| Long Term Plan | | The Year 11 course begins by looking at the role of the Sun and Moon in calculating time and distance, looking at the work of Eratosthenes and Aristarchus. Students then move onto topics from astrophysics and cosmology, looking at the formation of stars and planets, galaxies and the Big Bang. | | |
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| | | **Learning Cycle** | **Key Concepts and Themes** | **Vocabulary** |
| **Year 11: Astronomy** | **HT1** | Time and the Earth-Moon-Sun Cycles<br><br>Formation of planetary systems | • Sidereal and synodic days. Mean Solar Time and Local Mean Time, and the Equation of Time. Sundials<br>• Lunar phase cycles<br>• Astronomical methods for determining longitude, including the horological method (Harrison's marine chronometer)<br><br>• Gravitational attraction, tidal gravitational forces, gravitational interactions (orbits, chaotic motion, resonances and Lagrangian points), accidental collisions and solar wind.<br>• Formation of planets, including gas giants. | Sidereal, synodic, Apparent Solar Time, Mean Solar Time, Equation of Time, Gnomon, Equinox, Solstice<br><br>Attraction, tidal forces, elastic forces, Roche Limit, terrestrial, gas giant, |
| | **HT2** | Formation of planetary systems cont.<br><br>Exploring starlight | • Discovery of exoplanets: transit method, astrometry and radial velocity measurements.<br>• Requirements and possibility of life-forms existing, including on Titan, Europa, Enceladus and outside the Solar System, the Goldilocks zone and the Drake Equation.<br>• The search for extra-terrestrial life (SETI)<br><br>• Astronomical magnitude. Apparent and absolute magnitude.<br>• Classification of stars, spectral types and the Hertzsprung-Russell diagram.<br>• Inverse square law<br>• Heliocentric parallax<br>• Light curves for variable stars (long and short period, eclipsing binary, Cepheid, novae and supernovae) | Exoplanet, transit, astrometry, Goldilock's Zone<br><br>Mangitude, spectral type, parsec, main sequence, dwarf star, supergiant, intensity, electromagnetic spectrum, emission/absorption lines, heliocentric parallax, |
| | **HT3** | Exploring starlight cont.<br><br>Stellar evolution | • Using Cepheid variables to determine distances.<br>• Binary stars and clusters<br>• Radio telescopes and arrays, CCDs<br>• Importance of infrared, x-ray, gamma and ultraviolet astronomy in discoveries.<br>• Effects of telescopes of appearance of astronomical objects.<br>• Messier catalogue, Bayer system.<br><br>• Effect of radiation pressure and gravity on main sequence stars, and changes to this pressure in life cycle of stars.<br>• Neutron/electron pressure in neutron/white dwarf stars.<br>• The Chandrasekhar Limit<br>• Stages and time scales of stellar evolution for stars similar to and greater in mass to Sun.<br>• Studying black holes. | Supernovae, binary stars, clusters, array<br><br>Messier Catalogue, New General Catalogue, Bayer system, radiation pressure, electron/neutron pressure, Chandrasekhar Limit, emission and absorption nebulae, |
| | **HT4** | Our place in the Galaxy<br><br>Cosmology | • Appearance and features of the Milky Way<br>• The Local Group<br>• Hubble classification of galaxies – "tuning fork" diagram<br>• Active galaxies: Seyfert, quasars and blazars<br>• Clusters and superclusters<br>• Formation and evolution of galaxies<br><br>• Redshift, including the wavelength formula<br>• Hubble's Law and Hubble's constant. The age of the universe. | 21 cm radio waves, Local Group, Andromeda, Large and Small Magellanic Clouds, Triangulum, Spiral, Barred Spiral, Elliptical, Tuning Fork, Active Galactic Nucleus, Quasar, Blazar, Cluster, Supercluster<br><br>Redshift, Blueshift, Observed wavelength, emitted wavelength, radial velocity, Hubble's Law, Hubble constant |

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| | **HT5** | Cosmology cont.<br><br>Revision | • Expansion of the universe; including how it supports the Big Bang Theory and the Steady-State Theory<br>• Major observational evidence for Big Bang Theory: Quasars, Cosmic Background Radiation and Hubble Deep Field images<br>• Fluctuations in the CMB and discoveries of WMAP and Planck mission.<br>• Dark matter and dark energy, its detection<br>• Fate of the universe | Big Bang Theory. Steady State theory, Cosmic Microwave Background, Deep Field, WMAP, Planck Mission, Dark matter, Dark energy, heat death, Big Freeze, Big Rip |
| | **HT6** | External assessments | • Paper 1: Naked Eye – Date TBC<br>• Paper 2: Telescopic – Date TBC | |

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| **Skill Development** | • Observation skills: How to plan and prepare for an astronomical observation. Use of star charts, planispheres and computer software to navigate the sky.<br>• Mathematical skills: Use geometrical arguments for astronomical measurements, graphing skills for the presentation and analysis of data, use of formulae and equations.<br>• Study skills: Development of strategies for learning knowledge, selecting appropriate knowledge.<br>• Evaluation skills: Evaluating and improving observational designs.<br>• Scientific/cultural awareness: Understand the development of the field of astronomy, its theories and its importance to human civilisation. |