

Astronomy

Course Outline

2020-2021

Teacher—Mr. Robert Davis

Class: Rm. 358

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Course Description— A general survey course in astronomy. Topics will include our historic development of understanding the universe, observing the night sky, astronomical equipment and telescopes, solar system astronomy, stellar evolution, stars and galaxy, cosmology, space exploration, and new advances in astronomy. Prerequisites and more detailed topic outline on attached district course description.

The course will meet one period per day. The class will may meet once a week in the computer lab or use available computer equipment to perform activities with astronomy software and internet searches for related materials.

Course Philosophy—Astronomy is for students that wish to continue their science education beyond the introductory Regents or non-Regents science courses. This course will have more flexibility than a Regents curriculum, allowing the students to help drive the direction and depth of the topics covered.

Astronomy is an extremely diverse science that gets less than 3 weeks coverage through the whole Regents sequences (mainly in Earth Science). This course is designed for the student that is interested in exploring the subject in much greater depth. Because of the scale of the universe, we will perform few direct experiments on our subject (lol). However, due to the advances in observational technologies, astronomy is a very dynamic subject. New and significant discoveries are constantly being made. This often makes the internet a more powerful resource than a well developed textbook. The course is designed to be flexible enough that the students will be able to review and discuss some of these ground breaking topics as they are happening. At the other end of the spectrum is the simple nature of observational astronomy. Astronomy started by humans' fascination with looking up at the night sky and wondering what it was all about. Plans for classroom and individual observation of the night sky will be discussed.

Course Structure—

Teacher Lecture-3 or so per week to convey the factual information of the course.

Computer Lab- Astronomy software and internet searches as appropriate

Student Presentations-Each student is expected to make two 5-10 minute presentation per quarter.

In Class Activities-There is a limited number of “experiments” that can be done with astronomy during daylight hours, but these will be incorporated into the class.

Out of Class Activities-Monthly star gazing activities will be assigned.

Test and Quizzes-One big test per quarter, quizzes happen about every two weeks. (In class only for now)

Weekly Readings: Students may be asked to read and discuss one story or article per week that relates to astronomy and space in general

Grading Policy (In class. No tests planned at this time for remote learning.)

Quarter Test-	20%
Quizzes-	30%
Textbook Questions	15%
Other:	35%

Student identified resources & presentations
Student readings and discussion

Class Activities and Homework
Student Observational Log

Year End Grade

Each of 4-quarters-- 20%

The last 20% will be a combination of the final exam, attendance at any night observation sessions, and other year long projects to be discussed later.

Missed Work—Due dates for work will be stated when assigned. At least one week will be available to accomplish most assignments.

My Expectation of Students—

- A three-ringed binder for handouts and notes. It can be part of a larger notebook.
- You are expected to have a scientific calculator (One that can handle scientific notation and square roots) and know how to use it.
- You are expected to bring your notebook and calculator to class everyday (Pencil or pen, too!) The textbook that you are given can be kept at home unless I ask you to bring it in.
- You are expected to hand in all material on time.
- Courteous, respectful and mature behavior is expected at all times. If I need to speak to you more than twice about disruptive behavior (including cell phones), I will be contacting your parents.
- To be in your seats and ready to go when the bell rings.
- **ASK QUESTIONS ABOUT THE UNIVERSE!**
- To work (well) with others, and not to always expect to work with your friends.
- If you are having difficulty, please ask for extra help.

My Expectations of the Teacher—

- To present the material in a number of different ways to help make it exciting.
- I expect to hand back all graded material within one week.
- Courteous, respectful and mature behavior is expected at all times.
- To be in the room and ready to go when the bell rings.
- **ANSWER QUESTIONS ABOUT THE UNIVERSE!**
- If you are having difficulty, I will be very willing to give extra help. Please feel free to talk to me anytime during the school day to set up extra help time during or after school. I also invite you and/or your parents to contact me via **EMAIL** robert.davis@wcsdny.org

MATH is part of the science of astronomy, and the teacher will not be afraid to use it. It will be expected that you should be able to use it as well. The teacher will take responsibility to ensure that any math used is within the background of the students (teaching it as required).

ASTRONOMY: A STUDY OF “OUR SPACE”

Code: S640 Full Year (11-12) (1 credit) (rank weight 1.0)

Prerequisite: Successful completion of two years of Science and a 75 or better on one Science Regents Exam

Text: Bennett, Jeffrey, The Cosmic Perspective--5th ed, San Francisco, 2008

Areas of Study Include:

- Nature of Astronomy
 - The birth of astronomy
 - What is Astronomy?
 - The Scientific Method
 - The difference between Astronomy and Astrology
- Cosmic Perspective
 - The Universe
 - Cosmic measurement of time and distance
 - The light year
 - Scientific notation
 - The scale of the universe
- Observational Astronomy
 - The celestial sphere
 - Measuring using angles
 - Objects “on” the sky
 - Reading Star Charts
 - Constellations
 - Observing planets
- The Earth and Moon’s motion and Keeping Time
 - The Earth’s motions: revolution and rotation
 - The calendar
 - The seasons and the tilt of the Earth
 - The day
 - The tides
 - The Moon phases
 - Solar and Lunar Eclipses
- History of Astronomy
 - Ancient Observers
 - Aristotle through Ptolemy
 - The Copernican Revolution
 - Heliocentric vs. Geocentric
 - Kepler and Brahe
 - Galileo and the birth of modern astronomy
 - Newton and Gravity
 - Halley to Herschel to Hubble
 - Einstein and Relativity
- Instruments of Astronomy
 - Reflecting and Refracting Telescopes
 - Large Telescopes and Observatories
 - The Electromagnetic Spectrum
 - Spectroscopy
 - Doppler Effect
 - Non-visible light telescopes
 - The Hubble Space Telescope
 - Future plans for telescopes
- The Space Age
 - The history of rocketry
 - Sputnik
 - The Space Race of the 60’s
 - NASA’s Mercury, Gemini, and Apollo missions
 - Artificial satellites to the planets
 - Space Shuttle through to International Space Station
 - Future of space exploration
- The Solar System
 - The Sun and its family
 - Gravity and orbits
 - Kepler’s Laws and Newton’s Law
 - Defining Planets and the Pluto controversy
 - Dwarf planets, comets, asteroids, and other planetesimals
 - Asteroid Belt, Kuiper Belt, and Oort Cloud
- The Earth as a Planet
 - The interior of the Earth
 - The Earth’s atmosphere
 - Organic chemistry and life
 - The uniqueness of Earth for supporting life
- The Moon
 - The Lunar surface
 - Cratered Surface
 - The Lunar interior
 - The possible origins of the Moon
- The Terrestrial Planets
 - Mercury
 - Venus
 - Earth
 - Mars
 - Comparing Mars and Venus to Earth
 - Satellite missions to the terrestrial planets
- The Gas Giants
 - Jupiter
 - Saturn
 - Uranus
 - Neptune
 - Comparison and Contrast of the Gas Giants
 - Satellite missions to the gas giants
- The Sun as a Star
 - The solar anatomy
 - Chemical composition
 - Nuclear fusion as the energy source
 - Surface events-Sunspots, flares and prominences
- Stars
 - The types of stars in the sky
 - The spectral classification of stars
 - Stellar population survey
 - The H-R diagram
- Stellar Distances
 - Parallax
 - Apparent and absolute magnitude
 - Variable Stars as distance markers
- Stellar Evolution
 - Interstellar medium
 - Forming gas clouds
 - Stellar Birth
 - Life on the Main Sequence
 - Stellar death and supernova explosions
 - White dwarfs, neutron stars, and black holes
- The Milky Way Galaxy
 - The anatomy of our galaxy
 - The spiral structure
 - The center and its super massive black holes
 - Distribution of stars and globular clusters
- Galaxies
 - Hubble’s discovery of other galaxies
 - Types of galaxies
 - Distance to galaxies
 - Galactic population and distribution
- Cosmology
 - The Big Bang theory
 - The age of the universe
 - Dark Matter and Dark Energy
 - The possible fates of the universe
- Life in the Universe
 - Life on Earth
 - What to look for from Earth?
 - SETI
 - Search for Extrasolar Planets
 - Could we colonize our solar system?

Assessment: School generated final exam