

Semester VII

Major – 16 (MJ - 16) ORE GEOLOGY

Credit – 4

EM= 100

Lectures – 60 Hours

T= 100 {75Ext. +25 Int.}

Instructions:

- There will be two groups of questions. **Group A** is compulsory which will contain **three** questions.
- **Question no. 1** will be **very short answer type** consisting of **five questions of 1 mark each**.
- **Question no. 2 & 3** will be of **short answer type** of **5 marks each**.
- **Group B** will contain **descriptive type six questions of 15 marks each**, out of which **any four** are to answer.

Course objective:

The primary objective of the course is

- to introduce fundamental aspects of ore forming processes in time and space, factors controlling the ore formation;
- to understand about the role of minerals in the national economy, spatial relationship between magnetism, sedimentation, metamorphism and ore formation

Learning outcomes:

After successfully completing this course, the students will be able to:

- On completion of the course the students are expected to gain knowledge of the various processes involved in the formation of economically important mineral deposits;
- to locate the mineral deposits; distribution of Indian mineral deposits, national mineral policy & develop skills to face the current challenges in the non-renewable mineral resources.

Skills to be Learned:

- To know the basic concepts of the ore forming processes in time and space, factors controlling the ore formation;
- to locate the mineral deposits & develop skills to face the current challenges in the non-renewable mineral resources.

COURSE CONTENT:

Unit	Topic	Total no. of Lectures
Unit 1: Ore deposits and ore minerals. Classification of ore deposits. Magmatic processes of mineralization. Porphyry, skarn and hydrothermal mineralization.		12
Unit 2: Structure and texture of ores, Paragenesis, Controls of ore localisation. Spatial and temporal distribution of ore deposits.		12

Unit 3: Plate tectonics and ore genesis. Ore bearing fluids, movement of ore bearing fluids, Fluid inclusion studies of ores, Geothermometry.	12
Unit 4: Mineralization associated with ultramafic, mafic and acidic rocks, Wall rock alteration, Magma related mineralization through geological time.	12
Unit 5: Mineralization associated with sedimentary rocks, submarine volcanism; Mineralization associated with metamorphic processes. Strati-form and strata-bound ores.	12

Books Recommended:

- Edwards, R. and Atkinson, K. (1986) *Ore Deposit Geology*. Chapman and Hall, London.
- Craig, J.M. and Vaughan, D.J. (1981) *Ore Petrography and Mineral Geology*. John Wiley.
- Evans, A.M. (2012) *Ore Geology and Industrial Minerals*. Third Edition (Reprint), Blackwell
- Sawkins, F.J. (1984) *Metal Deposits in relation to Plate Tectonics*. Springer Verlag.
- Stanton, R.L. (1972) *Ore Petrology*. McGraw Hill.
- Torling, D.H. (1981) *Economic Geology and Geotectonics*. Blackwell Sci. Publ.
- Barnes, H.L (1979) *Geochemistry of Hydrothermal Ore Deposits*. John Wiley.
- Klemm, D.D. and Schneider, H.J. (1977) *Time and Strata Bound Ore Deposits*. Springer Verlag.
- Guilbert, J.M. and Park, Jr. C.F. (1986) *The Geology of Ore Deposits*. Freeman.
- Mookherjee, A. (2000) *Ore genesis -a Holistic Approach*. Allied Publishers.
- Wolf, K.H. (1981) *Hand book of Strata Bound and Stratiform Ore Deposits*. Elsevier.




Semester VII

Major – 17 (MJ - 17) REMOTE SENSING & GIS

Credit – 4

FM= 100

Lectures – 60 Hours

T= 100 {75Ext. +25 Int.}

Instructions:

- There will be two groups of questions. **Group A** is compulsory which will contain **three** questions.
- Question no. 1 will be very short answer type consisting of **five** questions of **1** mark each.
- Question no. 2 & 3 will be of short answer type of **5** marks each.
- **Group B** will contain **descriptive** type six questions of **15** marks each, out of which **any four** are to answer.

Course objective:

The primary objective of the course is

- to introduce fundamental aspects of Remote sensing and photogeology, digital image processing, usage of GPS and GIS in geology

Learning outcomes:

After successfully completing this course, the students will be able to:

- On completion of the course the students are expected to gain knowledge of the several advanced remote sensing concepts, sensors and satellites;
- learn about remote sensing approaches covering fields measurement using aerial and satellite missions;
- learn about Digital image processing of remotely sensed data and interpretation.

Skills to be Learned:

- To know the basic concepts of the fundamental concepts of Remote sensing and photogeology, digital image processing, usage of GPS and GIS in geology.
- Skill on Digital image processing of remotely sensed data and interpretation.

COURSE CONTENT:

Unit	Topic	Total no. of Lectures
Unit 1: Photogeology Types and acquisition of aerial photograph, Scale and resolution, Elements of air photo interpretation. Identification of sedimentary, igneous and metamorphic rocks and various aeolian, glacial, fluvial and marine landforms.		12
Unit 2: Remote Sensing Concepts in remote sensing, Sensors and scanners, Satellites and their characteristics, Data formats -Raster and Vector.		12

Unit 3: Digital Image Processing Fundamentals of Image processing, Image Correction, Image enhancement, Image classification, FCC and Image Ratioing,	12
Unit 4: GIS Datum, Coordinate systems and Projection systems, Introduction to DEM analysis; GIS integration and Case studies-Indian Examples	12
Unit 5: GPS, Concepts of GPS Integrating GPS data with GIS, Applications in earth system sciences	12

Books Recommended:

- Demers, M.N., 1997. *Fundamentals of Geographic Information System*, John Wiley & sons. Inc.
- Hoffmann-Wellenhof, B., Lichtenegger, H. and Collins, J., 2001. *GPS: Theory & Practice*, Springer Wien New York.
- Jensen, J.R., 1996. *Introductory Digital Image Processing: A Remote Sensing Perspective*, Springer- Verlag.
- Lillesand, T. M. & Kiefer, R.W., 2007. *Remote Sensing and Image Interpretation*, Wiley.



Semester VII

Major – 18 (MJ - 18) ENGINEERING GEOLOGY

Credit – 4

FM= 100

Lectures – 60 Hours

T= 100 {75Ext. +25 Int.}

Instructions:

- There will be two groups of questions. **Group A** is compulsory which will contain **three** questions.
- **Question no. 1** will be **very short answer type** consisting of **five** questions of **1 mark** each.
- **Question no. 2 & 3** will be of **short answer type** of **5 marks** each.
- **Group B** will contain **descriptive type** six questions of **15 marks** each, out of which **any four** are to answer.

Course objective:

The primary objective of the course is

- to introduce fundamental aspects of geology in major engineering projects; the necessity of geological inputs in designing large infrastructural projects such as dams, tunnels & roads etc.

Learning outcomes:

After successfully completing this course, the students will be able to:

- On completion of the course the students are expected to gain knowledge of the significance of geology in major engineering projects; Apply geological knowledge to major infrastructure projects.
- to understand the material properties and effect of natural hazards on engineering structures.

Skills to be Learned:

- To know the basic concepts of the engineering projects; the necessity of geological inputs in designing large infrastructural projects such as dams, tunnels & roads etc.
- Skill to understand the material properties and effect of natural hazards on engineering structures.

COURSE CONTENT:

Unit	Topic	Total no. of Lectures
Unit 1:	Engineering Geology and its applications, Scope of Engineering Geology; Elementary concepts of rock mechanics - Strength and Elastic properties. Engineering properties and characteristics of soils. Properties of building stones.	12
Unit 2:	Basic concept of-Rock Quality Designation (RQD), Rock Structure Rating (RSR), Rock Mass Rating (RMR), Tunneling Quality Index (Q)	12

Unit 3: Dams and reservoirs: Types of Dams-masonry or concrete dams- gravity, arch and buttress. Earth Dams and composite dams. Geological considerations- topography, structure and lithology. Foundation and seepage problems in dams and their treatment. Reservoir: Reservoir problems-seepage and silting.	12
Unit 4: Tunnels: terminology, definition, types- hard rock and soft rock tunnels. Geological considerations- topography, structure and lithology. Bridge sites: Terminology, Bridge structure, types, bridge problems, and stability of bridges. Geology of bridge sites.	12
Unit 5: Stability of rock slopes and cutting in rocks: Classification of slopes- stable and unstable slopes- Geological parameters. Measures for stabilization of slopes. Foundation treatment; Grouting, Rock Bolting and other support mechanisms; soil stabilization.	12

Books Recommended:

- Krynin, D.P. and Judd W.R. 1957. Principles of Engineering Geology and Geotechnique, McGraw Hill (CBS Publ).
- Johnson, R.B. and De Graf, J.V. 1988. Principles of Engineering Geology, John Wiley.
- Goodman, R.E., 1993. Engineering Geology: Rock in Engineering constructions. John Wiley & Sons, N.Y. Waltham, T., 2009. Foundations of Engineering Geology (3rd Edn.) Taylor & Francis.
- Bell: F.G, 2006. Basic Environmental and Engineering Geology Whittles Publishing.
- Bell: F.G, 2007. Engineering Geology, Butterworth-Heineman.




Semester VII

**Major – 19 (MJ – 19) (Practical) ORE GEOLOGY, REMOTE SENSING & GIS,
ENGINEERING GEOLOGY**

Credit – 4

Lectures – 60 x 2 = 120 Hours

P = 100 marks

Practical	Marks Distribution
1. Ore Geology Experiment:	20
2. Remote Sensing & GIS Experiment	20
3. Engineering Geology practical	20
4. Class record	20
5. Viva Voce	20
Total=100	

Suggested Practical**AMJ 01: Ore Geology**

1. Study of Geological cross-section of important mineral deposits.
2. Study of distribution of important ore deposits in India
3. Megascopic & microscopic study of important ores and their textures.
4. Megascopic study of important industrial, metallic and non-metallic, precious and semi-precious stones.
5. Ore petrographic study of ore minerals and establishment of paragenetic sequence
6. Exercises on ore reserve calculations.
7. Estimation of grade of ores.

AMJ 02: Remote Sensing & GIS

1. Study of Seismic / landslide zones of India.
2. Aerial Photo/ & Satellite imagery interpretation, identification of sedimentary, igneous and metamorphic rocks
3. Identification of structural features in Aerial Photo/Satellite imagery
4. Identification of geomorphic features in Aerial Photo/Satellite imagery

AMJ 03: Engineering Geology

1. Computation of reservoir area, catchment area, reservoir capacity and reservoir life.
2. Merits, demerits & remedial measures based upon geological cross sections of project sites.
3. Engineering properties of Igneous, Sedimentary & Metamorphic rocks.
4. Computation of RQD, RSR, RMR and 'Q'
5. Plotting of Major Dams, Reservoirs, & Tunnels on the outline map of India.

Semester VIII

Major – 20 (MJ - 20) EXPLORATION GEOLOGY
 Credit – 4
 EM= 100

Lectures – 60 Hours
 T= 100 {75Ext. +25 Int.}

Instructions:

- There will be two groups of questions. **Group A** is compulsory which will contain **three** questions.
- **Question no. 1** will be **very short answer type** consisting of **five questions of 1 mark each**.
- **Question no. 2 & 3** will be of **short answer type** of **5 marks each**.
- **Group B** will contain **descriptive type six questions of 15 marks each**, out of which **any four** are to answer.

Course objective:

The primary objective of the course is

- to introduce the basic principles of mineral exploration; different sampling methods.
- To understand different exploration strategies, including geological and geochemical mapping.

Learning outcomes:

After successfully completing this course, the students will be able to:

- On completion of the course the students are expected to gain knowledge of the exploration of ore deposits and industrial minerals.
- To understand the exploration techniques, including sampling, drilling and evaluation of reserves. various processes involved in the formation of economically important mineral deposits;

Skills to be Learned:

- To know the basic concepts of the mineral exploration; different sampling methods to locate the mineral deposits &
- develop skills to face the current challenges in the non-renewable mineral resources.

COURSE CONTENT:

Unit	Topic	Total no. of Lectures
Unit 1: Mineral Resources	Resource reserve definitions, Mineral resources in industries – historical perspective and present, A brief overview of classification of mineral deposits with respect to processes of formation in relation to exploration strategies	12
Unit 2: Prospecting and Exploration	Principles of mineral exploration, Prospecting and exploration-conceptualization, methodology and stages, Sampling, subsurface sampling including pitting, trenching and drilling,	12

Geochemical exploration.	
Unit 3: Evaluation of data: Evaluation of sampling data, Mean, mode, median, standard deviation and variance Drilling and Logging Core and non-core drilling, planning of bore holes and location of boreholes on ground, Core-logging	12
Unit 4: Geophysical methods Different types of geophysical methods for exploration- gravity, magnetic, electrical, seismic, Self-potential, Induced-polarization methods.	12
Unit 5: Reserve estimations and Errors: Principles of reserve estimation, density and bulk density Factors affecting reliability of reserve estimation, Reserve estimation based on geometrical models (square, rectangular, triangular and polygon blocks), Regular and irregular grid patterns, statistics and error estimation	12

Books Recommended:

- Clark, G.B. 1967. *Elements of Mining*. 3rd Ed. John Wiley & Sons.
- Arogyaswami, R.P.N. 1996 *Courses in Mining Geology*. 4th Ed. Oxford-IBH
- Moon, C.J., Whateley, M.K.G., Evans, A.M., 2006, *Introduction to Mineral Exploration*, Blackwell Publishing




Semester VIII

Advance Major – 01 (AMJ - 01) ELEMENTS OF GEOCHEMISTRY

Credit – 4

EM= 100

Lectures – 60 Hours

T= 100 {75Ext. +25 Int.}

Instructions:

- There will be two groups of questions. **Group A** is compulsory which will contain **three** questions.
- **Question no. 1** will be **very short answer type** consisting of **five** questions of **1** mark each.
- **Question no. 2 & 3** will be of **short answer type** of **5** marks each.
- **Group B** will contain **descriptive type** six questions of **15** marks each, out of which **any four** are to answer.

Course objective:

The primary objective of the course is

- To provide a comprehensive knowledge on how chemical principles are used to explain the mechanisms that control the large geological systems such as the Earth's mantle, crust, ocean and atmosphere, and the formation of the solar system;
- To understand the qualitative and quantitative composition of planet Earth and solar system material;
- knowledge on geological processes and their geochemical signatures; understanding of geochemical behavior of elements and isotopes and their applications.

Learning outcomes:

After successfully completing this course, the students will be able to:

- On completion of the course the students are expected to understand the fundamental processes in Earth science in a geochemical context; Quantify the geological processes through trace element modeling;
- Apply basic geochemical techniques to explain, interpret and predict common processes in Earth science;
- Develop the ability to explain, interpret and predict common processes in Earth sciences in a geochemical context.

Skills to be Learned:

- To know the basic concepts of the geochemistry.
- develop skills to face the current challenges in the geochemical context.

COURSE CONTENT:

Unit	Topic	Total no. of Lectures
Unit 1: Concepts of geochemistry Introduction to properties of elements: The periodic table. Chemical bonding, states of matter and atomic environment of elements. Geochemical classification of elements, Partition coefficient		12

Unit 2: Layered structure of Earth and geochemistry Composition of different Earth reservoirs and the nuclides and radioactivity Conservation of mass, Stable isotope (C-O-S) and elemental fractionation, Concept of radiogenic isotopes in geochronology (U-Pb, Lu-Hf, Th-Pb, Rb-Sr) and isotopic tracers	12
Unit 3: Element transport Advection and diffusion, Chromatography. Aqueous geochemistry- basic concepts and speciation in solutions, Eh, pH relations, MnO-H ₂ O system, Fe-H ₂ O system	12
Unit 4: Geochemistry of solid Earth The solid Earth – geochemical variability of magma and its products. The Earth in the solar system, the formation of solar system, Composition of the bulk silicate Earth, Meteorites: types & composition	12
Unit 5: Cosmic abundance of elements Distribution of elements in solar system and in Earth, Chemical differentiation and composition of the Earth, General concepts about geochemical cycles and mass balance. Properties of elements, Geochemical behavior of major elements, Major, Minor, Trace elements, Geochemical criteria for discrimination of different tectonic environments.	12

Books Recommended:

- Mason, B. (1986) *Principles of Geochemistry*. 3rd Edition, Wiley New York.
- Rollinson, H. (2007) *Using geochemical data – evaluation, presentation and interpretation*. 2nd Edition. Publisher Longman Scientific & Technical.
- Walther, J. V. (2009). *Essentials of geochemistry*. Jones & Bartlett Publishers.
- Albarède, F. (2003). *Geochemistry: an introduction*. Cambridge University Press.
- Faure, Gunter and Teresa M. Mensing (2004). *Isotopes: Principles and Applications*, Wiley India Pvt. Ltd




Semester VIII

Advance Major – 02 (AMJ - 02) ENVIRONMENTAL GEOLOGY

Credit – 4

FM= 100

Lectures – 60 Hours

T= 100 {75Ext. +25 Int.}

Instructions:

- There will be two groups of questions. **Group A** is compulsory which will contain **three** questions.
- **Question no. 1** will be **very short answer type** consisting of **five questions of 1 mark each**.
- **Question no. 2 & 3** will be of **short answer type** of **5 marks each**.
- **Group B** will contain **descriptive type six questions of 15 marks each**, out of which **any four** are to answer.

Course objective:

The primary objective of the course is

- to learn about the interactions between the atmosphere, ocean, land, and human activities
- to learn how to identify and categorize geological hazards, such as landslides, rockfalls, etc
- to learn how to reduce pollution and manage waste

Learning outcomes:

After successfully completing this course, the students will be able to:

- To understand the relationship between humans and the environment, and how to identify and manage environmental hazards

Skills to be Learned:

- need to understand how human activities impact the environment, such as climate change, pollution, and energy use.

COURSE CONTENT:

Unit	Topic	Total no. of Lectures
Unit 1: Basics of Environment; Type of Environment; Man and Environment; Components of environmental Geology, Concepts and principles of Environmental Geology; Time scales of global changes in the ecosystem and climate		12
Unit 2: Atmosphere, structure and composition of atmosphere; Global warming. Greenhouse effect: CO ₂ increase and global warming in the present and past atmospheres;		12




Unit 3: Environmental Pollution: Sources of Air Pollution, emission of major industrial air pollutants, effects of air pollution on atmospheric processes, oxides of carbon as pollutants, greenhouse effect, global warming, chlorofluoro carbons (CFC's), depletion of ozone layer, effects of ozone depletion, smog, acid rain;	12
Unit 4: Components of Hydrosphere; Water cycle; solubility of gases in water, Acidification of Ocean; Impact of oceanic and atmospheric circulation on climate and rain fall. Fluctuation of water table due to anthropogenic and geogenic causes.	12
Unit 5: Water Pollution: Types of water pollution, groundwater pollution and its effects, sources of water pollution; organic and inorganic contamination of groundwater and its remedial measures.	12

Books Recommended:

- *Abhijit Dutta. Environmental Issues and Challenges*
- *K. Sharma Environmental Pollution*
- *Bell, F.G. (1999): ogical Hazards, Routledge, London.*
- *Bryant, E. (1985): Natural Hazards, Cambridge Univ. Press.*
- *Keller, E.A. (1978) Environmental Geology*
- *Rekha Ghosh and D. S. Chatterjee :Environmental Geology*
- *Valdiya, K.S. (1987) Environmental Geology- Indian Context*
- *Patwarrdhan, A.M. (1999) The Dynamic Earth System*
- *Smith, K.(1992) Environmental Hazards*




Semester VIII

Advance Major – 03 (AMJ – 03) (Practical)

Credit – 4

Lectures – 60 x 2 = 120 Hours

P = 100 marks

Practical	Marks Distribution
1. Exploration Geology Experiment:	20
2. Elements of Geochemistry Experiment	20
3. Environmental Geology practical	20
4. Class record	20
5. Viva Voce	20
Total=100	

Suggested Practical

MJ 20: Exploration Geology

- Identification of anomaly
- Concept of weighted average in anomaly detection
- Geological cross-section
- Models of reserve estimation & Numerical problems related to exploration
- Plotting of Ore distribution on India map
- Study of Metallogenic provinces of India.

AMJ 01: Elements of Geochemistry

- Types of geochemical data analysis and interpretation; of common geochemical plots.
- Geochemical analysis & interpretation of rocks & mineral (XRF, EPMA, XRD data)
- Geochemical variation diagrams and its interpretations.
- REE normalized plot & its interpretations
- Eh & Ph plot

AMJ 02: Environmental Geology

- Analyses of alkalinity, acidity etc. in water samples.
- Analyses of pH and Electrical Conductivity in water.
- Preparation of ocean and atmospheric circulation maps.
- Preparation of seismic and volcanic zonation maps of India and world.
- Demarcation of flood prone areas in the outline map of India
- Presentation of chemical analyses data



SEMESTER VIII

RESEARCH COURSE (RC) (FOR HONOURS WITH RESEARCH)**RC-1: RESEARCH METHODOLOGY**

Credits: 04 Lectures: 60

Marks: 100 (End Semester Examination=75 Semester Internal Examination= 20 (Theory), Class Performance & Attendance =05)**Pass Marks (Internal + End Semester) = 40****Instructions to Question Setters****Semester Internal Examination (SIE) – 20 Marks:**

The question paper will be divided into two groups: Group A and Group B.

Group A: Group A is compulsory, which will contain two questions.

Question No.1 will consist of five very short answer-type questions, each carrying 1 mark. All five questions are compulsory.

Question No.2 will be the short-answer type of 5 marks. This question is also compulsory.

Group B: Contains two descriptive-type questions, each carrying 10 marks. Candidates are required to answer only one question from this group.

End Semester Examination (ESE) – 75 Marks:

The question paper will be divided into two groups: Group A and Group B.

Group A (Compulsory): Question 1: Five very short answer-type questions of 1 mark each. Questions 2 and 3: Short answer-type questions, each carrying 5 marks.

Group B: Contains six descriptive-type questions, each carrying 15 marks. Candidates are required to answer any four questions from this group.

Note: Questions in the theory papers may have subdivisions.

COURSE OBJECTIVES

- To introduce students to the basic concepts of research and research methodology.
- To develop an understanding of research design, data collection methods, and data analysis techniques.
- To equip students with skills for formulating research problems, hypotheses, and conducting literature reviews.
- To enable students to write research proposals and reports ethically and systematically.

COURSE OUTCOMES

After completion of the course, students will be able to:

1. Understand the fundamentals of research and its types.
2. Formulate research problems and hypotheses.
3. Conduct literature surveys using digital tools and databases.
4. Apply qualitative and quantitative research techniques.
5. Prepare research proposals, reports, and theses.
6. Understand ethical issues in research and plagiarism.



COURSE CONTENT

Unit I: Introduction to Research

(12 Lectures)

- Meaning, Objectives, and Characteristics of Research
- Types of Research: Basic, Applied, Descriptive, Analytical, Quantitative, Qualitative, Experimental
- Research in Interdisciplinary and Multidisciplinary Contexts
- Scientific Method and Research Process
- Identification and Formulation of Research Problem

Unit II: Literature Review and Research Design

(12 Lectures)

- Sources of Literature: Journals, Books, Databases (INFLIBNET, JSTOR, Google Scholar, Scopus)
- Techniques of Review Writing and Referencing Styles (AIP/APA/MLA/Chicago)
- Plagiarism and Academic Integrity: Use of Plagiarism Detection Tools (Turnitin, URKUND)
- Research Design: Concept, Components, and Types (Exploratory, Descriptive, Experimental)

Unit III: Data Collection and Sampling Techniques

(12 Lectures)

- Primary and Secondary Data
- Methods of Data Collection: Observation, Interview, Questionnaire, Survey, Case Study
- Sampling Techniques: Probability and Non-probability Sampling
- Tools and Techniques for Data Collection (e.g., Google Forms, Surveys)

Unit IV: Data Analysis and Interpretation

(12 Lectures)

- Classification, Tabulation, and Presentation of Data (Charts, Graphs, Tables)
- Measures of Central Tendency and Dispersion
- Correlation and Regression Basics
- Introduction to Statistical Software (SPSS, Excel, R, Python – basic commands)
- Interpretation and Drawing Inferences

Unit V: Research Reporting and Ethics

(12 Lectures)

- Structure of Research Report/Thesis
- Referencing and Citation Management Tools (Zotero, Mendeley)
- Ethics in Research: Fabrication, Falsification, Plagiarism, Authorship Issues
- IPR, Patents, Copyright, and Open Access Publishing

Suggested Readings and Tools

1. Research Methodology: Methods and Techniques, C. R. Kothari and Gaurav Garg, New Age International Publishers, 4th ed., 2019.
2. Research Methodology: A Step-by-Step Guide for Beginners, Ranjit Kumar, Pearson Education, 5th ed., 2021.
3. Research Methodology, R. Panneerselvam, PHI Learning Pvt. Ltd., 2nd ed., 2014.
4. Research Methodology: Concepts and Cases, Deepak Chawla and Neena Sondhi, Vikas Publishing, 2nd ed., 2016.



5. Data Reduction and Error Analysis for the Physical Sciences, Philip R. Bevington and D. Keith Robinson, McGraw-Hill Education, 3rd ed., 2003.
6. How to Write and Publish a Scientific Paper, Robert A. Day and Barbara Gastel, Cambridge University Press, 8th ed., 2016.
7. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, John W. Creswell and J. David Creswell, SAGE Publications, 5th ed., 2018.
8. Technical Report Writing, Aditham Bhujanga Rao, PHI Learning Pvt. Ltd., 1st ed., 2012.

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SEMESTER VIII

RC-2: RESEARCH INTERNSHIP/ FIELD WORK/ DISSERTATION**Credits: 08**

This course will include laboratory work, practicums, field projects, survey analyses, or internship-based projects. Students must submit a comprehensive research report and defend their dissertation/thesis.

The evaluation will consider the following:

- ✦ Motivation for the choice of topic
- ✦ Project dissertation design
- ✦ Methodology and Content depth
- ✦ Results and Discussion
- ✦ Future Scope & References
- ✦ Participation in Internship programme with reputed organization
- ✦ Application of Research technique in Data collection
- ✦ Report Presentation
- ✦ Presentation style

Marks distribution may be as follows or adjusted as appropriate:

- ✦ Assessment of Project Synopsis: **75 marks**
- ✦ Assessment of Project Thesis: **100 marks**
- ✦ Viva-voce: **25 marks**

About the Synopsis Format

The synopsis must include the following sections:

1. **Introduction**
2. **Preliminary Review of Literature / State-of-the-Art**
3. **Problem to be Investigated**
4. **Objectives of the Research**
5. **Research Questions and/or Hypotheses**
6. **Research Methodology**
 - Research Type
 - Research Design
 - Tools to be Used for Data Collection and Analysis
7. **Significance of the Proposed Work**
8. **Research Limitations and Future Work**
9. **Tentative Chapterization**
10. **References** (*Bibliography is also desirable*)

