



Avinashilingam Institute for Home Science and Higher Education for Women

(Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD)
Re-accredited with A++ Grade by NAAC, CGPA 3.65/4, Category I by UGC
Coimbatore - 641 043, Tamil Nadu, India

Department of Zoology

Name of the Scholar : Gayathri S

Roll No: 21PHZOP001

Name of the Supervisor : Dr K S Santhy

21PHZO03D-Nano Science and Applications

(Applicable for Ph.D. Part- Time scholar admitted in January 2022)

Unit I: Synthesis of Nano Materials

20 Hrs

Introduction to Nanotechnology, Bulk Synthesis-Top-down and bottom-up approaches – Physical approaches-Ball milling- Inert gas condensation technique – Arc plasma and laser ablation, Chemical Approaches- Sol gel processing-Solvothermal, hydrothermal, precipitation, Spray pyrolysis, Electro spraying and spin coating routes, Self-assembly, Self- Assembled Monolayers (SAMs), Biological – Microbial, Algae, Plant extracts as reducing agents.

Unit II: Advanced characterization methods for nanomaterials

20 Hrs

Quantum wells, wires and dots – Size and dimensionality effects. Nanorods, nanowires, nanotubes, and nanofibers, Metal-based nanomaterials, Particle size measurement- Optical Microscopy – Field Emission Scanning Electron Microscopy (FESEM) – Transmission Electron Microscopy (TEM) - UV-Vis spectrophotometry – FTIR- Raman spectra- Dynamic Light scattering (DLS)- Zeta Potential-Diffraction topography- Fluorescence spectrometer- Confocal microscopy.

Unit III: Phytochemical analysis, Extraction and Chromatographic Techniques

20 Hrs

Phytochemical analysis of extracts- Extraction techniques: Refluxing, Soxhlet, Ultrasonic, Microwave. Chromatographic techniques: Paper chromatography, thin layer chromatography, High-performance liquid chromatography, High-performance thin layer chromatography, Gas chromatography, Affinity chromatography, Ion exchange chromatography.

Unit IV: Topical Formulation

20 Hrs

Classification and types, Preparation and stability of ointments - Trituration fusion chemical reaction, Emulsification. Pastes: Differences between ointments and pastes, Preparation of pastes and their preservation, Mechanism of topical formulation and evaluation. Ointments: Types of ointments, classification and selection of dermatological vehicles, Characterization of Formulation, Guidelines for topical formulation.

Unit V: Applications

15 Hrs

Nano Medicine - Approach to developing Nano medicines- Nano carriers, Binding mechanism, Diagnostic applications - Medicinal use: Wound healing applications, pharmaceutical application: Industrial application, Agricultural application.

References

- Rakesh, R. (2007). Core Concept of Nanotechnology with Application spectrum. SBS Publishers and Distributors.
- Jenny, P.G., and Kenneth, N.T. (2010). Crystal Structure Analysis -3rd edition. Oxford University Press, New York.
- Sarfaraz, K.N. (2013). Handbook of Pharmaceutical Manufacturing Formulations Semisolid Products. Vol.4, 2nd edition, CRC Press.
- Charles, P.P., and Frank, O.J. (2006). Owens John, Introduction to Nanotechnology. Wiley and sons INC.
- Heather, S. (2011). Molecular Biology Techniques: A Classroom Laboratory Manual, Elsevier. Academic Press, USA.
- Shah, M. A., and Shah, K. A. (2003). Nano technology the science of small. Wiley India Pvt Ltd.
- Harbone, J. B. (1998). Phytochemical Methods: A guide to modern techniques of plant analysis. 3rd edition.
- Wilson and Walker (2018). Principles and Techniques of Biochemistry and Molecular Biology. 8 th edition, Cambridge University Press, New York.
- David, W., Osborne., and Anton, H.A. (1989). Topical Drug Delivery Formulations. 1st edition, Vol.42.
- Trends and Formulation Strategies for Topical Drugs (2018). BASF PharmaSolutions.

Course Outcomes:

1. Acquire knowledge on the extraction, isolation and purification of phytoconstituents
2. Gain knowledge in nanoparticles synthesis, characterization and its uses
3. Attain knowledge on the applications of nanotechnology