An Introduction to Astronomy
Astronomy I
"The Solar System"
Course Syllabus

Textbook: Eric Chaisson and Steve McMillan. Astronomy: A Beginner's Guide to the Universe. Upper Saddle River, NJ: Prentice Hall, 2001.

I. Weeks 1 & 2: Prologue, "Charting the Heavens," pp. 1-21.

Topics: "Our place in space, Constellations, Celestial Sphere, Celestial Coordinates, Earth's Orbital Motion, Solar Day, Sidereal Day, Seasonal Changes, Lunar Phases, Eclipses, Measuring Distances: Triangulation, Cosmic Distance Scale, and Parallax.

II. Weeks 3 & 4: Chapter 1, "The Copernican Revolution," pp. 23-41.

Topics: "Planetary Motion, Geocentric Universe, Heliocentric Model of the Solar System, Birth of Modern Astronomy, Laws of Planetary Motion, Kepler's Simple Laws, Newton's Laws of Motion and Gravitation, Dimensions of the Sun, Weighing the Sun."

III. Weeks 5 & 6: Chapter 2, "Light and Matter," pp. 43-66.

Topics: "Light and Radiation, Wave Motion, Interaction Between Charged Particles, Electromagnetic Spectrum, Blackbody Spectrum, Radiation Laws, Emission Lines, Absorption Lines, Atomic Structure, Particle Nature of Radiation, Spectrum of Hydrogen, Kirchhoff's Laws, Spectral-Line Analysis, Doppler Effect."

IV. Weeks 7 & 8: Chapter 3, "Telescopes," pp. 71-94.

Topics: "Reflecting and Refracting Telescopes, Telescope Design, Light-Gathering Power, Resolving Power, Atmospheric Blurring, Image Processing, New Telescope Design, Hubble Space Telescope, Essentials of Radio Telescope, Value of Radio Astronomy, Interferometry, Infrared and Ultraviolet Astronomy, High Energy Astronomy, Full-Spectrum Coverage."

V. Weeks 9 & 10: Chapter 4, "The Solar System," pp. 98-122.

Topics: "Planetary Properties, Interplanetary Matter, Asteroids, Comets, Meteoroids, Formation of the Solar System, Planet Formation, Solar System Differentiation, Comet and Asteroid Formation."

VI. Weeks 11 & 12: Chapter 5, "Earth and Its Moon," pp. 126-151.

Topics: "Physical Properties of the Earth, Earth's Overall Structure, Tides, Gravitational Deformation, Tidal Locking, Earth's Atmosphere, Greenhouse Effect, Lunar Atmosphere?, Earth's Seismology, Earth's Interior, Lunar Interior, Continental Drift and Plate Tectonics, Lunar Plate Tectonics, Lunar Surface Features, Lunar Erosion, Magnetism – Earth and Lunar, Earth-Moon System Formation and Evolution."

VII. Weeks 13 & 14: Chapter 6, "The Terrestrial Planets," pp. 154-179.

Topics: "Orbital and Physical Properties of the Terrestrial Planets, Rotation Rates, Atmospheres, Mercury's Surface, Venus's Surface, Mars's Surface, Internal Structure and Geological History of Mercury, Venus, and Mars, Atmospheric Evolution on Earth, Venus, and Mars, The Moons of Mars."

VIII. Weeks 15 & 16: Chapter 7, "The Jovian Planets," pp. 154-179.

Topics: "Observations of Jupiter and Saturn From Earth and Through Space Exploration, Discoveries of Uranus and Neptune, Overall Properties and Differential Rotation of the Jovian Planets, Jupiter's Atmosphere: Its Appearance, Composition, Structure, and Weather, Atmospheric Compositions and Weather of Saturn, Uranus, and Neptune, Internal Structure, Magnetosphere, and Internal Heating of the Jovian Planets."

IX. Weeks 17 & 18: Chapter 8, "Moons, Rings, and Pluto," pp. 206-227.

Topics: "Galilean Moons of Jupiter: Io, Europa, Ganymede, and Callisto, Large Moons of Saturn and Neptune: Titan and Triton, Medium-Sized Jovian Moons, Saturn's Spectacular Ring System, Roche Limit, Structure, Rings of Jupiter, Uranus, and Neptune, Planetary Ring Formation, Discovery of Pluto, Pluto-Charon System, Pluto's Origin."

X. Weeks 19 & 20: Chapter 9, "The Sun," pp. 230-249.

Topics: "Sun's Bulk, Overall Structure, Luminosity, Interior, Energy Transport, Evidence for Solar Convection, Solar Atmosphere, Chromosphere, Transition Zone and Corona, X-Rays, Sunspots, Solar Magnetism, Solar Cycle, Active Regions, Changing Solar Corona, Nuclear Fusion, Proton-Proton Chain, Proton-Proton Chain Energy Generation, Solar Neutrinos."

An Introduction to Astronomy
Astronomy II
"The Universe"
Course Syllabus

Textbook: Eric Shaisson and Steve McMillan. Astronomy: A Beginner's Guide Guide to the Universe. Upper Saddle River, NJ: Prentice Hall, 2001.

I. Weeks 1 & 2: Chapter 11, "The Interstellar Medium," pp. 276-299.

Topics: "Interstellar Matter, Gas and Dust' Density and Composition of the Interstellar Medium, Interstellar Clouds, Star-Forming Regions, Dark Dust Clouds, Centimeter Radiation, Molecular Gas, The Formation of Stars Like the Sun, Gravity and Heat, Stage 1 – An Interstellar Cloud, Stages 2 & 3 – A Contracting Cloud Fragment, Stages 4 & 5 - Protostellar Evolution, Stages 6 & 7 – A Newborn Star, The Zero-Age Main Sequence, "Failed" Stars, Star Clusters and Associations, Clusters Nebulae.

II. Weeks 3 & 4: Chapter 12, "Stellar Evolution," pp. 301-325.

Topics: "Evolution of a Sun-like Star, The Red Giant Branch, Helium Fusion, The Carbon Core, The Death of a Low-mass Star, Dense Matter, Planetary Nebulae, White Dwarfs, The Death of a High-mass Star, Supernova Explosions, Novae and Supernovae, Type I and Type II Supernovae, Supernova Remnants, Supernovae and the Formation of the Heavy Elements, Observing Stellar Evolution in Star Clusters, Cycle of Stellar Evolution."

III. Weeks 5 & 6: Chapter 13, "Neutron Stars and Black Holes," pp. 326-349.

Topics: "Neutron Stars, Pulsars, Neutron-Star Binaries, X-ray Sources, Gamma-ray Bursts, Millisecond Pulsars, Pulsar Planets, Black Holes, The Final Stage of Stellar Evolution, Escape Speed, The Event Horizon, Black Holes and Curved Space, Space Travel Near Black Holes, Orbits and Tidal Forces, Approaching the Event Horizon, Tests of General Relativity, Singularity, Observational Evidence for Black Holes, Black Holes in binary Systems, Have Black Holes Been Detected?"

IV. Weeks 7 & 8: Chapter 14, "The Milky Way Galaxy," pp. 350-375.

Topics: "Our Parent Galaxy, Measuring the Milky Way, Star Counts, Observations of Variable Stars, A New Yardstick, The Size and Shape of Our Galaxy, Large-scale Structure, Mapping Our Galaxy, Stellar Populations, Orbital Motion, The Formation of the Milky Way,

Galactic Spiral Arms, Self-propagating Star Formation, Density Waves, The Mass of the Milky Way, Dark Matter, The Search for Stellar Dark Matter, The Galactic Center."

V. Weeks 9 & 10: Chapter 15, "Normal Galaxies," pp. 376-403.

Topics: "Hubble's Galaxy Classification, Spirals, Ellipticals, Irregulars, A H-R Diagram for Galaxies, The Distribution of galaxies in Space, Extending the Distance Scale, Galaxy Clusters, Clusters of Clusters, Galaxy Masses, Mass Measurements, Dark Matter in the Universe, Galaxy Formation and Evolution, Mergers and Acquisitions, Galaxy, Interactions, Colliding Galaxies, Hubble's Law, Universal Recession, Hubble's Constant, The Cosmic Distance Scale, Large-Scale Structure in the Universe."

VI. Weeks 11 & 12: Chapter 16, "Active Galaxies and Quasars," pp. 404-429.

Topics: "Beyond the Local Realm, Seyfert Galaxies, Radio Galaxies, Core-Halo Radio Galaxies, Lobe Radio Galaxies, The Central Engine of an Active Galaxy, Energy Production, Energy Emission, Quasi-Stellar Objects, The Discovery of Quasars, Relativistic Redshifts and Look-Back Time, Observed Properties of Quasars, Quasar Energy Generation and Lifetimes, Quasar "Mirages", Active Galaxy Evolution."

VII. Weeks 13 & 14: Chapter 17, "Cosmology," pp. 430-453.

Topics: "The Universe on the Largest Scales, Cosmic Expansion, Cosmic, Paradox, The Birth of the Universe, Where Was the Big Bang?, The Cosmological Redshift, The Fate of the Universe, Critical Density, The Density of the Universe, An Accelerating Universe, The Cosmological Constant, The Age of the Universe, Curved Space, The Geometry of Space, The Cosmic Microwave Background, Matter and Radiation, The Formation of Nuclei and Atoms, Helium Formation, Nucleosynthesis and the Density of the Universe, The Formation of Atoms, Cosmic Inflation, The Horizon and Flatness Problems, The Epoch of Inflation, Implications for the Universe, The Formation of Large-Scale Structure in the Universe."

VIII. Weeks 16 & 17: Chapter 18, "Life in the Universe," pp. 455-470.

Topics: "Cosmic Evolution, Life in the Universe, Life on Earth, Density and Culture, Life in the Solar System, Life as We Know It, Alternative Biochemistries, Intelligent Life in the Galaxy, The Drake Equation, Rate of Star Formation, Fraction of Stars Having Planetary Systems, Number of Habitable Planets per Planetary System, Fraction of Habitable Planets on Which Life Arises, Fraction of Life-Bearing

Planets on Which Intelligence Arises, Fraction of Planets on Which Intelligent Life Develops and Uses Technology, Average Lifetime of a Technological Civilization, The Search for Extraterrestrial Intelligence, Meeting Our Neighbors, Radio Communication, The Water Hole."