YASTR 11

Board/Authority Authorized Course Framework

District: Abbotsford (34)

Developed by: Alf Penner & Bruce Cuthbertson

Date Developed: December 2003

School Name: Yale Secondary School and Rick Hansen Secondary School

Principal's Name: Bruce Nicholson & Jinder Sarowa

BAA Approval Date: APR - 5 2004

BAA Signature:

Course Name: Astronomy

Grade Level: Grade 11

Number of Course Credits: 4

Number of Hours of Instruction: Approximately 110 hours

Prerequisites: Science 10, Math 10

Special Training, Facilities or Equipment Required: TV/VCR, 8" reflecting telescope and mount, access to computer lab

Course Synopsis:
This course is designed to give students the opportunity to learn theoretical and practical applications of astronomy. Students will be learning and applying knowledge in the fields of history, physics, mathematics, and art. Students will experience first-hand observational techniques used by amateur and professional astronomers, and learn to make careful observations of astronomical objects. In addition, students will also keep track of current events relevant to astronomy and space science. Evaluation will take on both formative and summative formats, culminating in a portfolio examination that requires students to compile their best work over the course of the year.

Rationale:
Given the acceleration of people's exploration and understanding of the universe, students need to be given the opportunity to learn in more detail the workings of the universe and how people have and may continue to study and explore it. Unfortunately, the present science curricula provide very little opportunity for students to study this field in detail (aside from small sections of the Science 9 and Earth Science 11 curricula). As well, the opportunity for students to learn in the field through direct observation of the

subject they are studying is an invaluable tool at reinforcing the concepts learned in class. Finally, the course provides opportunities for students to be challenged in the fields of mathematics, science, literary skills, and art, which is unlike most courses offered to students at the secondary level.

Organizational Structure:

Unit	Title	Time
Unit I	History and Equipment	15 Hours
Unit II	The Solar System	20 Hours
Unit III	Stars	15 Hours
Unit IV	Extra-Solar Objects and Cosmology	10 Hours
Unit V	Practical Applications of Astronomy	50 - 55 Hours
	Total Hours	110 - 115 Hours

Unit Descriptions:

Unit I: History and Equipment

Time: 15 Hours

Students begin the course exploring the pre-history and history of astronomy and astronomical observation. They will learn of the various models of the universe and the repercussions faced when models changed. Through this study of the past students will gain a better understanding of how astronomical observation is conducted.
Next, students learn of the basic equipment used in amateur astronomy as well as proper care and maintenance of the equipment.

Curriculum organizer: History
It is expected that students will be able to:

- Describe the contributions of various astronomers past and present
- Describe the geocentric and heliocentric models of the universe and discuss their advantages and disadvantages
- Describe the difficulties faced associated with switching from the geocentric to the heliocentric model

Curriculum organizer: Equipment
It is expected that students will be able to:

- Identify the main components of a reflecting and refracting telescope
- Distinguish between various telescope designs
- Define and describe: aperture, light-gathering power, focal length, focal ratio, magnification, resolving power, central obstruction, seeing
- Perform calculations pertaining to telescope use

Unit II: The Solar System

Time: 20 Hours

Students will explore the various structures that comprise the solar system along with the basic principles of motion and optics that govern the movement of these objects and how we see them.

Curriculum organizer: Formation
It is expected that students will be able to:

- Explain how the solar system was formed
- Outline the major events and factors that contributed to the solar system's present appearance and structure

Curriculum organizer: Planets
It is expected that students will be able to:

- List the planets in order of rank and size
- Describe the planets in terms of their composition, atmosphere, orbital period
- Apply Kepler's laws of motion to the movement of the planets
- Illustrate the solar system to scale with respect to the relative sizes of the planets and their distances from the sun

Curriculum organizer: Moon
It is expected that students will be able to:

- Illustrate and explain how solar and lunar eclipses occur
- Illustrate and explain how the phases of the moon occur
- Describe the various theories behind the moon's formation
- Identify and label major surface features of the moon

Curriculum organizer: Other objects
It is expected that students will be able to:

- Distinguish between meteors, meteorites, and meteoroids; explain the origin of meteor showers
- Name the major components of a comet and the typical orbit of a long and short-period comet

Unit III: Stars

Time: 15 Hours

Students will learn the processes behind the formation, life, and death of various star types, including the sun. They will also learn how stars are classified and how distances to stars can be measured.

Curriculum organizer: The Sun
It is expected that students will be able to:

- Describe how the sun and other stars are formed
- Describe the fusion process
- Describe the general structure of a star

Curriculum organizer: Stellar Evolution
It is expected that students will be able to:

- Describe and outline the main events in the life cycle of a low, medium, and high-mass star
- List the different spectral types of stars
- Create a Hertzsprung-Russell diagram

Curriculum organizer: Measuring Distance
It is expected that students will be able to:

- Use the distance modulus formula and baseline parallax methods for determining a star's distance

Unit IV: Extra-Solar Objects and Cosmology

Time: 10 Hours

Students will explore the various cosmological phenomena that lie outside the confines of the solar system, how they are classified, and also discuss the various theories behind the structure, origin, and fate of the universe.

Curriculum organizer: Extra-Solar Objects
It is expected that students will be able to:

- Demonstrate how objects are classified using the Messier Catalogue and the New Galactic Catalogue
- Describe and give examples of various types of nebulae, galaxies, clusters, and star groupings

Curriculum organizer: Cosmology
It is expected that students will be able to:

- Use the Hubble constant to describe the various models of the universe's progression
- Apply the Doppler shift principle to the motion of the galaxies

Unit V: Practical Applications of Astronomy

Time: 50 – 55 Hours

This unit, which runs for the duration of the course concurrently with the other units, gives students the opportunity to apply their classroom learning in the field. Students will locate and make proper observations and recordings of various objects and phenomena. Students will also conduct research of current events to study the ways in which astronomy and space science are being used presently.

Curriculum organizer: Current Events
It is expected that students will be able to:

- Use the Internet to locate current news items related to astronomy and space science
- Summarize and reflect on current events items

Curriculum organizer: Observation
It is expected that students will be able to:

- Find, identify, measure, draw, and label various constellations
- Describe the motion of the sky due to the Earth's rotation and revolution
- Find, identify, and draw various deep-sky objects and planets
- Make proper sketches of solar and lunar features
- Demonstrate proper use of astronomical equipment
- Use various techniques for measuring and locating objects
- Use maps and charts to find astronomical objects

Instructional Components:

- Direct instruction
- Indirect instruction
- Interactive instruction
- Independent instruction
- Modelling
- Brainstorming
- Group work

Assessment Components:

- 40% of the grade will be based on evaluation conducted during the classroom portion of the course (Units I-IV)
- 40% of the grade will be based on evaluation conducted during the practical application portion of the class (Unit V)
- 20% of the grade will be based on a final portfolio evaluation based on the student's collection of work throughout the year

Type of Assessment	Details	Weighting (%)
Formative	In-class assignments, projects	20
	Practical observations, current events	40
Summative	Unit exams	20
	Portfolio review	20
	Total	**100**

Performance Methods:

- Poster projects
- Worksheets
- Sketches, diagrams
- Portfolio compilation
- Use of equipment

Personal Communication:

- Group dialogue
- Current events reflection/discussion
- Self evaluation (portfolio)

Other:

- Weekly assessments
- Rubrics
- Rating scales
- Teacher anecdotal records