

M. Phil. APPLIED GEOLOGY  
(effective from 2010-11 Session)

Syllabus for Semester System

No. of Theory Papers- 4

No. of Practical Paper- 1

**1st Semester:**

Course No.		Credit Hours
MAG. 611 (Theory Compulsory)	- Geological Principles	4CH
MAG. 612 (Theory Elective)	- Developments in Geology	4CH
MAG. 613	- Research Methodology	4CH
MAG. 614	- Qualitative Analysis and Computer Application	4CH
MAG. 615	-Review and Writing Research Papers	4CH

**2nd Semester:**

MAG. 621	- Seminar	4CH
MAG. 622	- Dissertation	12CH

**Syllabus for M. Phil. (APPLIED GEOLOGY) Examination  
1st Semester**

**A. Course- MAG. 611 (Theory Compulsory) Geological Principles 4CH**

**Unit- I**

1. Principles of erosion, sedimentation and transformation of sediments to hard rocks. Sedimentary environments. Laboratory techniques in sedimentary petrology. Field measurements of current bedding, ripple marks; Plotting and analysis of field data.
2. Principles of ore formation and geology of important mineral deposits namely, Iron and Manganese ores of Koira- Badbil region, Sukinda valley chromite deposits, Bauxite deposits of Koraput, Malanjkhand Cu deposit, Pb-Zn deposits of Rajasthan.

**Unit- II**

3. Principles of Remote Sensing for geological investigation. Remote Sensing data products. Methods of interpretation of aerial photographs and satellite images. Digital images. Digital image processing methods.
4. Principles of Geomorphology and Geomorphic divisions of India; Characteristic land forms of each division.
5. Methods of chemical analysis of water for carbonate, Sulphate, calcium, magnesium, acidity and alkalinity; Hydrological cycle; Hydrological properties of rocks. Groundwater provinces of India. Ground water exploration techniques. Well drilling techniques and installation. Ground water exploration techniques. Well drilling techniques and installation.

**Unit- III**

6. Basic methods of geological mapping; Recording and analysis of planar and linear structural data. Structural geology of Singhbhum -Gangpur belt, Sausar belt and Aravalli Belt.
7. Methods of geochemical analysis of  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{K}_2\text{O}$ ,  $\text{Na}_2\text{O}$  and  $\text{CaO}$  in rocks. IUGS Classification of igneous rocks. CIPW Norms calculations; Discrimination diagrams for igneous rocks and their interpretations. Important igneous provinces-. Singhbhum Granitic Complex, Syenites of Eastern Ghats belt, Deccan Basaltic Province, Ultramafic rocks of Sukinda valley.
8. Metamorphism and classification of metamorphic rocks. ACF, AKF and AFM diagrams. Metamorphism in Eastern Ghats Belt, Gangpur belt, Sausar belt.

**Unit- IV**

9. Formation of Soil. Soil erosion and conservation methods. Soil types of India
10. Engineering properties of rocks. Important hydel projects of India

Objectives and expected outcome: In these units, the students can know the characteristic properties, origin and distribution of ore minerals. After the study, the student will have the knowledge of exploring them by mapping, sampling, geophysical methods and remote sensing methods. The students can also know the requirement of knowledge geology for the construction of various engineering structures such as bridge, tunnel etc.

**Books Recommended for Paper MAG 611:**

- 1) Pettijohn, F. J.: Sedimentary rocks
- 2) Reneick and Singh : Depositional Sedimentary environments
- 3) Lindholm., R. C.,: A practical Approach to Sedimentary rocks
- 4) Jenson, J. R. Remote Sensing of environment
- 5) B. C. Panda: Remote sensing principles and application.
- 6) Bateman, A. M.: Economic mineral deposits
- 7) Krishnaswamy, S.,: Mineral resources of India
- 8) Thurnbury, W. D.: Principles of Geomorphology
- 9) Holmes, A.: Principles of Physical Geology
- 10) Mathur, S. M. ;Geomorphology of India
- 11) Todd, D. K.: Ground water Hydrology
- 12) Karanth, K. R. : Hydrogeology
- 13) Garg, S. P. : Ground water and Tube wells
  
- 14) Bose, M, K. : Igneous Petrology
- 15) Best,: Igneous and Metamorphic petrology
- 16) Chatterjee, G. C.,: Igneous Rocks of India
- 17) N. Chenna Kesavulu: Text Book of Engineering Geology
- 18) Bhaskar Rao, B. : Metamorphic Petrology
- 19) Harker, A.: Metamorphic Petrology
- 20) Mason, R.,: Petrology of Metamorphic Rocks
- 21) Winkler, H. J. F.,: Petrogenesis of Metamorphic Rocks
- 22) Lahee, :Field Geology
- 23) Marshak, S., and Mitra, G.,: Basic Methods of Structural geology
- 24) Jeffery, P. G., and Hutchison, D.,: Chemical Methods of Rock Analysis
- 25) Pichamuthu, C. S., Physical geography of India
- 25) P. K. Guha, Remote sensing for the beginners
- 25) Lillesand, T. M., Keifer, R. W., Chipman, J. W.,, Remote sensing and Image interpretation

**Course- MAG. 612 (Theory Elective) Developments in Geology**

**4CH**

**Developments in Geology - B (Geospatial Technology)**

**Unit- I**

1. Concept of Geospatial technology and its component.
2. Principles of Remote sensing and data acquisition systems.
3. Basic features of RS data products- imageries, radar images and digital images.

**Unit- II**

4. Characteristic features of digital Images
5. Image analysis and pattern recognition; image enhancement reduction and magnification, contrast enhancement.
6. Rationing. Spatial filtering, Edge enhancement. Special transformation. Thematic information extraction,

**Unit- III**

7. Classification scheme. Training site selection; Supervised classification.
8. Geographic information system, Data structure of GIS, Raster and vector data for geographical entities.

**Unit- IV**

9. Application of GIS in various fields of geology
10. Fundamentals of GPS and its use in mapping.

Objectives and expected outcome: In the said paper, the students are explained the application of remote sensing and GIS for solving various problems.

### **Books Recommended for Paper MAG 612 (B)**

- 1) Bosler, J. G.,: Geospatial Science and Technology
- 2) Guha, P. K., : Remote sensing for the beginners
- 3) Jenson, J. R., : Remote sensing of the Environment
- 4) Panda, B. C., : Remote sensing- Principles and Application
- 5) Jenson, J. R., : Introductory digital Image Processing
- 6) Lillesand, T. M., Keifer, R. W., Chipman, J. W.,: Remote sensing and Image interpretation
- 7) Campbell, J. B.: - Principles of Geographical Information System
- 8) Lo, C. P, and Yeung, A. K. W.: Concept and Techniques of Geographic Information System
- 9) Panigrahi, N., : Geographical Information Science
- 10) Anji Reddy, M., : Remote sensing and Geographic Information System
- 11) Chandra, A. M., and Ghosh, S. K., : Remote sensing and Geographic Information System

### **Course- MAG. 613 Research Methodology**

**4CH**

#### **Qualitative Analysis and Computer Application**

##### **Unit- I**

Application of statistical concepts/ procedures, Data, Diagrammatic representation of data, Probability, Measures of central tendency, Measures of dispersion, Skewness and Kurtosis, Normal distribution, Simple correlation, multiple correlation, regression analysis, Sampling, Simple random sampling, Systematic sampling .

##### **Unit- II**

Testing of hypothesis tests, X<sup>2</sup> (Chi-square) , t and F-test; Analysis of variance, covariance; Principal component analysis, Experimental design, Completely randomized block design, randomized block design, Latin square design. One-way analysis of variance, two-way analysis of variance, Follow-up tests; Non-parametric procedures; Writing of Research report.

##### **Unit- III**

Windows and or Linux operating system; Programming fundamentals; Basics of high level Programming language- C, Editing, Compilation and running a programme, storing data; Elementary numerical methods. Plotting graph; Preparing paper? Report using latex.

##### **Unit- IV**

Learning software packages specific to Applied Geology. ERDAS- for image processing; 21<sup>st</sup> Century GIS and ARC GIS; Petrological data analysis software (Petrofest), Groundwater data analysis software (MUDFLOW).

Objectives and expected outcome: In these units, the students will study various techniques of statistical methods which will be useful in geological problems. They are also getting a scope to go through the knowledge of computer methods that will be useful in carrying out research activities.

### **Course- MAG. 614 Practical and/ or Field study**

**4CH**

Objectives: Practicals related to papers 611 and 612 are conducted

**Course- MAG. 615 Review and Writing Research Papers****4CH**

Objectives: In this paper, the students are given the training of “ how to design and develop a research literature” which is a part of every research thesis.

**Second Semester****MGL.621 - Seminar****4CH**

Objectives: The students are given the scope to expose themselves to an audience where they can speak out about a topic of their own choice.

**MGL.622 - Dissertation****12CH**

Objective: A candidate will work for a dissertation under the supervision of a guide of the department or joint guides. In case of joint guidance, one of the guides shall be from the Department of Earth Sciences. The dissertation shall be examined by an external examiner and internal examiner (guide/guides) followed by a viva-voce to be conducted by both the examiners.