M. Phil. APPLIED GEOLOGY
(effective from 2017-18 Session)

Syllabus for Semester System

No. of Theory Papers- 4

No. of Practical Paper- 1

First 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

Objectives: In these units, the students can know the characteristic properties, origin and distribution of ore minerals. In addition, they shall be explained the knowledge of remote sensing and GIS, mapping methodologies in the field and the importance of geology in engineering structures.

Expected outcome After the study, the student will have the knowledge of exploring them by mapping, sampling, geophysical methods and remote sensing methods. The students can know the requirement of knowledge geology for the construction of various engineering structures such as bridge, tunnel etc.

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 deoposits of Koraput, Malanjkhand Cu eposit Pb-Zn deposits of Rahjasthan.

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 SiO_2, Al_2O_3, K_2O, Na_2O and 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

Books Recommended for Paper MAG 611:

1. Phillips, F. C. (1977) An Introduction to Crystallography, Longman Higher Education, page no: 1-295.
2. Evans, R. C. (1939) An Introduction to Crystal chemistry, 2ndedition, Cambridge university press, page no: 1-410.
3. Dana, E. S. (2006) A Text Book of Mineralogy, CBS; 4 edition page no: 1-156.
4. Kerr, P. F (1977) Optical Mineralogy, McGraw-Hill College; 4 edition page no: 1-492.
5. Beloussov, V. V. (1974) Basic Problems in Geotectonic, McGraw-Hill Book Company page no: 1-312.
6. Valdiya, K. S. (1985) Aspects of Tectonics, McGraw-Hill Education page no: 1-304.

Course- MAG. 612 (Theory Elective) Developments in Geology 4CH

Objectives: Satellite data for resources assessment and analysis have taken centre stage in Geological science due to its properties of multiplicity. Space information in geology is very important to find out changes in any dynamic environment. In this paper they elaborates in a very smooth manner.

Expected outcome: After the study, the students will have the knowledge of the application of remote sensing and GIS for solving various problems.

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 recognisition; 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.

Books Recommended for Paper MAG 612 (B)

1. Lillesand, M. Thomas and Ralph W. Kiefer, (2007) Remote Sensing and Image Interpretation, 6th revised edition, John Wiley & Sons, New York, page no. 1-768.
2. Jensen, R. John (2013) Remote Sensing of the Environment, 2nd edition An Earth Resource Perspective, Pearson India Pvt. Ltd., Delhi, page no: 1-618.
3. M. Anji Reddy (2004) Geoinformatics for Environmental Management, B.S Publications, Hyderabad, page no. 1- 327.
4. Sharma, V.K. (1991) Remote Sensing for Land Resources Planning, Concept Publishing Company, New Delhi, page no. 1-456.
5. Albert, L. O. C. P. and Yeung,K. W. (2006) Concepts and Techniques of Geographic Information Systems, 2nd edition, Prentice-Hall of India, New Delhi, page no: 1-544.
6. Peter, A. Burrough and Rachael, A. Mc. Donnell, (2015) Principles of Geographical Information System, Oxford University Press Inc., New York, page no: 1-352.

Course- MAG. 613 Research Methodology 4CH

Objectives: 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.

Expected outcome: After the study, the students will have the confidence to apply the science of statistics and computer in their research area so that they can overcome the cumbersome areas of analysis and reach the destination in an easy manner.

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, X2 (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; 21st Century GIS and ARC GIS; Petrological data analysis software (Petrofest), Groundwater data analysis software (MUDFLOW).

Books Recommended for Paper MAG 613 (B)

1. Gupta, S. C. (2016) Fundamentals of Statistics, Himalaya Publishing House Pvt. Ltd. 7th Edition, page no:1-234.
2. Gupta, S C and Kapoor,V K (2014) Fundamentals of Mathematical Statistics, Sultan Chand & Sons, .page no. 1-458
3. Medhi, J. (2007) Statistical Methods - An Introductory, New Age International,2nd Edition, page no:1-450.
4. Gupta, S. P. (2014) Statistical Methods, Sultan Chand & Sons, 44th Edition, page no:1-1436.

Course- MAG. 614 Practical and/ or Field study 4CH

Objectives: Practical related to papers 611 and 612 are conducted so that the theory can be applicable in a practical manner.

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 research literature" which is a part of every research thesis.

Expected outcome: The students will be in a position to identify their areas of research basing on their knowledge of collected literature. They will be in a position to identify the techniques of adopting various methodologies to reach their goal.

Second Semester

MGL.621 Seminar 4CH

Objectives : The aim of this paper is to build the capacity in the students to shed the fear of speaking before the audience. They are exposed to a common platform where they venture to face the questions from the audience regarding their research topic.

Expected outcome: The students are given the scope to expose themselves to an audience where they can speak out about a topic of their own choice to be adopted for their M.Phil. topic.

MGL.622 - Dissertation 12CH

Objectives: 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.

Expected outcome: After the course, the candidates may prepare themselves to go for Ph.D. works.