Linwood Holton Governor's School
Astronomy I and II, NAS 131/132 Syllabus
Fall 2008

Instructor: **Dr. Steve Rapp**

Location: **Linwood Holton Governor's School at the Southwest Virginia Higher Education Center, second floor, One Partnership Circle, P.O. Box 1987, Abingdon, VA 24210**

Web Site: **http://www.hgs.k12.va.us/ or http://steverapp.pageout.net/**

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Textbook: ***Astronomy Today* 6/*e* by Chaisson & McMillan, 2006, Sixth Edition. ISBN 0-13-240085-5 with CD-ROM. Companion Web site for the text: http://www.aw-bc.com/chaisson/. Click on the book cover that matches your book.**

Minimum Computer Requirements:
IBM compatible, 233 MHz processor, 1 Gig of RAM, 1 Gig of available space on your hard drive, 56 K modem (T1 line preferable), Internet Explorer 6.0 or Netscape 4.1 (the later the version the better)

Other Materials:
Scientific Calculator, Windows 98 or later, Microsoft Word 2003 or later, Microsoft Excel 2003 or later, ILink, Telescope Kit, 3 Astronomy Class CDs, and other materials to be announced at a later date

Course Delivery:
This course will be taught via the Internet with daily on-line discussion sessions. Tests will be administered on-line and homework will be collected via email.

Grade Determination:
Tests: Seven tests will be given and they will be open book/note.
Lab work: Twenty-nine lab activities will be assigned. A word-processed lab report for each activity must be turned in by the due date. Information on how to do a lab report and a sample lab report are found in Pageout web links. Two to three class projects will be assigned. Your final average will be determined by adding points acquired on tests and points acquired on lab reports and then dividing by the total points possible. Grades on each assignment will be recorded in Pageout. Students may access their grades online at anytime.

Event Schedule:
For detailed information on weekly schedule and assignments visit: http://steverapp.pageout.net/ .

Policies:

Academic Dishonesty: Collaboration on examinations, in class assignments, and homework assignments is forbidden except where specifically specified as "Team" activities. In general, one team may not collaborate with another team on "Team" activities. Students violating this policy will be subject to disciplinary action and possibly a failing grade in the class.

Assignments: ALL ASSIGNMENTS SHOULD BE COMPLETED ON TIME AND TURNED IN ON THE DUE DATE. ASSIGNMENTS WILL BE ACCEPTED UP TO 3 DAYS LATE, BUT THERE WILL BE A PENALTY OF 10 POINTS FOR EVERY DAY LATE. THIS MEANS THE MAXIMUM SCORE THAT CAN BE RECEIVED IS 70%. AFTER 3 DAYS A GRADE OF ZERO WILL BE RECORDED. MAKE SURE YOU EMAIL YOUR ASSIGNMENT FAR ENOUGH AHEAD SO THAT IT REACHES ME BY THE DEADLINE.

Grading System: The regular university grading scale will be used:
90-100 = A; 80-89 = B; 70-79 = C; 60-69 = D; 59 or below = F.

Objectives of the Course

- **Excite the student about astronomy.**
- **Provide a foundation in astronomy fundamentals.**
- **Cultivate problem-solving skills.**
- **Allow the student through the study of astronomy to appreciate new developments in the world of science.**
- **To enhance the student's ability to make informed judgments concerning national science initiatives.**

Class Guidelines

1. Be on time for class.
2. Do your own work.
3. Don't miss my class to do something in another class, like making up a test for example.
4. Email me if you know you are going to be absent.
5. Participate in class.
6. Be prepared for tests. If you miss the day before the test is scheduled you will still be required to take the test on the scheduled day unless an emergency has occurred. You are to receive NO OUTSIDE HELP.
7. Email all lab reports as an attached word document to me at srapp@hgs.k12.va.us.

Curriculum Framework

- **Charting the Heavens**
  - **Our Place in Space**
  - **Motions of the Sun and the Stars**
  - **Motion of the Moon**
  - **Measurement of Distance**
- **The Copernican Revolution**
  - **Ancient Astronomy**
  - **The Geocentric Universe**

    - **The Heliocentric Model**
    - **Laws of Planetary Motion**
    - **Birth of Modern Astronomy**
    - **Solar System Dimensions**
    - **Newton's Laws**
- **Radiation**
    - **Information from the Skies**
    - **The Electromagnetic Spectrum**
    - **The Distribution of Radiation**
    - **The Doppler Effect**
- **Spectroscopy**
    - **Spectral Lines and Their Formation**
    - **Molecules**
    - **Spectral Line Analysis**
- **Telescopes**
    - **Optical Telescopes**
    - **High-Resolution Astronomy**
    - **Radio Astronomy**
    - **Interferometry**
    - **Other Astronomies**
- **The Solar System**
    - **Planetary Properties**
    - **The Overall Layout of the Solar System**
    - **Terrestrial and Jovian Planets**
    - **Interplanetary Debris**
    - **Spacecraft exploration of the Solar System**
- **Earth, Our Home in Space**
    - **Earth in Bulk**
    - **Earth's Atmosphere**
    - **Earth's Interior**
    - **Earth's Magnetosphere**
    - **Surface Activity**
    - **Tides**
- **The Moon and Mercury**
    - **Orbital Properties**
    - **The Moon and Mercury in Bulk**
    - **Rotation Rates**
    - **Lunar Cratering**
    - **Lunar Surface Composition**
    - **The Surface of Mercury**
    - **Evolutionary History of the Moon and Mercury**
- **Venus**
    - **Orbital Properties**
    - **Venus in Bulk**
    - **Long-Distance Observations of Venus**
    - **The Surface and Atmosphere of Venus**
    - **Venus's Magnetic Field and Internal Structure**
- **Mars**
    - **Orbital Properties and Mars in Bulk**
    - **Earth-Based Observations of Mars**
    - **The Surface of Mars**
    - **The Martian Atmosphere and Internal Structure**
    - **The Moons of Mars**
    - **Exploration of Mars**
- **Jupiter**
    - **The Atmosphere of Jupiter**
    - **Jupiter in Bulk**

    - **Internal Structure and Magnetosphere**
    - **The Moons of Jupiter**
    - **Jupiter's Ring System**
- **Saturn**
    - **Saturn in Bulk**
    - **Saturn's Atmosphere**
    - **Saturn's Interior and Magnetosphere**
    - **Saturn's Spectacular Rings**
    - **The Moons of Saturn**
- **Uranus, Neptune, and Pluto**
    - **The Discovery of Uranus and Neptune**
    - **Uranus and Neptune in Bulk**
    - **The Atmospheres of Uranus and Neptune**
    - **Magnetospheres and Internal Structure**
    - **The Moon Systems of Uranus and Neptune**
    - **The Rings of the Outermost Jovian Planets**
    - **The Discovery and Origin of Pluto**
    - **Pluto in Bulk**
- **Solar System Debris**
    - **Asteroids**
    - **Comets**
    - **Meteoroids**
- **The Formation of the Solar System**
    - **Modeling the Origin of the Solar System**
    - **The Condensation Theory**
    - **The Differentiation of the Solar System**
    - **The Role of Catastrophes**
    - **The Angular Momentum Problem**
- **The Sun: Our Parent Star**
    - **The Sun in Bulk**
    - **The Solar Interior**
    - **The Solar Atmosphere**
    - **The Active Sun**
    - **The Heart of the Sun**
    - **Observations of Solar Neutrinos**
- **Measuring the Stars: Giants, Dwarfs, and the Main Sequence**
    - **The Distance to the Stars**
    - **Stellar Motion**
    - **Luminosity and Apparent Brightness**
    - **Temperature and Color**
    - **The Classification of Stars**
    - **The Hertzsprung-Russel Diagram**
    - **Extending the Cosmic Distance Scale**
    - **Stellar Mass**
    - **Star Clusters**
- **The Interstellar Medium: Gas and Dust Among the Stars**
    - **Interstellar Matter**
    - **Emission Nebula**
    - **Dark Dust Clouds**
    - **21-Centimeter Radiation**
    - **Interstellar Molecules**
- **Star Formation: A Traumatic Birth**
    - **Gravitational Competition**
    - **The Formation of Stars Like the Sun**
    - **Stars of Different Masses**
    - **Observations of Cloud Fragments and Protostars**
    - **Shock Waves and Star Formation**

    - **Emission Nebulae and Star Clusters**
- **Stellar Evolution: From Middle Age to Death**
    - **Leaving the Main Sequence**
    - **The Evolution of a Sun-like Star**
    - **The Death of a Low-Mass Star**
    - **Evolution of Stars More Massive Than the Sun**
    - **Observing Stellar Evolution in Star Clusters**
    - **The Evolution of Binary-Star Systems**
- **Stellar Explosions: Novae, Supernovae, and Formations of the Heavy Elements**
    - **Life After Death for White Dwarfs**
    - **The End of a High-Mass Star**
    - **Supernova Explosions**
    - **The Formation of the Elements**
    - **The Cycle of Stellar Evolution**
- **Neutron Stars and Black Holes: Strange States of Matter**
    - **Neutron Stars**
    - **Pulsars**
    - **Blazars**
    - **Neutron-Star Binaries**
    - **Black Holes**
    - **Black Hole Properties**
    - **Space Travel Near Black Holes**
    - **Observational Evidence for Black Holes**
- **The Milky Way Galaxy: A Grand Design**
    - **Our Parent Galaxy**
    - **Measuring the Milky Way**
    - **The Large-Scale Structure of Our Galaxy**
    - **The Formation of the Milky Way Galaxy**
    - **Spiral Structure**
    - **The Mass of the Milky Way Galaxy**
    - **The Galactic Center**
- **Galaxies: Building Blocks of the Universe**
    - **Hubble's Galaxy Classification**
    - **The Distribution of Galaxies in Space**
    - **Hubble's Law**
    - **Active Galactic Nuclei**
    - **The Central Engine of an Active Galactic Nuclei**
- **Galaxies and Dark Matter: The Large-Scale Structure of the Universe**
    - **Dark Matter in the Universe**
    - **Galaxy Collisions**
    - **Galaxy Formation and Evolution**
    - **Black Holes in Galaxies**
    - **The Universe on Large Scale**
- **Cosmology: The Big Bang and the Fate of the Universe**
    - **The Universe on the Largest Scales**
    - **The Expanding Universe**
    - **The Fate of the Universe**
    - **Will the Universe Expand Forever?**
    - **The Geometry of Space**
    - **The Cosmic Background Microwave Background**
- **The Early Universe: Toward the Beginning of Time**
    - **Back to the Big Bang**
    - **The Evolution of the Universe**
    - **The Formation of Nuclei and Atoms**
    - **The Inflationary Universe**
    - **The Formation of Structure in the Universe**
    - **Toward Creation**

- **Life in the Universe: Are We Alone?**
  - **Cosmic Evolution**
  - **Life in the Solar System**
  - **Intelligent Life in the Galaxy**
  - **The Search for Extraterrestrial Intelligence**

LABORATORY REPORT DUE DATES

Laboratory Activities	Tentative Due Date
Lab 1.1 Simulating a Solar Eclipse Using Sky Chart III	Aug. 25
Lab 2.1 Understanding the Imagined Epicycles of the Ancients	Aug. 29
Lab 3.1 Comparing Andromeda Galaxy Images Using NASA's Sky View, A Virtual Telescope	Sept. 2
Lab 4.1 Discovering Spectra	Sept. 5
Lab 5.1 Building a Telescope	Sept. 9
Lab 5.2 Observing the Sky from Different Locations	Sept. 15
Lab 6.1 Observing the Planets	Sept. 19
Lab 7.1 Observing a Star to Determine Sidereal Time	Sept. 23
Lab 8.1 Apollo Exploration of the Moon	Sept. 26
Lab 9.1 Exploring Venus	Sept. 30
Lab 10.1 Exploring Mars	Oct. 6
Lab 11.1 The Galilean Moons	Oct. 9
Lab 12.1 The Rings of Saturn	Oct. 13
Lab 13.1 The Motions of Neptune	Oct. 17
Lab 14.1 Observing Chiron and Hidalgo	Oct. 21
Lab 15.1 Finding Beta Pictoris	Oct. 24
Lab 16.1 Understanding the Sun's Analemma	Oct. 28
Lab 17.1 Understanding the B-V Color Index of a Star	Nov. 5
Lab 18.1 Observing the Orion Nebula, M42	Nov. 7
Lab 19.1 Observing the Twenty Brightest Stars	Nov. 11
Lab 20.1 Discovering the Relationship between Star Distance and Apparent Magnitude	Nov. 14
Lab 21.1 Finding the Crab Nebula	Nov. 18
Lab 22.1 Observing Deep Sky Objects and Globular Clusters	Nov. 21
Lab 23.1 Black Hole in the Milky Way Galaxy	Nov. 25
Lab 24.1 Discovering the Distribution of Galaxies	Dec. 1
Lab 25.1 Exploring Active Galaxies	Dec. 4
Lab 26.1 Exploring the Cosmos	Dec. 8
Lab 27.1 Cosmic Background Radiation and Supernova	Dec. 10
Lab 28.1 Looking for E.T.	Dec. 12
Quiet Skies Project	TBA
Micro-Observatory Project	TBA

TENTATIVE EXAM SCHEDULE

Chapters 1-4	Sept. 3
Chapters 5-8	Sept. 24
Chapters 9-12	Oct. 14
Chapters 13-16	Oct. 31
Chapters 17-20	Nov. 12
Chapters 21-24	Nov. 25
Chapters 25-28	Dec. 12