

**DISCIPLINE SPECIFIC CORE COURSE**  
**DSC HH 412: Physical Science for Home Science**

**CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course(if any)
		Lecture	Tutorial	Practical/ Practice		
Physical Science for Home Science	4	2	0	2	XII Pass	Appeared in Communication Concepts and Theories

**Learning Objectives**

- To acquire knowledge of different compounds/substances and their importance
- To impart knowledge about various alternate energy sources
- To enhance their skills in handling different equipment

**Learning Outcomes**

After completing the course, students would be able to:

- Acquire the ability to correlate structures of different compounds/substances like biomolecules, polymers, surfactants and metals with their properties and functions
- Understand the basic principles of different analytical techniques and the equipment used
- Develop understanding of the basics of different physical phenomenon and their applications in day-to-day life
- Understand the basic concept of nanotechnology and green chemistry
- Understand the various renewable energies and need of energy conversion

**SYLLABUS OF DSC HH 412**

**THEORY**  
**(Credits 2; Hours 30)**

**Section A-Chemistry**

**UNIT I: Macromolecules, Dyes, surfactants and metals**

**12 Hours**

This unit highlights biomolecules, synthetic polymers, dyes, cleaning agents and metals

- Carbohydrates - Classification, structures and properties.
- Proteins – Amino acids (structures, classification and properties), and basic concepts of proteins structure
- Lipids – Classification, structures and properties of fatty acids, triacylglycerol and structural lipids
- Synthetic polymers – Classification, polymerisation, polymer morphology, general properties of polymers, (Examples - PE, PP, PVC, PET, PS, PTFE, Nylons), biodegradable polymers, compounding, recyclable plastics (Impact on environment and human health)

- Dyes – Classification of dyes, chemistry of dyeing, food colours, natural dyes
- Surfactants – Soaps and synthetic detergents (structure, cleansing action and their applications)
- Metals- Characteristics of metals and their alloys (iron, aluminium, copper, silver, steel), types of corrosion, tarnishing, prevention of corrosion

## **UNIT II: Introduction to Green chemistry**

**3 Hours**

This unit highlights the importance of Green chemistry

- Definition of green chemistry
- Need of green chemistry (Indiscriminate use of chemicals, fertilizers and pesticides)
- 12 principles of green Chemistry
- Important examples of green chemistry

## **Section B-Physics**

### **UNIT III: Renewable Energy and Electronics**

**9 Hours**

This unit highlights the importance of Renewable energy and basics of electronics

- Basics of Semi-Conductors and their applications in simple electronic devices.
- Light sources-Incandescent lamp, fluorescent tube, CFL, LED
- Renewable sources of energy: Wind energy, ocean energy, hydro energy, geothermal energy
- Solar Energy- Importance, photoelectric effect, storage, solar cooker, solar green houses, solar desalination, solar cell, need and characteristics of photo-voltaic (PV) systems

### **UNIT IV: Sound, Optics and Nanotechnology**

**6 Hours**

This unit highlights the introduction of nanotechnology, colour measurement, optics, sound and radio communication

- Spectrum of light, chromaticity and CIE chromaticity diagram, basics of spectrometry
- Basics of LASER and optical fibres
- Lenses-types of lenses, power measurement, defects and their remedies, applications in various instruments, photographic camera
- Introduction to nanotechnology, nano materials, properties and applications in different fields
- Basic knowledge of sound, echo, reverberations, acoustics of buildings
- Geostationary satellites, elementary knowledge of radio communication: AM and FM

### **PRACTICAL**

**(Credits 2; Hours 60)**

#### **1. Section A- Chemistry**

- Safe handling and disposal of chemicals generally used in chemical laboratories
- Experiments using Analytical techniques:
  - Separation of mixture of amino acids using paper chromatography and determination of  $R_f$  values
  - Estimation of proteins by Lowry's/ Biuret method
  - Determination of hardness of water by using complexometric titration
- Qualitative tests for carbohydrates
  - Monosaccharides
  - Disaccharides and polysaccharides
- Preparation of Osazones of monosaccharides and disaccharides
- Saponification of the given oil
- Preparation of biodiesel from vegetable oil preferably waste cooking oil.

- Preparation of nanoparticles of gold using tea leaves / silver nanoparticles using plant extracts

## 2. Section B- Physics

- Study of different types of experimental errors, their reporting and graphing techniques
- Determination of inner diameter, outer diameter and depth of beaker using Vernier Calliper
- Determination of area of cross section of glass rod and wire using Screw Gauge
- The use of Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses
- Study of the voltage and current of the solar cells in series and parallel combinations.
- Study of V-I & power curves of solar cells, and find maximum power point & efficiency of solar cell.
- Study of the application of solar cells to provide electrical energy to domestic appliances such as lamp, fan and radio.
- Electroplating of the given metal article with a superior metal and to determine the E.C.E.
- Determination of  $\lambda_{\text{max}}$  using colorimeter.
- Verification of Beer- Lambert law.
- To study/observe the effect of size on colour of nanomaterials.
- Study of different types of lenses and determination of power of a convex lens.

### Essential Readings

- Ahluwalia, V. K., Dhingra, S. and Gulati, A., 2005, College Practical Chemistry, University Press (India) Pvt. Ltd, India.
- Anastas, P.T. and Warner, J.C., 1998, Green Chemistry: Theory and Practice, Oxford University Press, U.S.A.
- Bahl, A. and Bahl, B.S., 2022, Advanced Organic Chemistry, (6<sup>th</sup> ed.), S. Chand and Sons, New Delhi.
- Beiser, A., Mahajan, S. and Choudhary, S.R., 2017, Concepts of Modern Physics, McGraw-Hill, India.
- Boyle, G., 2012, Renewable Energy, Power for a sustainable future (3<sup>rd</sup> ed.), Oxford University Press, U.S.A.
- Dua, A. and Manav, N., 2017, Practical Organic Chemistry, Manakin Press, New Delhi.
- Freedman, R.A., Young, H.D. and Ford, A.L., 2021, University Physics with modern physics (15<sup>th</sup> ed.), Pearson Education, India.
- Kulkarni, S. K., 2014, Nanotechnology: Principles & Practices (3<sup>rd</sup> ed.), Capital Publishing Company, New Delhi.
- Lancaster, M., 2016, Green Chemistry: An Introductory Text (2<sup>nd</sup> ed.), RSC Publishing, U.K.
- Poole, C.P., Frank, Jr. and Owens, J., 2003, Introduction to Nanotechnology (1<sup>st</sup> ed.), Wiley India Pvt. Ltd, India.
- Sharma, R.K., Sidhwani, I.T. and Chaudhari, M.K., 2013, Green Chemistry Experiments: A monograph, I.K. International Publishing House Pvt Ltd, New Delhi.
- Sukhatame, S.P. and Nayak, J. K., 2017, Solar energy, Tata McGraw - Hill Publishing Company Ltd., India.

### Suggested Readings:

- Chattopadhyay, K.K. and Banerjee, A. N., 2009, Introduction to Nanoscience and Technology, PHI Learning Private Limited, New Delhi.
- Flint, B.L. and Worsnop, H.T., 1971, Advanced Practical Physics for students, Asia Publishing House, India.
- Jacob, T., 1979, Textbook of Applied Chemistry, McMillan India Ltd., Noida.

- Khandelwal, D. P., 1985, A Laboratory Manual of Physics for Undergraduate Classes, Vani Publication, New Delhi.
- Morrison, R.T., Boyd, R. N. and Bhattacharjee, S.K., 2021, Organic Chemistry (7<sup>th</sup> ed.), Pearson Education, New Delhi.
- Sharma, S.P., 2003, Basic Radio and Television (2<sup>nd</sup> ed.), Tata McGraw Hill, India.
- Singh, H., 2001, B.Sc. Practical Physics, S. Chand and Co., New Delhi.
- Solomon, T.W., 2017, Organic Chemistry (12<sup>th</sup> ed.), John Wiley & Sons, U.S.A.
- Vogel, 2009, Quantitative Chemical analysis, Pearson Education, New Delhi.
- Walker, J., Resnick, R., and Halliday, D., 2013, Fundamentals of Physics, Wiley, U.S.A.

**Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**