Murrieta Valley Unified School District
High School Course Outline
February 2019

Department: Science

Course Title: Physics IB SL

Course Number: 3532

Grade Level(s): 11 or 12

Length of Course: 1 year

Prerequisite(s): C or better in CP Chemistry (Not sure if there would be a pre-requisite

UC/CSU (A-G) Requirement: D

Brief Course Description: This course meets UC/CSU and district graduation requirements as a category D physical laboratory science. This is the single year physics course that will co-exist within the CP Physics class. Students will continue to explore both theoretical ideas and experimental results in the IB Physics SL course, which will allow students to develop traditional practical skills and techniques and increase their abilities in the use of mathematics. In addition to the core concepts, students will investigate how engineering practices utilize different aspects of physics. All students will participate in practical activities, which provide students with the opportunity to design investigations, collect data, develop manipulative skills, analyze results, collaborate with peers and evaluate and communicate their findings. The IB exam will be offered in May of the course.

I. Goals

The student will:

A. Appreciate scientific study and creativity within a global context through stimulating and challenging physics and engineering opportunities.
B. Understand and apply a body of knowledge, methods and techniques that characterize physics as well as engineering technology.
C. Develop an ability to analyze, evaluate and synthesize scientific information in the context of physics and engineering.
D. Understand the need for, and the value of, effective collaboration and communication during scientific activities.
E. Develop experimental and investigative scientific skills including the use of current technologies as related to the fields of physics and engineering.
F. Apply effective communication skills in the study of physics.

G. Be critically aware, as global citizens, of the ethical implications of using science and technology.
H. Understand the possibilities and limitations of science and technology.
I. Understand the relationships between scientific disciplines and their influence on other areas of knowledge.

II. Outline of Content for Major Areas of Study

Semester 1

A. Measurements and uncertainties
    1. Measurements in physics
    2. Uncertainties and errors
    3. Vectors and scalars

B. Mechanics
    1. Motion
    2. Forces
    3. Work, energy and power
    4. Momentum and impulse

C. Thermal physics
    1. Thermal concepts
    2. Modelling a gas

D. Waves
    1. Oscillations
    2. Travelling waves
    3. Wave characteristics
    4. Wave behavior
    5. Standing waves

E. Electricity and magnetism
    1. Electric fields
    2. Heating effect of electric currents
    3. Electric cells
    4. Magnetic effects of electric currents

F. Circular motion and gravitation
    1. Circular motion
    2. Newton’s law of gravitation

G. Final exam

Semester II

A. Atomic, nuclear and particle physics
    1. Discrete energy and radioactivity
    2. Nuclear reactions
    3. The structure of matter

B. Energy production
    1. Energy sources
    2. Thermal energy transfer

C. Engineering physics
    1. Core Topics
        i. Rigid bodies and rotational dynamics
        ii. Thermodynamics

D. Individual investigation based on individual interest (internal assessment – IA). See description below.

E. Group 4 project in conjunction with students in the other IB science subjects offered. See description below.

F. Preparation for official IB exam.

III. Accountability Determinants

A. Key Assignments:
    a. 20 hours of practical activities of investigative laboratory work.

    b. Data based questions each unit for students to analyze a given set of data. Practice without the use of a calculator.

    c. Extended response questions solving a substantial problem or carrying out a substantial piece of analysis or evaluation, which will require students to write a number of paragraphs in response. Practice with the use of a calculator.

    d. Individual investigation: Internal Assessment requirement – carry out investigation (10 hours) and write report (6-12 pages long). Students will design a purposeful research question that specifically investigates a topic related to the curriculum, but the student has free choice of that

topic. The report will reflect the student's personal engagement, exploration, analysis, evaluation and format. Possible tasks for the individual investigation could include:

i. Hands-on laboratory investigation

ii. Manipulated or observational fieldwork

iii. Using a spreadsheet for analysis and modelling

iv. Extracting data from a database and analyzing it graphically

v. Producing a hybrid of spreadsheet/database work with a traditional hands-on investigation

vi. Using a simulation, provided it is interactive and open-ended.

e. Group 4 Project (10 hours): The group 4 project is a collaborative activity where students from different group 4 subjects work together on a scientific or technological topic, allowing for concepts and perceptions from across the disciplines to be shared in line with aim 10—that is, to "develop an understanding of the relationships between scientific disciplines and their influence on other areas of knowledge". The project can be practically or theoretically based. The project allows students to appreciate the environmental, social and ethical implications of science and technology. It may also allow them to understand the limitations of scientific study. The emphasis is on interdisciplinary cooperation and the processes involved in scientific investigation, rather than the products of such investigation. The choice of topic is open.

B. Assessment Methods

Assessment of student performance will include but not limited to:

a. Skill mastery and quality of work

b. Multiple choice exams

c. Performance tasks

d. Individual/group projects

e. Individual/group presentations

f. Data-based questions, short-answer questions and extended-response question exams

g. Internal assessment: individual investigation

h. Group 4 project

i. External assessment: official IB exam

IV. Instructional Materials and Methodologies

A. Required Textbook(s)

Physics: Principles and Problems
Author: Zitzewitz, Elliott, Haase, Harper, Herzog, Nelson, Nelson, Schuler, and Zorn
Publisher: McGraw-Hill Glencoe
Date of Publication: 2008

B. Supplementary Materials

C. Instructional Methodologies

1. Direct instruction
2. Seminars
3. Class discussions
4. Group projects/presentations
5. Cooperative learning
6. Experiments
7. Experiential learning
8. Interactive instruction
9. Inquiry learning
10. Project-based learning
11. Individual student presentations
12. Adaptations for special needs and English Language learners