

# PHYS1241 HIGHER PHYSICS 1B (SPECIAL)

## SYLLABUS

**Textbooks:** D. Halliday, R. Resnick & J. Walker\*  
*"Fundamentals of Physics Extended", 6<sup>th</sup> Ed. (Wiley ISBN 0-471-39222-7)*

Serway & Jewett\*  
*'Physics for Scientists and Engineers, 6<sup>th</sup> Ed. (ISBN 0-534-42938-1) OR*  
*'Physics for Scientists and Engineers with Modern Physics', 6<sup>th</sup> Ed. (ISBN 0-534-40949-0)*

\* *There are many suitable texts, you need only buy one. If you already have 'Physics for Scientists and Engineers' by Paul A. Tipler 4<sup>th</sup> Ed., this is suitable. If you have another book but are not sure about its suitability for the course, discuss its suitability with your lecturer or First Year Office.*

### WEEKS 1-8, SESSION 2:

TOPIC	TEXT
<ul style="list-style-type: none"><li>• WAVES IN ELASTIC MEDIA Mechanical waves. Types of waves. Travelling waves. Wave speed in a stretched string. Power and intensity in wave motion. The superposition principle. Interference of waves. Standing waves. Resonance.</li></ul>	HR Chapter 17
<ul style="list-style-type: none"><li>• SOUND WAVES Audible, ultrasonic and infrasonic waves. Propagation speed of longitudinal waves. Travelling longitudinal waves. Sound intensity. Vibrating systems and sources of sound. Beats. The doppler effect.</li></ul>	HR Chapter 18
<ul style="list-style-type: none"><li>• INTERFERENCE Wave optics. Young's experiment. Intensity of interfering waves. Interference from thin films.</li></ul>	HR Chapter 36
<ul style="list-style-type: none"><li>• DIFFRACTION Diffraction from a single slit. Diffraction from a circular aperture. Diffraction from a double slit. Diffraction grating – resolving power.</li></ul>	HR Chapter 37
<ul style="list-style-type: none"><li>• POLARIZATION Polarization. Polarizing sheets. Polarization by reflection. Double refraction. Circular polarization.</li></ul>	HR Chapter 39
<ul style="list-style-type: none"><li>• EARLY QUANTUM PHYSICS The blackbody dilemma: Planck's hypothesis. The photoelectric effect and photons. The continuous X-ray spectrum. The Compton effect.</li></ul>	HR Chapter 39

Matter waves, de Broglie hypothesis. The wave-particle duality. Atomic models, spectra and Atomic Structure. The Bohr model of the hydrogen atom.	
<ul style="list-style-type: none"> <li><b>ALTERNATING ELECTRIC CURRENTS (I)</b> Alternating currents. Alternators, alternators in series. Phase relations, phase amplitude diagrams. AC circuits containing a pure resistance. Power. R.M.S. values. AC circuits containing a pure capacitance or a pure inductance. Series RLC circuit, reactance, scalar impedance. Real circuit components.</li> </ul>	Lecture Notes
<ul style="list-style-type: none"> <li><b>ALTERNATING ELECTRIC CURRENTS (II)</b> Series and parallel combinations of components. Series resonance, bandwidth, Q factor, applications. Parallel resonance. The ideal transformer.</li> </ul>	Lecture Notes

*WEEKS 9 – 14, SESSION 2:*

<ul style="list-style-type: none"> <li><b>EXOPLANETS</b> Star and planet formation. Detection of planets around other stars (exoplanets). The angular momentum problem. The two-body problem. Differential gravitational forces. Roche and instability limits. Future exoplanet searches.</li> </ul>	Special Notes
<ul style="list-style-type: none"> <li><b>ENERGY GENERATION IN THE SUN</b> Discovery of the nucleus. Nuclear properties. Radioactive decay law. Nuclear masses and binding energy. Binding energy versus mass number plot. Nuclear force. Nuclear models. Alpha, beta and gamma decay. Fission and fusion. The Coulomb barrier. Fusion cycles in the Sun. The solar neutrino problem.</li> </ul>	<i>SJ 44.1 – 44.7</i>  <i>SJ 45.1 – 45.4</i>
<ul style="list-style-type: none"> <li><b>THE 2006 NOBEL PRIZE IN PHYSICS</b> Who won it, and why.</li> </ul>	<a href="http://www.nobel.se">www.nobel.se</a>
<ul style="list-style-type: none"> <li><b>THERMAL PHYSICS</b> Thermal equilibrium. The zeroth law. Temperature. Temperature scales. Thermal expansion. Heat. Heat capacity. Latent heat. Heat conduction. The first law. Applications. Ideal gas law. Kinetic theory. Heat capacities of an ideal gas. Adiabatic changes. Equipartition of energy.</li> </ul>	<i>SJ 19.1 – 19.5</i> <i>SJ 20.1 – 20.7</i> <i>SJ 21.1 – 21.4</i>
<ul style="list-style-type: none"> <li><b>PLANETARY ATMOSPHERES</b> Earth. Solar system planets. Vertical structure of Atmosphere. Escape of gases. Exoplanets. Signatures of life on exoplanets.</li> </ul>	Special Notes

- **RELATIVITY**

Brief review of problems of 19<sup>th</sup> Century, 'classical' physics. Michelson Morley experiment. Postulates of Special Relativity. The meaning and principles of Relativity, Lorentz Transformations, Relativity and Simultaneity. Experimental evidence. Length Contraction and Time Dilation, Velocity, Mass and Energy within the Relativistic Picture. Doppler effect, discussion of paradoxes.

*SJ 39.1 – 39.10*