SRINIVAS UNIVERSITY

Mukka, Mangaluru – 574146

Web : www.srinivasuniversity.ac.in

[In compliance of University Grants Commission (MinimumStandards and Procedures for Award of Ph.D. Degree) Regulations, 2022]

COURSEWORK SYLLABUS OF
Ph.D. PROGRAMME IN
CHEMISTRY

INSTITUTE OF ENGNEERING AND TECHNOLOGY
SRINIVAS UNIVERSITY
Mukka Mangaluru – 574146.

A. COURSE WORK PATTERN **400 M**

Sl. No.	Subjects	Credits	Internal Marks	External Marks	Marks
1	Research Methodology (22SPHDRM001)	4	50	50	100
2	Electrochemistry and Techniques (22SPHDCHE02)	4	50	50	100
3	Analysis And Presentation Of Proposed Research Topic (22SPHDPUB003)	4	50	50	100
4	Review Of Literature (22SPHDPUB004)	4	50	50	100
Total		**16**	**200**	**200**	**400**

COURSE WORK SYLLABUS

1. RESEARCH METHODOLOGY
(22SPHDRM001)

Module-1

Meaning, Objectives and Characteristics of research - Research methods Vs Methodology - Types of research - Descriptive Vs. Analytical, Applied Vs. Fundamental, Quantitative Vs. Qualitative, Conceptual Vs. Empirical - Research process - Criteria of good research - Developing a research plan. Defining the research problem - Selecting the problem - Necessity of defining the problem -Techniques involved in defining the problem - Importance of literature review in defining a problem - Survey of literature - Primary and secondary sources – Development of working hypothesis.

Module -2

Research design and methods – Research design – Basic Principles- Need of research design – – Features of good design – Important concepts relating to research design – Observation and Facts, Laws and Theories, Prediction and explanation, Induction, Deduction, Development of Models - Developing a research plan - Exploration, Description, Diagnosis, and Experimentation- Determining experimental and sample designs.

Module -3

Sampling design - Steps in sampling design - Characteristics of a good sample design - Types of sample designs - Measurement and scaling techniques - Methods of data collection – Collection of primary data - Data collection instruments Testing of hypotheses - Basic concepts - Procedure for hypotheses testing flow diagram for hypotheses testing - Data analysis with Statistical Packages – Correlation and Regression - Important parametric test - Chi-square test - Analysis of variance and Covariance

Module -4

Data Analysis using MS Excel Introduction to Spreadsheets Spreadsheet Functions to Organize Data, Introduction to Filtering, Pivot Tables, and Charts, Advanced Graphing and Charting. Interpretation and report writing - Techniques of interpretation - Structure and components of scientific reports - Different steps in the preparation - Layout, structure and language of the report - Illustrations and tables - Types of report - Technical reports and thesis

Module-5

Ethics in Research: Importance, Principles, Developing a code of ethics, Ethics and Respondents, Ethics and Clients, Ethics and research firm. Plagiarism. Patent and Copyrights

REFERENCES:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2021. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 2015. Research Methodology: Methods and Techniques. New Age International. 418p. 3. Anderson, T. W., An Introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt., Ltd., New Delhi
4. Sinha, S.C. and Dhiman, A.K., 2012. Research Methodology, EssEss Publications. 2 volumes. se knowledge base, Atomic Dog Publishing.
5. Trochim, W.M.K., 2015. Research Methods: the conci 270p.
6. Fink, A., 2019. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications
7. Intellectual Property Rights in the Global Economy: Keith Eugene Maskus, Institute for International Economics, Washington, DC, 2019

8. Subbarau NR Handbook on Intellectual Property Law and Practice Publishing Private Limited.2008 S Viswanathan Printers
9. Research Methodology, Shashi k Gupta and Praneet Rangi. Kalyani Publishers, 6th edition

ELECTROCHEMISTRY AND TECHNIQUES (22SPHDCHE02)

Module -1:

Electrochemistry: Introduction, Derivation of Nernst equation for electrode potential. Reference electrodes: Introduction, construction, working and applications of calomel and Ag / AgCl electrodes. Measurement of electrode potential using calomel electrode. Ion selective electrode: Introduction; Construction and working of glass electrode, determination of pH using glass electrode. Concentration cells: Electrolyte concentration cells, numerical problems.

Module -2:

Electronic Properties and Band Theory: Metals, insulators and semiconductors, electronic structure of solids-band theory, band structure of metals, insulators and semiconductors. Intrinsic and extrinsic semiconductors, doping semiconductors, p-n junctions, super conductors. Optical properties- Optical reflectance, photoconduction. Magnetic Properties-Classification of materials: quantum theory of paramagnetic cooperative phenomena-magnetic domains, hysteresis.

Module -3:

Electrode Kinetics: Metal/solution interface- Dependence of electrochemical reaction rate on over potential-current density for single step and multi-step processes-Influence of electrical double layer on rate constants. Activation and diffusion controlled processes- Marcus kinetics and quadratic dependence of Gibbs free energies-electron transfer processes involving organic and inorganic compounds. Different types of over potentials- polarization behaviour. Mechanism of hydrogen evolution and oxygen reduction in acid and alkaline media. Experimental methods for elucidation of reaction mechanism.

Module -4:

Metal Finishing: Introduction, Technological importance. Electroplating: Introduction, principles governing-Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal ion & electrolyte; pH, temperature & throwing power of plating bath; additives- brighteners, levellers, structure modifiers & wetting agents. Electroplating of Nickel (Watt's Bath) and Chromium (decorative and hard). Electro less plating: Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.

Module-5:

Electrochemical Techniques: Polarography; Chronopotentiometry; Chronoamperometry, Chronocoulometry, Linear Potential Sweep Voltammetry; Cyclic Voltammetry, Impedance measurements; AC Voltammetry.

REFERENCES:

1. B.S.Jai Prakash, R.Venugopal, Sivakumaraiah&PushpaIyengar., "Chemistry for Engineering Students", Subhash Publications, Bangalore. 2021
2. R.V.Gadag&A.Nityananda Shetty., "Engineering Chemistry", I K International Publishing House Private Ltd. New Delhi. 2021
3. P.C.Jain& Monica Jain., "Engineering Chemistry", DhanpatRai Publications, New Delhi.
4. A. J. Bard and L. R. Faulkner, Electrochemical Methods: Fundamentals and Applications, 2nd Ed., John Wiley & Sons, New York, 2001. ISBN: 0-471-04372-9.
5. Gurdeep and Rajesh : Thermodynamics, Goel Publishing House, Meerut.
6. Barrow G M : Physical Chemistry, 5th Ed, Mcgraw Hill Co. (1968).
7. Chemical Kinetics and Dynamics; Jeffrey I Steinfeld, Joseph S. Francisco and William L. Hase. Prentice Hall, 2nd edition, 1998.

8. Laidler, K. J.; “Chemical Kinetics", 3rd Edition 1997 , Benjamin-Cummings. Indian reprint - Pearson 2009.

3.ANALYSIS AND PRESENTATION OF PROPOSED RESEARCH TOPIC (22SPHDPUB003)

The candidates should publish the proposed work in the conference abstract book/ proceedings/ Journal.

Article quality and its presentation carries 50% weightage as internal marks and final end exam carries 50% weightage.

Exam descriptive. Questions will be general. Answers can be in relation to his/her published

4. REVIEW OF LITERATURE (22SPHDPUB004)

The candidate should publish the review article of his/her proposed work and they should submit the proof of published paper. Review article quality and its presentation carries 50% weightage as internal marks and final end exam carries 50% weightage.
Exam Descriptive. Questions will be General. Answers can be in relation to the published review paper.

NOTE:
IA Components

DDLR completion certificate
One MOOCs/Online certificate on Research methodology
One review paper with ISSN No (Connected to fourth paper of coursework)
One paper presented in conference – Proof (Connected to third paper)
Assignment for Second paper (given by the Guide or Coordinator)
Assignment for first paper (given by the Guide or Coordinator)