

**UNIVERSITY OF MADRAS**  
**UG – NON-MAJOR ELECTIVE COURSE**  
**OFFERED IN THE DEPARTMENT OF PHYSICS**  
**SYLLABUS WITH EFFECT FROM 2020-2021**

**BPS-NME02**

**PHYSICS OF EVERYDAY LIFE**  
**(INTERDISCIPLINARY)**

Unit – I

**Art of Estimation and Fermi Problems:** The Fermi Rule- Guesstimation Techniques-Fermi problems in real life (Number of Popcorn vendors in Tamilnadu, Delhi, India; how many people in your town own red coloured cars etc)

Unit –II

**Understanding your Electric Bill:** Basics of electricity- Ohms law, power consumption, Joule heating-saving electricity-ways to minimize power consumption.

Unit – III

**Your Car, Refrigerator and Microwave oven:** Concept of temperature & electromagnetic waves - Conversion of Work into Heat vice versa-Heat Engines- Carnot's Cycle, Carnot engine & efficiency- Refrigerator-magnetron-design of microwave ovens.

Unit – IV

**Physics of digital memory devices:** Photoelectric effect-recording of audio and video-Operating principles of magnetic hard disk drive-Charge coupled device (CCD)- principle of CCD camera.

Unit – V

**Mobile communication and Global Positioning System (GPS):** Wire and wire-less communication- Common cellular networks components-Protocols. Fundamentals of GSM & CDMA Network, GSM & CDMA Frequency Band. GPS: Operating principles of GPS-Accuracy and errors in GPS navigation.

**Text Books:**

1. Fundamentals of Physics by D. Halliday, R. Resnick, J. Walker, John Wiley & Sons
2. Mobile Cellular Telecommunications: Analog and Digital Systems by William C. Y. Lee; Tata McGraw Hill Publication.
3. Wireless Communications: Principles and Practice by Theodore S. Rappaport; Pearson / PHI Publication.

**References:**

1. Wireless Communications and Networks: 3G and Beyond by Iti Saha Misra; Tata McGraw Hill Publication
2. Wireless and Digital Communications by Dr. Kamilo Feher; PHI Publication.
3. H. Labiod, H. A33, C. De Santis: WI-FI, BLUETOOTH, ZIGBEE and WIMAX Springer-2007.

**UNIVERSITY OF MADRAS**  
**UG – NON-MAJOR ELECTIVE**  
**COURSE OFFERED IN THE DEPARTMENT**  
**OF**

**BPS-NME03**

**COMPLEMENTARY PHYSICS – I**  
**(Science Students other than Physics)**

Unit-I

**Elasticity:** Stress- strain- Hooke's law- Elastic moduli- bending of beams-static torsion- torsion pendulum–cantilever(AFM), uniform and non-uniform bending, I section girder.

Unit-II

**Properties of Matter:** Surface tension - Molecular theory of surface tension - surface energy - excess pressure in a liquid drop, factors affecting surface tension – applications -Streamline and turbulent flow-Coefficient of viscosity-Brownian motion–Viscosity of gases.

Unit-III

**Electricity:** Voltage and current, Ohms law. Electric power (EB Bill)–transformer- generator.  
**Magnetism:** Electromagnetic induction-superconductivity-Meissner effect-Maglev train

Unit-IV

**Mobile communication and Global Positioning System (GPS):** Wire and wire-less communication- Common cellular networks components-Protocols. Fundamentals of GSM & CDMA Network, GSM & CDMA Frequency Band. GPS: Operating principles of GPS- Accuracy and errors in GPS navigation.

Unit -V

**Our Universe:** Galaxies- Stars, Planets & satellites – solar system, lunar and solar eclipses - blackholes. Artificial satellites: Geostationary and Polar satellites.

**Books for study:**

1. Elements of Properties of Matter, D.S Mathur, S.Chand & Co. (2010).
2. Fundamentals of Physics with Applications by Arthur Beiser
3. Electricity and Magnetism, AS Mahajan, AA Rangwala, McGraw Hill, New Delhi (2017).
4. Mobile Cellular Telecommunications: Analog and Digital Systems by William C.Y.Lee; Tata McGraw Hill Publication.
5. Wireless Communications: Principles and Practice by Theodore S. Rappaport ;Pearson/ PHI Publication.
6. An Introduction to Astrophysics, Baidyanath Basu ,Tanuka Chattopadhyay, sudhindra Nath Biswas, Second Edition(2010), PHI Learning Private Limited.

**UNIVERSITY OF MADRAS**  
**UG – NON-MAJOR ELECTIVE**  
**COURSE OFFERED IN THE DEPARTMENT**  
**OF**

**Books for reference:**

1. Mechanics (in SI units)-(Berkeley Physics course-volume1), Charles Kittel, Walter D knight etc, second edition Tata McGraw Hill publication, 2017.
2. Fundamentals of General Properties of Matter, H.R Gulati, R Chand and Co, Fifth edition (1977).
4. Electricity and Magnetism, EM. Purcell, David Morin (3<sup>rd</sup> Edition), Cambridge university press.
3. Wireless and Digital Communications by Dr. Kamilo Feher ; PHI Publication.
4. An Introduction to Astro Physics, Baidyanath Basu, Tanuka Chattopadhyay, sudhindra Nath Biswas, Second Edition (2010), PHI Learning Private Limited.
5. Physics of the universe, Hewish. A, CSIR publication, New Delhi, 1992.