| | |
|---|---|
| Semester | **II** |
| Course [*1] | Multi-Disciplinary |
| Paper Title / Code | The Story of the Universe / M1PH 230211T |
| No. of Credits *[2] | **3** |
| Theory / Practical / Composite | **Theory** |
| Minimum No. of preparatory hours per week a student has to devote | 3 |
| Number of Modules | 1 |
| Syllabus | <u>The Story of the Universe</u><br>[36L]<br><br>*[A collection of instructional videos / sims appropriate for the course may be prepared and used during the course along with live demonstrations. Laboratory experience on electric circuits may be offered. Students may be evaluated periodically using questionnaires in lieu of traditional examinations*.]<br><br>The Galilean Age: The Mathematical description of motion (velocity, acceleration, Inertial reference frames, non-uniform motion,space time graphs), Projectile motion: Principles of Inertia and Superposition, Center of mass motion, collisions, Conservation of Momentum.<br><br>[4L]<br><br>The Newtonian cult: Concept of Force, the three laws of motion and their applications. The Moon and the apple - Gravitational Physics: Kepler's Laws, simple astronomical applications.<br><br>[4L]<br><br>Concept of Energy, Conservation, Energy and Atoms, Binding Energy (Examples: gravitational binding, atomic and nuclear binding), Conservation and Symmetry. |

| | |
|---|---|
| | [4L]<br><br>Concept of a Field vis a vis Action at a distance. Electric & magnetic fields, Maxwell's work on unification.<br><br>[4L]<br><br>Waves: What constitutes a wave like disturbance, sources of Waves, standing waves, waves in interference. Physics of sound and musical instruments, color of sky/sea<br>Major parts of the EM spectrum: Use in astronomical detection and discovery.<br>[8L]<br>Does the earth really move through anything? Elementary special relativity.<br><br>Physics in the Free fall frame: Discussions on the equivalence principle and GR, touching on black holes, expanding universe and gravitational waves.<br><br>The Tale of Quantum physics, quantization of energy, wave-particle duality and principle of superposition.<br>[12L] |
| Learning Outcomes *[3] | (1) Students from any disciplines are able to understand the Physics perspective covering a wide range of topics in simple terms.<br>(2) Enables students to take informed decisions about science in technology in future. Specially important when they assume important roles in the socio-economic growth of the country. |
| Reading/Reference Lists *[4] | <u>Reference Books:</u><br><br>1. R.P Feynman - Six Easy pieces and six not so easy pieces<br>2. March - Physics for Poets<br>3. Hewitt - Practicing Physics for Conceptual Physics<br>4. Crowell - Conceptual Physics<br>5. Christopher Schiller (Motion Mountain Series)<br>6. Isaac Asimov (Understanding Physics in 3 volumes)<br>7. Kakalios - The amazing story of the Quantum and the Physics of Everyday things |

| | | |
|---|---|---|
| | 8. A P French – Mechanics<br>9. Kerson Huang - Fundamental Forces of Nature – The Story of Gauge Fields<br>10. George Gammow - Mr. Topkins in the Wonderland | |
| Evaluation | Theory<br>CIA: 15<br>Semester Exam: 35 | Practical (if applicable)<br>CA:<br>Semester Exam: |
| Paper Structure for Theory Semester Exam | 5Q / 7Q, each 3 Marks + 2Q/3Q each 10 Marks : 35 | |

## Template for Paper Submission

*1: Major / Minor / Multi-Disciplinary / Ability Enhancement / Skill Enhancement / Value-Added.

*2: In case of composite paper, kindly mention the credit allotted to theory and practical components separately.

*3: Learning outcomes should preferably contain one or two outcomes related to social / environmental consciousness.

*4: The list should preferably contain one or two online courses developed by SWAYAM, NPTEL, etc.