ANDHRA UNIVERSITY
DEPARTMENT OF GEOLOGY
COLLEGE OF SCIENCE AND TECHNOLOGY

Scheme of Instruction and Examinations
Advanced Post P.G. Diploma Course in
Mineral Exploration and Resource Evaluation
(With effect from the admitted batch 2013-2014)
## Scheme of Instruction and Examinations

### I–SEMESTER, ADVANCED, P.G. DIPLOMA IN MINERAL EXPLORATION AND RESOURCE EVALUATION

(With effect from the admitted batch 2013-2014)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Course</th>
<th>Teaching/Lab Hours Per week</th>
<th>Duration of Examination hours</th>
<th>Allotment of Marks</th>
<th>Total Marks</th>
<th>Subject Credits</th>
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**TOTAL** | 650 | 26
## II – SEMESTER, ADVANCED, P.G. DIPLOMA IN MINERAL EXPLORATION AND RESOURCE EVALUATION

<table>
<thead>
<tr>
<th>S. No</th>
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<th>Subject Credits</th>
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<td>02</td>
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Grand total of marks = **1350**  
Grand total of Credits points = **54**
SYLLABUS

ADVANCED, P.G. DIPLOMA IN MINERAL EXPLORATION AND RESOURCE EVALUATION

PAPER-I, GEOLOGICAL EXPLORATION

I – SEMESTER,

UNIT – I


UNIT – II

Geological mapping: Surface and sub-surface mapping, Methods of sampling. Guides to ore search – Physiographic, Mineralogical, Stratigraphic guides.

UNIT – III

Lithological and Structural guides. Regional exploration – Different stages. Planning and operation. Documentation and analysis of exploration data. Prospecting criteria and selection of target areas for exploration during reconnaissance and initial follow-up. Geological setting and prospecting criteria for important mineral deposits.

UNIT – IV

Drilling techniques, Geological aspects of site selection for drilling operations, planning of drilling operations, borehole surveys, correction of deviated boreholes and directional drilling, core-sampling, assaying, and RQD (Rock Quality Designation) measurements for Rock Mass characterisation.

UNIT – V

Case studies: Gold deposits, massive sulfide deposits, porphyry copper deposits, tin-tungsten deposits associated with acid magmatism, Uranium deposits and Heavy Mineral Deposits.

PRACTICALS:
Calculation of in-situ reserves from borehole data. Calculation of blocked reserves. Introduction to geostatistical estimation of reserves. Reserve estimation using UNFC, JORC (Joint ore reserves estimate codes) Australia and CIM (Canadian Institute of Mining) methods.
Model Question Paper
I – Semester,
ADVANCED, P.G. DIPLOMA IN MINERAL EXPLORATION AND RESOURCE EVALUATION

Paper – I, GEOLOGICAL EXPLORATION
(Effective from the Admitted Batch of 2013-2014)

Time: 3Hrs                   Max. Marks: 85

Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.

UNIT-I

1. Write an essay on controls of mineralization

OR

2. Answer any TWO of the following
   a) Parameters for Exploration
   b) Rift related ore deposits
   c) Nature of sulphide deposits

UNIT-II

3. Discuss in detail about physiographic guides in mineral exploration

OR

4. Answer any TWO of the following
   a) Channel Sampling
   b) Surface Mapping
   c) Mineral Alteration Products as guides

UNIT-III

5. Describe in detail about documentation of exploration data

OR

6. Answer any TWO of the following
   a) Faults as guides in exploration
   b) Lithological guides
   c) Criteria for selection of area for exploration

UNIT-IV

7. Write an essay on different drilling techniques used in mineral exploration.

OR

8. Answer any TWO of the following
   a) Core sampling.
   b) Assaying.
   c) Causes for deviation of drill holes.

UNIT-V

9. Write in detail about various steps involved in exploration for massive sulphide deposits.

OR

10. Answer any TWO of the following:
    a) Gold deposits exploration.
    b) Uranium deposits exploration.
    c) Porphyry copper deposits exploration.
SYLLABUS
ADVANCED, P.G. DIPLOMA IN MINERAL EXPLORATION AND RESOURCE EVALUATION

PAPER-II, GEOCHEMICAL EXPLORATION

I – Semester

UNIT – I

Introduction to Geochemical Exploration. Geochemical cycle, mobility and association of elements, primary and secondary dispersion patterns and their classification.

UNIT – II

Geochemical surveys, sampling media – Geo chemical Exploration methods: lithogeochemical, hydrogeochemical, pedogeochemical, Biogeochemical and Radon emanometric techniques.

UNIT – III

Geochemical Surveying techniques, sample collection methods, data processing and presentation.

UNIT – IV

Concepts in analytical chemistry; Classical and rapid methods of analyses; Atomic absorption spectrometry; Inductively coupled plasma-atomic absorption spectrometry; X-ray fluorescence analysis; Energy dispersive X-ray spectrometry; X-ray diffraction analysis; micro beam and surface analysis techniques; neutron activation analysis, mass-spectrometry. Introduction to Analytical Techniques in Geochemical Exploration for U, Th. and RMRE. Preparation of anomaly maps. Interpretation of data.

UNIT - V

Case histories of geochemical surveys and integrated exploration programmes.

PRACTICALS:

Classical and rapid methods of sample analyses; Atomic absorption spectrometry; Inductively coupled plasma-atomic absorption spectrometry; X-ray fluorescence analysis; Energy dispersive X-ray spectrometry; X-ray diffraction analysis; micro beam and surface analysis techniques; neutron activation analysis, mass-spectrometry. Geochemical data maps and interpretation.
Model Question Paper

I – Semester.

ADVANCED, P.G. DIPLOMA IN MINERAL EXPLORATION AND RESOURCE EVALUATION

Paper – II, GEOCHEMICAL EXPLORATION

(Effective from the Admitted Batch of 2013-2014)

Time: 3Hrs                   Max. Marks: 85

Answer FIVE questions, choosing ONE from each Unit.

All questions carry equal marks.

UNIT-I

1. Write a detailed account on primary dispersion of elements and its use in mineral exploration.

   OR

2. Write any TWO of the following:
   a) Geochemical cycle.
   b) Mobility of elements.
   c) Secondary dispersion.

UNIT-II

3. Write a detailed account on Biogeochemical methods of exploration.

   OR

4. Write any two of the following:
   a) Hydro geochemical methods
   b) Litho geochemical methods.
   c) Geochemical surveys.

UNIT-III

5. Give the various methods of sample collection and advantages of various methods.

   OR

6. Write any TWO of the following:
   a) Geochemical data processing.
   b) Muck sampling.
   c) Drill hole sample.

UNIT-IV

7. Give a brief account on various instruments useful for geo-chemical analysis.

   OR

8. Write any TWO of the following:
   a) Preparation of anomaly maps.
   b) Interpretation of data.
   c) XRF analysis.

UNIT-V

9. Give a detailed account on exploration of sulfide deposits with case studies.

   OR

10. Write any TWO of the following:
    a) Exploration of Chromite deposits.
    b) Exploration of Bauxite deposits.
    c) Exploration of Manganese deposits.
ADVANCED, P.G. DIPLOMA IN MINERAL EXPLORATION AND RESOURCE EVALUATION

PAPER-III, GEOPHYSICAL EXPLORATION

I – SEMESTER.

UNIT - I

Gravity Method of Exploration:

The Earth’s gravity field, the force of gravity on the surface of the Earth, the figure of the earth, geoid, spheroid and international Gravity formula, establishment of gravity bases, drift correction, principles of Gravity instruments, Reduction of gravity data, free air and Bouguer anomalies, preparation of gravity anomaly maps and their interpretation in terms of shape, size and depth.

UNIT –II

Magnetic Method of Exploration:

Earth’s main magnetic field, Origin and temporal variations, Geomagnetic elements, magnetic moments, intensity of magnetization and induction, magnetic potential and its relation to field, Principle of magnetic prospecting instruments, field surveys and data reduction, preparation of magnetic anomaly maps and their quantitative interpretation. Magnetic anomalies due to simple pole and dipole, introduction to aeromagnetic surveys.

UNIT – III

Electrical Method of Exploration:

Principle of electrical Methods of prospecting, Different types of electrode arrays, field procedure, profiling and sounding application in ground water prospecting and civil Engineering applications.

UNIT- IV

Seismic Method of Exploration:


UNIT-V

Case studies:
Petroleum, Natural gas, Coal, Ground water, and other Minerals.

PRACTICALS

Processing and interpretation of Gravity, Magnetic, electrical and seismic data.
Model Question Paper
I – Semester, Advanced Post P.G. Diploma Course in
Mineral Exploration AND RESOURCE EVALUATION
Paper – III, GEOPHYSICAL EXPLORATION
(Effective from the Admitted Batch of 2013-2014)

Time: 3Hrs                Max. Marks: 85
Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.

UNIT-I
1. Write an essay on the preparation of gravity anomaly maps and their interpretation.

OR

2. Write any TWO of the following:
   a) Geoid, spheroid and international gravity formula.
   b) Drift correction.
   c) Free air and Bonguer correction.

UNIT-II
3. Define geomagnetic elements and draw neatly their vectorial representation. Give the mathematical relationships between different geomagnetic elements. Also discuss the origin of magnetic anomalies.

OR

4. Write any TWO of the following:
   a) Magnetic anomaly maps.
   b) Aeromagnetic surveys.
   c) Working principle of magnetometers.

UNIT-III
5. Describe the basic principles of resistivity method and write in detail about ground water prospecting using resistivity methods.

OR

6. Write any TWO of the following:
   a) Electrical methods of prospecting.
   b) Sounding application in ground water prospecting.
   c) Electrical arrays.

UNIT-IV
7. What is Geophone, Draw a neat sketch and explain in detail.

OR

8. Write notes on any TWO of the following:
   a) Principles of wave propagation.
   b) Recording of seismic data.
   c) Interpretation of Seismic data.

UNIT-V
9. Write in detail the application of geophysical methods in hydrocarbons exploration.

OR

10. Write notes on any TWO of the following:
    a) Case studies on Coal exploration.
    b) Case studies on Ground water exploration.
    c) Case studies on Economic minerals exploration.
SYLLABUS

ADVANCED, P.G. DIPLOMA IN MINERAL EXPLORATION AND RESOURCE EVALUATION

PAPER-IV, MINERAL RESOURCE EVALUATION AND MODELLING

I – SEMESTER.

UNIT – I


UNIT- II


UNIT-III


UNIT-IV


UNIT – V

Modelling techniques. Demand analysis, analysis of time scale data; analysis based on land use, macroeconomic variations, econometric model.

PRACTICALS

Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.

UNIT-I

1. Explain in detail about the Geometrical methods of reserves estimation.
   OR

2. Write short notes on any TWO of the following:
   a) Classification of Coal resources.
   b) Isochore method of reserves estimation.
   c) Marginal resources.

UNIT-II

   OR

4. Write short notes on any TWO of the following:
   a) Geological image interpretation.
   b) Interaction of EMR with earth surface features.
   c) Terrain elements used for image interpretation.

UNIT-III

5. What are spatial data models. Discuss the advantages and disadvantages of different models.
   OR

6. Write short notes on any TWO of the following:
   a) Different Modules in Arc GIS.
   b) Spatial Modelling.
   c) Data integration in GIS for Mineral targeting.

UNIT-IV

7. Explain the types and geological applications of Factor Analysis.
   OR

8. Write short notes on any TWO of the following:
   a) ANOVA.
   b) Discriminant Analysis.
   c) Probability distribution.
   OR

9. Discuss in detail about econometric modeling technique.

UNIT-V

10. Write short notes on any TWO of the following:
    a) Macroeconomic variations.
    b) Analysis of time scale data.
    c) Demand analysis.
Annexure I

ADVANCED P.G. DIPLOMA IN
MINERAL EXPLORATION AND RESOURCE EVALUATION

Organized by: Geology Department, Andhra University and GSI Training Institute, Hyderabad.

Duration of the Course: One year.

Eligibility: P. G. in Geology & Geophysics

No. of Seats: 24+6 Foreigners

Ratio of the seats: 2:1 Geology: Geophysics

Reservation for A.U. students: 25% of the seats – 6 (Geology – 4: Geophysics – 2)

Mode of admission: Based on the marks obtained in PG courses

Responsibilities of the A.U.: Admission
: Evaluation of papers
: Award of Diploma and assistance in placement

Responsibilities of the GSI: Teaching and Field Project supervision and all Academic activities.

Tuition Fee: Rs. 20,000/- per annum.

To Andhra University:
: Admission Fee & Examination Fee
: Tuition Fee: 50% to A.U

To GSI Training Institute:
: Tuition Fee: 50% to GSI Training Institute.
: Project Field work expenses (Boarding and Lodging) will be borne by individual students. Necessary logistics for field work (exploration and surveys) will be arranged by GSI TI.

Project expenses in II Semester: To be borne by the candidate.

Course Commencement: Academic session starts in the first week of July.

Field training: Regional traverses, guided mapping and independent mapping in selected blocks like Chitradurga (gold/ copper/ iron) / Wajrakarur (diamond and gold)/ Kothagudem (Coal/iron ore)/ Garividi (manganese/ bauxite /dimension stone), etc.