



**FACULTY COUNCIL OF SCIENCE
JADAVPUR UNIVERSITY**

NOTICE

It is to notify for information of all concerned that the classes of Ph.D. Course Work for the year 2019 under the **Department of Geological Scs.** will commence from Thursday, the 1st of August 2019 in the respective department. All registered candidates who are willing to do Ph.D. course work under the said Department are requested to submit Ph.D. Course registration form duly forwarded by the concerned Supervisor(s) and HoD of the respective Department to the Office of the undersigned within Monday, the 29th of July 2019.

The course work registration form and the modules of course work are annexed in the consecutive pages.

Date: 08/07/2019

Sd/-

**(Dr. Atiskumar Chattopadhyay)
Principal Secretary,
Faculty Council of Science**



যাদবপুর বিশ্ববিদ্যালয়

JADAVPUR UNIVERSITY
KOLKATA-700 032

FORM FOR COURSE REGISTRATION FOR PH.D.SCHOLARS
(UNDER F.E.T./F.SC./F.A.)

DEPARTMENT/SCHOOL/INSTITUTION : **GEOLOGICAL SCS.**
(in which registered for Ph.D.)

(ENROLMENT FOR SEMESTER: JULY/DECEMBER, JANUARY/JUNE)

1. Name in full (in Block letters) : _____
2. Sex(Male/Female) : _____
3. Address for Communication: _____

4. Phone No. _____ Mobile No. _____
5. Course Taken:

Sl.No.	Name of Subject/course	Subject Code	Dept./School/Institution under which subject offered
1.	Research Methodology	A	
2.	Review of Research Work	B	
3.			
4.			
5.			
6.			

Date: _____

Signature of the student in full

Head of the Department/Director of School

Supervisor(s)

Signature of the Dean, Faculty of Science

Registration No. _____ of _____

Date of Registration _____

Superintendent, Ph.D. Cell, Faculty of Science

**MODULES / SUBJECTS OFFERED FOR PH.D.COURSE
WORK UNDER DEPARTMENT OF GEOLOGICAL SCS.**

FOR THE SESSION 2019 -2020

Courses	Subject	Full Marls
Compulsory Units	A. Research Methodology	50
	B. Review of Research Work	50
Elective Units	04. Geodynamics	50
	05. Petrography in Structural Geology	50
	09. Textural modeling -- a tool for petrogenesis of igneous and Metamorphic rocks.	50
	10. SEDEX process with particular emphasis on Fe-Mn ore deposits.	50
	11. Reading seminar in the subject of ore deposits related to igneous Systems.	50
	12. Platinum group of elements: a key tracer of Earth's interior	50
	13. Basic techniques of numerical modeling in Structural Geology and Tectonics	50
	14. Use of Meso- and Micro-scale structures in structural analysis.	50
	15. Carbonates through ages – its physical, chemical & biological perspectives	50
	16. Sequence stratigraphy in the light of basin evolution	50
	17. Geochemistry of hydrothermal ore deposits – theoretical & practical aspects	50
	18. Ground Water Quality, Management and Environmental Impact	50
	19. Advanced Structural Geology	50
	20. Environmental Micropaleontology	50
	20. Shear zone pattern and granite emplacement	
	22. Geochemistry of Groundwater and Deterioration of Groundwater Quality	50
	23. Geomorphology and Quaternary Stratigraphy	50
	24. Magnetic Behaviors of Natural Materials	50
	25. Geophysical Experiments in Magnetism	50
	26. Environmental Geo-technology	50
27. Fluvial Hydraulics and Sediment Transport	50	

N.B. : Students to opt for any 2 elective units out of the elective units offered. See the successive pages for the modules in detail.

COMPULSORY UNITS

A. Research Methodology:

Definition of problem : Necessity of defining problem, Technique involved in defining a problem. Surveying the available literature.

Techniques involved in solving the problem: Different methods used to solve a problem.

Research Design: Subject of study; Place of study; Reason of such study; Type of data required; Method of data collection; Periods of study; Style of data presentation.

Developing a research plan: Research objective; Informations required for solving the problem; Each major concept should be defined in operational terms; An overall description of the approach should be given and assumption if considered should be clearly mentioned in research plan; The details of techniques to be adopted.

Methods of data collection: Experimental methods.

Analysis of data: Various measures of relationship often used in research studies, Correlation coefficients.

Chi-Square test: Definition of chi-square test. Significance in Statistical analysis.

Computer:

Basic of Computer Operating System: Using Windows – Directory structures – command structure (Document preparation, EXCEL, Power Point Presentation).

Word Processing: Basics of Editing and Word processing.

Numerical analysis.

Figure Plotting: Figure insertions in documents.

Web Browsing for Research: Usage of Webs as a tool for scientific literature survey.

Error Analysis: Basics of a measurement and its interpretation, mean, standard deviation, variance, correlation coefficient; Usage of packages (e.g. ORIGIN; EXCEL) for data analysis.

Curve Fitting: Linear and Non-linear fitting of data.

B. **Review of Research Work:**

The relevance of the research work from the perspective of the subject – Possible ways to apply the research work in future.

ELECTIVE UNITS

UNIT No. 04: Geodynamics:

Earth's lithosphere, Physical properties of Mantle rocks and minerals, Thermo-mechanical Instability of the Mantle, Gravity driven Geodynamic processes, Core Dynamics.

UNIT NO. 05: Petrography in Structural Geology:

Preparation of Petrographic thin sections, Analysis of Tectonic Fabric, Analysis of micro-scale structure, Deformation Mechanism, Relation between Deformation and Crystallization, Shear zone Rocks.

UNIT No. 09: Textural modeling ----- a tool for petrogenesis of igneous and Metamorphic rocks.:

Classical and advanced Techniques for Textural Analysis, Nucleation and growth of materials in Magmatic and Metamorphic Systems, Role of deformation on formation of Texture, Equilibrium and non-equilibrium textures and their Significance, modeling igneous and metamorphic textures to recover p-T-t history of rocks and melts.

UNIT No. 10: SEDEX process with particular emphasis on Fe-Mn ore deposits:

Definition, Type of deposit and classification, Factors controlling the process, Genetic Model, Sources of elements, Specific examples.

UNIT No. 11: Reading seminar in the subject of ore deposits related to igneous Systems:

The participants will read some key and fundamental papers in the subject of ore deposits related to igneous system, especially in the field of chromite, platinum group elements (PGE) and Ni-Cu-sulfide deposits. The course will focus on extensive reading of scientific articles plus discussion to have a deeper understanding of the crystal-melt equilibria that controls fundamental processes of magmatic ore deposits.

UNIT No. 12: Platinum group of elements: a key tracer of Earth's interior:

Geochemistry of noble metals (Os, Ir, Rh, Ru, Pt, Pd and Re) provides unique clues to the early origins of our planet. How noble metals are distributed within the Earth is the subject of intense debate. The relative effects of different processes can be assessed using PGE-patterns as well as Os isotopic systematics of the mantle materials. In this particular course basic geochemical characters of the PGEs; their fractionation, and the fundamental processes involved in the fractionation will be discussed. In addition, the use of PGE geochemistry to understand the chemical evolution of the Earth's mantle will be a significant component of this course.

UNIT No. 13: Basic techniques of numerical modeling in Structural Geology and Tectonics:

Fundamental Concept and basis of Numerical Modeling, Physical theories of Geological situations and Modeling Equations, mathematical and Numerical Techniques, Use of different softwares like MS Excel, Visual Basic, Ansys for Numerical Modeling.

UNIT No. 14: Use of Meso- and Micro-scale structures in structural analysis :

Identification of different small scale geological structures in outcrop and under microscope, Collection of data, plotting of structural elements, Basis of analysis, Process of reconstruction of evolutionary history.

UNIT No 15: Carbonates through ages – its physical, chemical & biological perspectives :

Distribution and distinction of carbonate deposits in rock record. Distinctions between Precambrian and Phanerozoic Carbonate deposit. Physico-chemical and biological control on carbonate deposition in Precambrian and Phanerozoic sequence. Isotopic signatures of carbonate deposits.

UNIT No. 16: Sequence stratigraphy in the light of basin evolution :

Understanding basin forming processes and basin architecture. Stratigraphic Signature of a basin: Sea level change, Basin-floor wobbling, Sedimentation rate and climate. Depositional facies, Seismic Facies Seismic Expression & Configuration and log-based Sequence, Correlation Sequence, Stratigraphic Principles & Facies Tracts Carbonate Sequence Stratigraphy and Drowning Unconformity. Application of sequence stratigraphy to basin evolution

UNIT No 17: Geochemistry of hydrothermal ore deposits – theoretical & practical aspects:

Sources of hydrothermal components (metals, fluids); Hydrothermal alteration and ore mineralization; Metal transport by hydrothermal fluids; Stable isotope systematic of hydrothermal ore minerals and gangue minerals; Fluid inclusions studies of hydrothermal ore deposits; Microthermometric freezing-heating experiments of fluid inclusions.

UNIT No 18: Ground Water Quality, Management and Environmental Impact

Introduction; Hydrogeochemistry; Groundwater Pollution; Groundwater Provinces; Environmental Impact Analysis; Artificial Recharge, Monitoring and Assessment; Groundwater Management; Rural Water Supply.

UNIT No 19: Advanced Structural Geology

Rock mechanics; Experimental rock deformation tests and failure criteria; Ductile and Brittle rock deformation, Paleostress analysis; Role of fluids in deformation; Advanced techniques in structural geology.

UNIT No 20: Environmental Micropaleontology

History of micropaleontology and its position in the context of the natural sciences; Overview of the systematic; Biology and ecology of major microfossil groups including foraminifera, radiolarians; Diatoms; Dinoflagellates; Calcareous nannofossils and acritarchs; Detailed study of foraminifera-preparation and research techniques; Taphonomic aspects; Applications to palaeoecology; Environmental monitoring and palaeo-oceanography, Geochemistry of tests and transfer function; Distribution in polar regions and mangroves their stratigraphic significance.

UNIT No 21: Shear zone pattern and granite emplacement

Types of Shear zone pattern; Mechanism of granite emplacement in both compression and extensional regime of a shear zone; Distinguishing field and microscopic features of granite emplacement in relation to the formation of different shear zones.

UNIT No 22: Geochemistry of Groundwater and Deterioration of Groundwater Quality

Expression of groundwater quality – Graphical treatment (Collins, Stiff, Hem, Piper, Gibbs and Schoeller) – Hydrochemical facies – Correlating geochemical sequence and hydrological condition – Geogenics (AS, F and heavy metals) and anthropogenic groundwater contamination – Mitigation processes – Interaction of saline and fresh water – Ghyben-Herzberg relation – Saltwater interface in a layer coarser aquifers – Upcoming of saltwater in coastal aquifer.

UNIT No 23: Geomorphology and Quaternary Stratigraphy:

Principles of sedimentation and quaternary stratigraphy; Quaternary land form and geologic events; Process of interflow; Principle of multiphase flow and diffusion; Land use and influence of water yield, quality, stream regimen; Environment of aquifer system and data interpretation on fluvial and fluvio-deltaic and coastal aquifers.

UNIT No 24: Magnetic Behaviors of Natural Materials:

A brief review of Magnetic Remanence; Magnetic Mineralogy, Oxidation Stages of FE-Ti oxides, Magnetic characters of iron-sulphides; Occurrences and alteration of FE-Ti oxides in Igneous, Sedimentary, and Metamorphic rocks; Magneto-mineralogical characters of Soils, Fly-ash and road dust particles.

UNIT No 25: Geophysical Experiments in Magnetism

Rock magnetic measurements; Initial Magnetic Susceptibility Study; High-Field Measurements; High- and Low- Temperature Measurements; IRM Measurements; NRM Measurements; Magnetic Cleaning Techniques.

UNIT No 26: Environmental Geo-technology

Constituting materials of the Earth's surface, Solids-Water and interrelationship, Classification of soils, Soil structure and clay mineralogy, Principles of effective stress, capillarity, porosity and permeability, Stress history of sediment compaction and consolidation, Indexing mechanical properties of rocks and soil and their influences on slope failure and bank erosion.

UNIT No 27: Fluvial Hydraulics and Sediment Transport

Physical properties of fluid and sediment; Hydrodynamic principles and processes; Turbulence in open-channel flows; Concepts of velocity distribution and turbulence intensity; Bed shear stress and sediment threshold-velocity concept; Fluvial Processes and bed forms; Meandering and Braiding, Scour at hydraulic structure-pier, abutment and contraction scour, Scour depth predictions, Dimensional analysis and synthesis of experimental data.