusion in the Sun’s core to release energy that eventually reaches Earth in the form of radiation. (HS-ESS1-1)</td>
</tr>
<tr>
<td>(HS-PS1-1)</td>
<td>Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. (HS-PS1-1)</td>
</tr>
<tr>
<td>(HS-PS1-2) (partial coverage)</td>
<td>Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron state of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. (HS-PS1-2) (partial coverage)</td>
</tr>
<tr>
<td>(HS-PS1-3)</td>
<td>Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (HS-PS1-3)</td>
</tr>
<tr>
<td>(HS-PS1-2) (partial)</td>
<td>Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron state of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. (HS-PS1-2) (partial)</td>
</tr>
<tr>
<td>(HS-PS1-7)</td>
<td>Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. (HS-PS1-7)</td>
</tr>
<tr>
<td>(HS-PS1-4)</td>
<td>Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. (HS-PS1-4)</td>
</tr>
</tbody>
</table>

### The Physics Semester (Bolded codes are the identifying codes for Next Generation Science Standards)

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(HS-PS2-2)</td>
<td>Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. (HS-PS2-2)</td>
</tr>
<tr>
<td>(HS-PS2-1)</td>
<td>Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. (HS-PS2-1)</td>
</tr>
<tr>
<td>(HS-PS3-2) partial</td>
<td>Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields. (HS-PS3-2) partial</td>
</tr>
</tbody>
</table>
Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields. (HS-PS3-2)

Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. (HS-PS2-5)

Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of energy of waves traveling in various media. (HS-PS4-1)

Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. (HS-ESS1-2)

Assessment of Learning

Assessment Types:
Three types of assessments will be used to determine if you have gained the necessary knowledge and skills of this course: Formative assessments, Summative assessments, and Habits of Work for Learning. Each is briefly described below:

Formative Assessments: Formative = Forming my knowledge and skills. Formative Assessments receive a weight of .1 in the overall grade. Formative assessments are information for teachers, students, and parents on the progress students are making as they practice gaining knowledge and skills found in Anchor Standards. Teachers use the results of these assessments as data to understand individual student learning needs, adjust instructional pathways, and modify lessons to help students better meet course standards. Students use the results of these assessments to determine how they are progressing and to plan steps to ensure their success.

Summative Assessments: Summative = Summation of my knowledge and skills. Summative Assessments can receive three different weights: 1, 1.5, or 2 depending on the size of the assessment, and therefore have the greatest impact on the Overall Course Mastery Grade. Summative assessments are used as a measure of independent student achievement in Anchor Standards. Throughout this course, summative assessments provide benchmark student achievement data. A summative assessment will always have clear scoring criteria for students to understand how they are performing.

Habits of Work for Learning: Habits of Work for Learning (HOWLs) are skills and dispositions that are essential to the learning process but do not provide evidence of what a student knows or can do in relation to content. WUHSMS teachers work to foster Habits of Work for Learning in three categories: preparation, participation, and perseverance.
Assessment Scoring:
Teachers will provide framing for summative assessment scores using proficiency level scoring criteria for grading similar to the example below:

Anchor Standard: Computational Modeling

<table>
<thead>
<tr>
<th>Course Standards: NGSS HS-L2-1 Use mathematical and/or computational representations to support explanations of factors that affect the carrying capacity of ecosystems at different scales. NGSS HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Representation</td>
</tr>
<tr>
<td>Computational Modeling &amp; Analysis</td>
</tr>
<tr>
<td>NC*</td>
</tr>
<tr>
<td>Beginning</td>
</tr>
</tbody>
</table>

*Scores in the "Beginning range" are well below proficient and thus they are below passing.

HOWL Scoring:
HOWLs will be scored at least once per checkpoint, and will be based on the frequency with which students demonstrate each of the habits: preparation, participation, and perseverance.

How is my Overall Course Grade Determined?
Overall course grades will be reported as letter grades and will be comprised of:
- Formative & Summative Scores: 95%
- HOWLs: 5%

For more information, please see the WUHSMS student handbook.

Communication:
How Do I Know My Grades?
- On Summative Assessments, a teacher will provide both a 4-point grade and a letter grade.
- You can monitor your progress in the following ways:
  - By reading feedback and scoring returned to students on summative assessments
  - By monitoring the scores and Overall Course Mastery Grade in the Parent/Student portal on JumpRope
  - By monitoring the grades sent home quarterly through report cards
Where Can I Find This Syllabus during the School Year?

- This syllabus will be available on the school website in each subject’s department tab once the school year is up and running.

How Do I See What’s Due?

- Summative assessment due dates and handouts are posted to the blue “Upcoming Assessment” section of the JumpRope Parent/Student Portal on or before the day they are assigned to students.

How Do I See What’s Past Due?

- If a student is missing an assessment, it will be listed in the red “Missing Assessment” section of the JumpRope Parent/Student Portal along with any attachments.

Best Way to Contact Me:

Please don’t hesitate to be in touch with me via phone or email, though email is very much the better mode: lferris@wcsu.net. As my schedule settles in, I will alert you to free periods I have during the school day. Finally, I urge you to use ARE block as a convenient way to see me should you need any review or support!!

Materials:

We will not be using a physical textbook in this class. We will frequently need to access digital materials on Google Classroom and elsewhere. Please ensure that you bring your laptop/tablet/netbook to class for full Participation.

Schoolwide Procedures:

Please see the Student Handbook for Procedures and Policies related to: Due dates and deadlines, extra credit, retaking assessments, and turnaround time for grade entry.

Personal Mobile Devices: This class will follow the procedures outlined in the student handbook.
Class Expectations:

Four norms I will seek to establish with you:

1) **Equity** - We each have a voice. We each have the right to be heard. We each have an obligation to contribute our thoughts.

2) **Respect** - We each deserve to be heard and understood. We owe one another the basic decency of attention and consideration. We can disagree without being disagreeable.

3) **Reason** - We need to focus on evidence and logic. We should expect to provide a rationale for our thoughts. We should expect to be asked for such.

4) **Stewardship** - We each have a role to play in establishing a positive classroom culture. We each have a role to play in our own learning.
RETURN THIS PORTION TO
Dr. Ferris by September 6, 2019

I have read this syllabus, and I have contacted the teacher with any questions I have.

Student name (printed): ________________________________

Parent/Guardian name (printed): __________________________

Signed: ____________________________  Date: ________________________