



JAI HIND COLLEGE

Basantsing Institute of Science & J. T. Lalvani College of Commerce.

And Sheila Gopal Raheja College of Management

Affiliated to University of Mumbai

Autonomous

Masters of Science (M.Sc in Physical Chemistry)

Semester I

Course Code: PSCHE101	Course title: Physical Chemistry I V
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Learning Objectives:

1. To make them understand the concept thermodynamics.
2. To make the Understand the concept of Quantum chemistry and Chemical kinetics.
3. To help them recognize the concept of Electrochemistry.

Learning Outcomes:

1. explain concept of thermodynamics, Quantum chemistry, Chemical kinetics and electrochemistry
2. solve numerical of thermodynamics, Quantum chemistry, Chemical kinetics and electrochemistry.
3. recognize the concept of Electrochemistry.

Semester I

Course Code: PSCHEPR101	Course Title: Physical Chemistry Practical I
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Learning Objectives:

1. To help them apply theoretical concepts of thermodynamics, electrochemistry in determination of heat of solutions, solubility products, mean ionic activity and effect of substituent on dissociation constant.
2. To make them understand the concept of Ostwald's dilutions law.
3. To make them explain plotting of graph of mathematical function.

Learning Outcomes:

1. determine heat of solutions, solubility products, mean ionic activity and effect of substituents on dissociation constant.
2. plot graph of mathematical function.
3. determine dissociation constant of a weak mono-basic acid conductometrically.

Semester II

Course Code: PSCHE201	Course Title: Physical Chemistry II
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Learning Objectives:

1. To understand the advanced concept of thermodynamics.
2. To Understand the advanced concept of Quantum chemistry and Chemical kinetics.
3. To help them recognize the concept of solid state and phase rule.

Learning Outcomes:

1. explain concepts of thermodynamics, Quantum chemistry, Chemical kinetics and solid state and phase rule.
2. solve numerical thermodynamics, Quantum chemistry, Chemical kinetics and solid state and phase rule.
3. recognize the concept of solid state and phase rule.

Semester II

Course Code: PSCHEPR201	Course title: Physical Chemistry Practical II
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Learning Objectives:

1. To inculcate aptitude for experimentation and treatment of data in learners.
2. To recapitulate the theory of the ionic strength, phase rule, chemical kinetics for experimental determinations.
3. To train them to apply static method for determination of empirical formula of the Complex.

Learning Outcomes:

1. determine polar plots of atomic orbitals of hydrogen atom.
2. develop knowledge in finding rate constant of decomposition reaction.
3. draw phase rule diagram for three component system.

Semester III

Course Code: PSCHE1301	Course Title: Thermodynamics, Electrochemistry & Polymers
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Learning Objectives:

1. To understand statistical thermodynamics.
2. To acquaint theory and derivation of electrochemistry.
3. To understand different characterization techniques of polymers.

Learning Outcomes:

1. describe the derivations and concept of statistical thermodynamics.
2. discuss the theory and derivation of electrochemistry.
3. identify different characterization techniques of polymers.

Semester III

Course Code: PSCHEP1301	Course Title: Practical Coursework I
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Learning Objectives:

To equip the students with practical skills in instrumental .
To train them with non-instrumental methods of analysis.
To train them with precaution of instrumentation.

Learning Outcomes:

acquire laboratory skills in calibration
use of instruments for chemical analysis
design experiments for instrumental and non-instrumental assays.

Semester III

Course Code: PSCHE1302	Course Title: Atomic, Molecular Structure & Spectroscopy
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Learning Objectives:

1. To understand the advantages of approximation methods for solving complex problems.
2. To explain bonding in simple molecules with Valence bond theory, Molecular orbital theory
3. To understand the principles and theories of rotational, vibrational Raman, ESR, Mossbauer and NQR spectroscopy.

Learning Outcomes:

1. apply approximation methods for solving complex problems.
2. describe bonding in simple molecules using MOT and VBT.
3. interpret rotational, vibrational Raman, ESR, Mossbauer and NQR spectra of different molecules.

Semester III

Course Code: PSCHEP1302	Course Title: Practical Coursework II
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Learning Objectives: To equip the students with practical skills in synthesis.
To train them with characterisation of coordination compounds
To sensitize them with chemical waste.

Learning Outcomes:

Apply laboratory skills in the synthesis of coordination complexes.
characterize using instrumental methods.
Formulate compound based on coordination complex

Semester III

Course Code : PSCHEP1302	Course Title: Practical Coursework II
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Learning Objectives:

To equip the students with practical skills in synthesis of coordination compound

To train them with characterisation of coordination compounds

To help them types of coordination compound

Learning Outcomes:

acquire laboratory skills in the synthesis of coordination complexes.

characterize using instrumental methods.

Solve problems in synthesis method of coordination compound

Semester III

Course Code: PSCHE1303	Course Title: Nanochemistry and Nanotechnology
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Objectives:

1. To understand various chemical and physical methods for the synthesis of diverse types of nanomaterials (0D, 1D and 2D).
2. To establish various characterization techniques for nanomaterials
3. To introduce different application of nanotechnology in the field of energy.

Outcomes:

1 explain the synthesis of metal nanoparticles.

2. assess physical properties of materials and make decision on their application in energy conversion devices.

3.describe the principles of Scanning Electron Microscope (SEM) and its use in characterizing nanoparticles.

Semester III

Course Code: PSCHEP1303	Course Title: Research Methodology
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Learning Objectives:

1. To understand a general definition of research design.
2. To familiar with how to write a good introduction to educational research study.
3. To make them help with the components that comprise such an introduction.

Learning Outcomes:

1. identify a research problem stated in a study.
2. distinguish a purpose statement, a research question or hypothesis and a research objective.
3. Differentiate the components that comprise research design.

Semester III

Course Code: PSCHE1304	Course Title: Application of Materials & Nuclear Chemistry
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Learning Objectives:

- 1.To understand advanced concept of Metals and alloys.
- 2.To introduce the mechanical properties of solid materials.
- 3.To introduce the concept, working and application of lasers.

Learning Outcomes:

1. explain the growth of single crystal, defect and atomic diffusion in solids.
2. identify mechanical properties of solid materials.
3. classify different laser and its application in Chemistry.

Semester III

Course Course: PSCHEP1304	Course Title: Literature Review
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Learning Objectives:

1. To understand the existing research and debates relevant to a particular topic or area of study.
2. To make them learn knowledge in the form of a written report.
3. To help them to analyse reports on research

Learning Outcomes:

1. review and conclude its finding of research
2. Use reports to frame problem statement
3. Frame and evaluate the report.

Semester IV

Course Code: PSCHE1 401	Course Title: Thermodynamics, Surface and Biophysical
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Learning Objectives:

1. To introduce the concept and phenomena of irreversible thermodynamics.
2. To understand the application of different voltametric methods.
3. To explain the advanced concept of surface and interfacial chemistry.

Learning Outcomes:

1. describe the Onsager's reciprocal relation and verify the Onsager relation.
2. illustrate the application of Cyclic voltammetry in organic synthesis.
3. summarise the concept of surface and interfacial chemistry.

Semester IV

Course Code: PSCHEP1401	Course Title: Practical Coursework III
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Learning Objectives:

1. To help them to solve problems in chemistry through experiments.
2. To train them with practicals\
3. To help them to analyse practicals

Learning Outcomes

1. design experiments.
2. perform experimental skills to solve problems in chemistry
3. Analyse the results of experiments.

Semester IV

Course Code: PSCHE1402	Course Title: Solid State Chemistry
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Learning Objectives:

1. To understand the Structure, properties and Synthesis of solids.
2. To understand the crystal defects and non-stoichiometry.
3. To introduce the Electrical and Magnetic Properties of solids.

Learning Outcomes:

1. distinguish between different structure of solids and various method to synthesize it.
2. identify different type of defects and its applications.
3. describe the electrical, magnetic, thermal and optical properties of solid.

Semester IV

Course Code : PSCHEP1402	Course Title: Practical Coursework IV
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Learning Objectives:

1. To evaluate commercial samples, ores and alloys for their percentage assay
2. To help them tounderstand quality control
3. t o mak ethem aware about importance of understanding errors on measurement

Learning Outcomes:

1. test quality control procedures,
2. Analyse errors in measurement
3. Comparison data comparison standards.

Semester IV

Course Code: PSCHE1403	Course Title: Photochemistry and Advanced Spectroscopy
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Learning Objectives:

1. To introduce the concept of Photochemistry & Photocatalysis.
2. To understand the principal and application of fluorescence phenomena.
3. To describe the principal, instrumentation and applications of advanced Spectroscopic Techniques-I& II.

Learning Outcomes:

1. apply the principles of Photochemistry & Photocatalysis in water splitting, CO₂ reductions etc.
2. describe the phenomena and mechanism of fluorescence quenching.
3. elucidate the structure of molecules applying advanced Spectroscopic Techniques-I & II.

Semester IV

Course: PSCHEP1403	Spectral Interpretation
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Learning Objectives:

1. To elucidate structural information about molecules from their spectral data.
2. To make them analyze spectral data.
3. to help them understand about structures of molecules.

Learning Outcomes:

interpret of UV/IR/NMR/Mass/XRD spectra and its analysis
Draw graph based on spectral data
Evaluate structural data .

Semester IV

Course: PSCHE1404	Materials, Devices and Computational Chemistry
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Learning Objectives:

1. To describe different photovoltaic cells and its applications in batteries and supercapacitors.
2. To introduce the concept of organic semiconductors, optoelectronic devices.
3. To introduce the of Intellectual Property Rights & Cheminformatics.

Learning Outcomes:

1. identify different type photovoltaic cells and its applications in batteries and supercapacitors.
2. explain the working of organic semiconductors, optoelectronic devices.
3. describe Intellectual Property Rights & Cheminformatics.

Semester IV

Course Code: PSCHEP1404	Course Title: Research Project
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Learning Objectives:

1. To train them with research problem
2. To help them to investigate research problems
3. To train them to perform experiments through project.

Learning Outcomes:

1. Design research workflow- literature review.
2. identify research problem and investigation.
3. Solve problems in research

