CHOICE BASED CREDIT SYSTEM IN P.G.COURSES

M.Sc. GEOPHYSICS

Scheme of Instructions and Examination
Effective from the Academic Year 2022-2023

CENTRE OF EXPLORATION GEOPHYSICS
DEPARTMENT OF GEOPHYSICS
OSMANIA UNIVERSITY
HYDERABAD 500 007
2022-23

OSMANIA UNIVERSITY

CHOICE BASED CREDIT SYSTEM IN P.G.COURSES

CENTRE OF EXPLORATION GEOPHYSICS,
DEPARTMENT OF GEOPHYSICS, HYDERABAD-500007.

M.Sc. Geophysics, I Year I Semester

Scheme of Instructions and Examination
(Effective from the Academic Year 2022-2023)

Duration: 16 Weeks Max. Marks: 650 / Max. Credits: 21

Theory:

S.No.	Subject Code	Subject	Instruction Hrs/Week	Exam. Duration	Max Marks		Total Marks	Credits
					Int. Asses.	Sem. Exam		
1	GP101T	Basic Geology	4	3	20	80	100	4
2	GP102T	Physics of the Earth	4	3	20	80	100	4
3	GP103T	Seismology	4	3	20	80	100	4
4	GP104T	Theory of Fields	4	3	20	80	100	4
Total			**16**	**12**	**20**	**320**	**400**	**16**

Practicals:

S.No.	Subject Code	Subject	Instruction Hrs/Week	Exam Duration	Marks Total	Credits
1	GP151P	Basic Geology	2	2	50	1
2	GP152P	Physics of the Earth	2	2	50	1
3	GP153P	Seismology	2	2	50	1
5	GP154F	Surveying and Geological Field Work	8	Viva-Voce	100	2
		Total:	**20**		**250**	5

Note:

1. Practical Examination will be conducted at the end of each Semester. Every Practical Examination will be of 50 marks.
2. Field Work: At the end of the I year 1st Semester the students will submit a Field Report on the Field work in Surveying and Geological field work (GP 155 F) conducted in 1st Semester. The field reports are assessed by conducting a viva-voce consisting of a Committee (External Examiner, HOD, Chairman BOS and concerned teacher), the marks are awarded for their performance.
3. The student will have to pay a sum of Rs.1,500/-per annum to the University at the time of admission and at the beginning of II year III rd Semester along with University Fee for field training.

M. Sc. GEOPHYSICS I YEAR I SEMESTER

Subject: BASIC GEOLOGY

Course No: GP101T Max Marks: 100/Max Credits: 04

Unit-I

(PHYSICAL GEOLOGY)

Introduction: Definition of Geology -Basic principles of Geology – its relationship with other sciences Different branches of Geology – Aim and applications of Geology. Origin of the earth - brief review of different theories.

Weathering of rocks: Agents and Types of weathering.

Rivers: Source and surface flow of water-erosion, transportation and development of landforms by deposition – V- shaped valleys, river capture phenomena. rapid, water fall, alluvial fan, meander, ox Bow Lake, flood plain.

Oceans: Introduction, Resources. Potential

Mountain: Types, causes of mountain building, horst, graben.

Volcanoes: Parts of typical volcano, products of volcano, types of volcanic eruptions,

Unit-II

(ROCK TYPES AND MINERALOGY)

Crystallography:

Definition of a crystal – Amorphous and crystalline states. Morphology of crystals: Face, edge, solid angle, interfacial angle.

Form: Simple, combination, closed, open pinacoid, prism – pyramid and dome. Symmetry **Elements:** Plane of symmetry, axis of symmetry, centre of symmetry, Crystallographic axes, parameters, indices, crystallographic notation, parameter systems of Miller, law of rational indices, classifications of crystals into 7 systems.

Mineralogy:

Definition of mineral – Classification of mineral into rock forming and ore forming minerals.

Physical Properties of Minerals: Colour, streak, transparency, lustre, luminescence, Fluorescence, Form, hardness, cleavage, fracture, specific gravity, magnetic properties.

Optical properties of minerals: Elementary concepts of optics, simple harmonic motion, amplitude, period, wave length, phase, polarized light, isotropic and anisotropic. Substances, reflection, refraction, Nicol prism and its construction, concepts of crossed Nichols, petrological microscope, its mechanical and optical parts, behaviour of isotropic and anisotropic minerals under crossed Nichols, pleochroism, absorption, interference Colours andextinction.

Mode of mineral formation: Occurrence and association of minerals, chemical properties of minerals – isomorphism – solid solution – polymorphism, mineral formation and silicate structure.

Descriptive Mineralogy: Study of physical, chemical and optical properties and mode of Occurrence of followingminerals:

Olivine, Augite, Hypersthene, Hornblende.Actinolite, Orthoclase, Microcline, Albite, Quartz, Biotite, Muscovite, Garnet (Almandine), chlorite, Calcite, Talc, Tourmaline, Beryl corundum, Kyanite andMagnetite.

Unit-III

(IGENEOUS ROCKS)

Introduction: Definition of rock, chemical composition of the curst, classification of Rocks-igneous sedimentary and metamorphic rocks.

Igneous Rocks: Classification into plutonic, hypabyssal and volcanic rocks. Forms of igneous rocks. Lava flows, sill, lacolith, lopolith, dyke, cone, sheet ring dyke, volcanic neck, Phacolith, Botholith, structures: vesicular, amygdaloidal, block and ropy lava, pillow:

Textures: Definition of texture, microstructure, allotromorphic, hypidiomorphic, Panidiomorphic, ophitic, intergranular, porphyritic, poikilitic, intersectral and intergranular, Classification of igneous Rocks

Origin of Igneous Rocks: Bowen's reaction principle, differentiation and assimilation.

Descriptive study of following igneous rocks: Granite, granodiorite, syenite, porphyritic granite, Pegmatite gabbro, dunite, peridotite, dolerite, rhyolite, obsidian and basalt.

Unit-IV

(SEDIMENTARY AND METAMORPHIC ROCKS)

Sedimentary Rocks: Introduction, mode of formation source, Transportation and deposition, classification of Sedimentary rocks, Structures and textures of sedimentary rocks,

Brief description of the following sedimentary rocks:

Conglomerate, breccia, sandstone, greywacke, shale, limestone, dolomite, Shelly and limestone.

Metamorphic Rocks:

Introduction: Definition, Types and agents of metamorphism; structure and textures of metamorphic rocks – grades and zones of metamorphism.

Brief description of the following metamorphic rocks: Quartzite, marble, slate, phyllite, schist, gneiss, charnockite and Khondalite.

Recommended Books:

1. Arthur Holmes, 1978, Principles of physicalGeology.
2. Rutleys, 1991, Elementary of Mineralogy – Revised by Gribble, C.D. CBS, Publishers andDistributors.
3. Tyrrell, G.W. 1975, The Principles of Petrology B.I.Publications.
4. Hueng, W.T., Petrology 1962, McGraw HillCo.,
5. Wingley, B.F. 1995, The Evolving Continent New York. John Wiley and
6. Pars Canilic, K.C., 1977, Plate tectonics and Crustal evolution – (*) Butter worth Heinemann

M. Sc. GEOPHYSICS I YEAR I SEMESTER

Subject: PHYSICS OF THE EARTH

Course No: GP102T Max Marks: 100/Max Credits: 04

Unit-I

Introduction to Geophysics: Geophysics and its importance among earth Sciences.

Solar system: Earth as a member of the solar system, basic facts relating to the earth's position in the solar system.

Geospheres: Scope of study of various Geospheres, Atmosphere, Ionosphere, Asthenosphere, lithosphere-hydrosphere and Biosphere. Meteorology and Hydrology.

Atmosphere: Constituent, vertical structure, weather analysis and fore casting.

Unit-II

Gravity field: Gravity field and its variations on the surface, internal and external Field, Geoid, spheroid and Ellipsoid of the earth. Shape and size of the earth.

Geomagnetic field: Magnetic elements and description of the magnetic field, Origin and Reversals of the magnetic field.

Paleomagnetism: Natural Remnant Magnetisation, Measurement of direction and intensity of NRM. Continental drift and polar wonder curves.

Geothermics: Heat sources, Geothermal flux distribution over continents and oceans.

Geochronology: Rock dating methods, U-Th, K-Ar, Rb-Sr, C-14, Fission-Track and magnetic dating.

Unit-III

Petrophysics: Different physical and Engineering properties of rocks Laboratory measurements of the physical properties of rocks namely Density, Seismic wave velocities, magnetic susceptibility, Electrical resistivity, thermal conductivity, porosity and permeability.

Concepts of Geodynamics: Plate tectonics/geodynamics hypothesis; plate boundaries and seismicity. Heat flow mechanisms, thermal modeling of earth, core-mantle convection and mantle plumes.

Unit-IV

Oceanography:Physical properties of seawater and methods of determination, distribution of salinity in the oceans, factors affecting salinity, water masses and water type, TS Diagram, Ocean Waves & Tides (Circulation of currents in major ocean waves. Tidal Waves, driven tidal waves, seiches, geostrophic effect on tidal waves, internal tidal waves, surface waves, permanent waves, waves due to local disturbances, equilibrium theory of tides, dynamic theory of tides). Marine pollution, steps to control marine pollution.

Recommended Books:

1. P.V. Sarma, 1976, Geophysical Methods in Geology, Elsevier.
2. Howell, 1959, Introduction to Geophysics, McGraw Hill Book Co. New York.
3. R.E. Sheriff, 1989, Geophysical Methods. Prentice Hall Engle Wood Cliffs.
4. New Jerssy.
5. I.K. Kaul, S. Senugupta and A.K. Bhattacharya, 1990, General and Applied Geophysics, (An introduction), Associate of Exploration Geophysicists, Hyderabad.
6. F.D. Stacey, 1977, Physics of the Earth, John Wiley and Sons, New York.
7. Rezhevisky and Novik, 1971, Physical properties of Rocks, Mir Publications.
8. Richter, C.F. 1969, Elementary Seismology, Eurasia Publishing house, Pvt. Ltd. New Delhi

M. Sc. GEOPHYSICS I YEAR I SEMESTER

Subject: SEISMOLOGY

Course No: GP103T Max Marks: 100/Max Credits: 04

Unit-I

Introduction to Seismology and phenomena of earthquake and its effects.Stress-Strain-Displacement, Body waves: P and S waves, Ray theory, Wave amplitude, Energy and Geometric spreading, Partitioning of seismic Energy at a boundary, Attenuation and scattering, Surface waves: Rayleigh waves, Love waves, Dispersion, Attenuation of surface waves.

Unit-II

Instruments: Inertial pendulum systems, Electromagnetic instruments, Force-Feedback instruments, seismic arrays and regional network, Amplitude and phase characteristics of seismometers, short-period, long-period and broad-band seismometers, analog and digital seismograms. Seismic data recorders.

Unit-III

Seismogram interpretation: Body-Wave nomenclature, Surface-Wave nomenclature, Travel-Time curves, Location of earthquakes (hypocenter and epicenter) and origin time. Seismic Sources, Types of faults, focal mechanisms and fault plane solutions. Source spectrum.Various magnitude scales and their limitations, seismic moment, stress drop and dimension of rupture during earthquakes. Intensity scales. Frequency- Magnitude (b value). Velocity Structure and Vp/Vs study.

Unit-IV

Plate tectonics, earthquake occurrence processes, elastic rebound theory, Great earthquakes and their effects, Great Indian earthquakes,Paleo seismology, Seismic hazard assessment, Strong ground motion prediction through probabilistic and deterministic analysis, Seismic hazard maps, Seismic Micro zonation, Vulnerability analysis, Seismic risk, Geotechnical analysis.

Recommended Books:

1. Fundamentals of Geophysics, William Lowrie
2. An Introduction to Seismology, Earthquakes and Earth structure By Stein &Wysession
3. Engineering Seismology By Agarwal
4. Modem Global Seismology, Thorne Lay and Wallace
5. Internal Constitution of the Earth By Gutenberg
6. Introduction to Seismology by Bath
7. The Earth, Jeffreys.S.H.
8. Elementary Seismology, Charles.F. Richter
9. An introduction to the theory of seismology, Bullen. K.E. and Bolt
10. Quantitative seismology: theory & methods, Aki. K. and Richards
11. Online material

M. Sc. GEOPHYSICS I YEAR I SEMESTER

Subject: THEORY OF FIELDS

Course No: GP104T Max Marks: 100/Max Credits: 04

Unit-I

Mathematical and physical field, continuity, scalar and vectors, TensorsStatic fields in free space, Coulomb's law, Field intensity, line of force, charge density, curl of vector, Special FunctionsStokes theorem, Gauss's law, Gauss's divergence theorem, Poisson's and Laplace's equation. Electrical dipole, Double layer.

Unit-II

Conductors and Dielectrics: Nature of conductors and dielectrics, polar and non-polar dielectrics. Harmonic functions.Orthogonal curvilinear, spherical and cylindrical coordinates, Method of images, Green's theorem, Green's function, Green's equivalent stratum, Dirichlet and Neumann problems.Electric fields in conductors, Ohm's law in differential and integral forms, conductive current and displacements current, equation of continuity. Relation between resistance andcapacitance

Unit-III

Magnetic flux, Magnetic vector potential, induction in magnetic media, Relation between gravity and magnetic potentials .The H-field, magnetic susceptibility and permeability, boundary conditions.ferromagnetism, magnetic poles ,magnetic scalar potential.

Unit-IV

Electromagnetic induction, law of inductions, Electric and magnetic energy densities, displacement currents, electromagnetic energy and pointing theorem. Maxwell's equations and electromagnetic waves, The wave equation, the waves in conducting media, Vector and scalar potentials of an electromagnetic field. Electromagnetic radiation from an oscillating dipole

Recommended Books:

1. Introduction to theory of fields by V. L. S. Bhimasankaram, G.A, Soloviev and S.V. SeshagiriRao1973.

2. Theory of Elasticity by Soloviev.G.A. Geophysical Field theory and method. Gravitational, electric and magnetic fields. Academic press. Alexander A. Kaufman, 1992.

M. Sc. GEOPHYSICS I YEAR I SEMESTER

Subject: BASIC GEOLOGY

Course No: GP151P Max Marks: 50/Max Credits: 01

Practicals:

Crystallography: Study of the following crystal models.

S. No.	Crystal Model	S. No.	Crystal Model
1	Cube	6	Hexagonal prism withpinacoids
2	Octahedron	7	Hexagonalpyramid
3	Dodecahedron	8	Orthorhombic prism withpinacoids
4	Tetragonal prism withpinacoids	9	Monoclinic pinacoids
5	Tetragonalpyramid	10	Triclinic pinacoids

Mineralogy: Study of the following rock forming minerals:

S. No.	A. Megascopic	S. No.	A. Megascopic	S. No.	B. Microscopic
1	Olivine	11	Microcline	1	Quartz
2	Augite	12	Plagioclase	2	Orthoclase
3	Hypersthene	13	Tourmaline	3	Microcline
4	Enstatite	14	Epidote	4	Plagioclase
5	Hornblende	15	Corundum	5	Biotite
6	Quartz	16	Apatite	6	Muscovite
7	Muscovite	17	Calcite	7	Hornblende
8	Biotite	18	Beryl	8	Augite
9	Garnet	19	Gypsum	9	Olivine
10	Orthoclase	20	Talc	10	Garnet

Petrology: Study of the following Rock Types:

S. No.	Megascopy of Rocks	S. No.	Thin Sections of Rocks	
1.	Granite (Pink &Grey)	1.	Granite	
2.	Syenite	2.	Gabbro	
3.	Pegmatite	3.	Dolerite	
4.	Gabbro	4.	Basalt	
5.	Basalt	5.	Sand stone	
6.	Sand stone	6.	Marble	
7.	Gneiss			
8.	Schist			
9.	Marble			
10.	Charnockite			
11.	Khondalite			

M. Sc. GEOPHYSICS I YEAR I SEMESTER

Subject: PHYSICS OF THE EARTH

Course No: GP152P Max Marks: 50/Max Credits: 01

Practicals:

1. Computations on the shape and size of the earth.
2. Analysis of radiometric data. Determination of ages of rocks.
3. Statistical Analysis of physical properties of Rocks.
4. Laboratory measurements of physical properties ofrocks.
   a) Density
   b) Seismic wavevelocity
   c) Magnetic susceptibility
   d) Electricalresistivity
   e) Porosity

M. Sc. GEOPHYSICS I YEAR I SEMESTER

Subject: SEISMOLOGY

Course No: GP153P Max Marks: 50/Max Credits: 01

Practicals:

1.
2. Identify P- and S-phases on the seismogram. Estimate i) ts-tp, ii), and iii) Md. Interpret the characteristic features of the earthquake event.
3. Identify the various phases for both body and surface waves on the given three components record. Locate the earthquake also.
4. Find the locations of the two earthquakes whose travel-time parameters are given in the following table. Identify the origin time and focal depth of each earthquake. Consider the velocity of P-wave, VP = 6.0 km/sec.
5. Identify all the phases on the teleseismic record.
6. Interpretation of Earthquake records.

M. Sc. GEOPHYSICS I YEAR I SEMESTER

Subject: SURVEYING GEOLOGICAL FIELDPRACTICE

Course No: GP154F Max Marks: 50/Max Credits: 01

Hands on Training:

1. **Introduction:** Definition; principles; types and various applications of surveying; Field and office work; Scale of a map or plan. Study ofToposheet
2. **Linear Measurements:** Distance measurements, sources of errors and corrections in linear measurements. Chain surveying, Fieldwork and plotting, obstructions in chain surveying, measurement ofoffsets.
3. **Direction measurement:** Bearing and its types, determination of magnetic bearing, prismatic compass, declination, compass survey.
4. **Leveling:** Determination of levels, Levelling-definition, principle, method and classification. Instruments levels and levelling staff, their construction, use and adjustment, sources of errors and precautions. Contours and contouring methods anduses.
5. **Surveying with GPS:** Determination of positions: Total station-principles; GPS- principles and its uses.

CHOICE BASED CREDIT SYSTEM IN P.G.COURSES
CENTRE OF EXPLORATION GEOPHYSICS,
DEPARTMENT OF GEOPHYSICS, HYDERABAD-500007.
M.Sc. Geophysics, I Year II Semester
Scheme of Instructions and Examination
(Effective from the Academic Year 2022-2023)

Duration: 16 Weeks Max. Marks: 650 / Max. Credits: 21

Theory:

S.No.	Subject Code	Subject	Instruction Hrs/Week	Exam. Duration	Max Marks		Total Marks	Credits
					Internal Asses.	Semester Exam		
1	GP201T	Applied Geology	4	3	20	80	100	4
2	GP202T	Magnetic Methods	4	3	20	80	100	4
3	GP203T	Electrical Methods	4	3	20	80	100	4
4	GP204T	Seismic Methods	4	3	20	80	100	4
Total:			**16**	**12**	**80**	**32**	**400**	**16**

Practicals:

S.No.	Subject Code	Subject	Instruction Hrs/Week	Exam. Duration	Marks	Credit
1	GP251P	Applied Geology	2	2	50	1
2	GP252P	Magnetic Methods	2	2	50	1
3	GP253P	Electrical Methods	2	2	50	1
4	GP254P	Seismic Methods	2	2	50	1
5	GP255F	Field Work (Geological and Geophysical-1)	3	Viva-voce	50	1
Total			**11**	**-**	**250**	**5**

Note:

1. Practical Examination will be conducted at the end of each Semester. Every Practical Examination will be of 50 marks.
2. Field Work: At the end of the I year 2nd Semester the students will submit a Field Report on the Field work in Geological and Geophysical Field work-1 – (GP255 F) conducted in the 2nd Semester. The field reports are assessed by conducting a viva-voce consisting of a Committee as (External Examiner, HOD, Chairperson BOS and concerned teacher), and the marks are awarded for their performance.
3. **The student will have to pay a sum ofRs.3000/-per annum**to the University at the time of admission and at the beginning of I year IInd Semester along with University Fee for field training.
4. It is mandatory for the students to undertake geological field training programme organized at a suitable location for a week's duration during/end of the IInd Semester.

M. Sc. GEOPHYSICS I YEAR II SEMESTER

Subject: APPLIED GEOLOGY

Course No: GP201T Max Marks: 100/Max Credits: 04

Unit-I

(STRUCTURAL GEOLOGY)

Definition of Structural Geology: objectives of structural geology-primary and secondary structures; bed, bedding planes, outcrop, attitude of beds, strike, dip and apparent dip.

Folds: parts of a folds, nomenclature of folds: Anticline, syncline, symmetrical fold, asymmetrical fold, overturned fold, recumbent fold, isoclinal fold.

Recognition of Folds in the Field: Direct observation, inferred folds, plotting attitude of beds on a map, aerial map pattern, drilling, mining and Geophysical methods, Determination of top of beds by primary features. Ripple marks, cross bedding, graded bedding, sole markings, local unconformities and related features.

Joints: Definition, geometric and genetic classification.

Faults: Terminology of fault plane; nature of movement along faults: Translational and rotational movements, relative movements, Effects of disturbed strata. Throw and heave; Classification: Geometrical classification, Genetic classification. Classification based on absolute movements.

Recognition of Faults in the Field: Discontinuity of structures, repetition and omission of strata's, features characteristics of fault plane, silicification and mineralization, physiographic criteria.

Unconformities: Types of unconformities, local unconformity, angular unconformity, nonconformity and disconformity.

Unit-II

(STRATIGRAPHY AND INDIAN GEOLOGY)

Introduction and Principles of Stratigraphy: Standard Geological time scale, Principles of correlation Physiographical sub-divisions of India.

A brief study of area, distribution Lithology and economic importance of the following geological groups of India.

Dharward;	Cuddapah;
Kurnool;	Gondwana;
Deccan Traps;	Vindyans;
Bundhelkhand and	Singhbum.

Unit-III

(ECONOMIC GEOLOGY)

Introduction: Ore minerals, gangue, ore and ore deposits. Syngenetic and epigenetic mineral deposits.

Ore genesis: A brief outline of the following types of deposits and their characteristics features.

Magmatic &Hydrothermal deposits: Formation of Chromite, magnetite ,Formation and migration of hydrothermal solutions. Causes of precipitation of ore minerals.Cavity filling and replacement deposits.Classification of hydrothermal deposits.Hydrothermal alteration.Formation of Copper, Lead Lime, Gold, Diamond and barite deposits.

Sedimentary & Residual deposits: Source, solution transportation and deposition.

Formation of bauxite deposits.

Unit-IV

(PETROLEUM GEOLOGY)

Introduction to the theory of plate Tectonics.

Basin Development – Introduction – Classification of Litho-units.

Petroleum Geology: Reservoir rocks-classification, hydrocarbon traps, origin of petroleum, Chemical composition and physical properties of petroleum crude, migration of oil and gas, gas hydrates, Petroliferous basins of India, Coal bed methene.

Recommended Books:

1. Billings, M.P.1974, Structural Geology, PrinticeHall.
2. Krishnan, M.S. 1982 Geology of India and Burma CBSPublishers.
3. Carotic, K.C. 1977, Plate Tectonics and Crustal Evaluations, Butterworth – Heinemann.
4. Best, Myron G., 1986 Igneous and Metamorphic Petrology CBS Publishers and Distributors.
5. Jenson, M.L. and Bateman, A.M. 1981, Economic Mineral Deposits – John Wiley&Sons
6. Kreiter, V.M. 1965, Geological Prospecting and Exploration, Mirpublications.
7. Krishnaswamy S., 1972, India's Mineral Resources – Oxford & IBII PublishingCo.,
8. Dutt, N.V.B.S., 1986, Geology and Mineral Resources of Andhra Pradesh., N.R.D.C.S., Ltd.

M. Sc. GEOPHYSICS I YEAR II SEMESTER

Subject: MAGNETIC METHODS

Course No: GP202T Max Marks: 100/Max Credits: 04

Unit-I

Principles of Magnetic method, Magnetic field of the earth &its Variation in space and time. Concept of Magnetic potential and field Poisson's relation.Magnetic elements.Factors contributing to the main Magnetic fields of the earth. Magnetic properties of rocks and minerals –Para–Dia and Ferro magnetism, Paleomagnetism

Unit-II

Introduction to the working principles of modern Magnetometers (Fluxgate, Proton Precession & Optical pumping (Rb,Cs)) Magnetic survey procedures on land, marine and air borne.Satellite magnetic data.IGRF.Scales of Surveys, Accuracy, Corrections to magnetic data.

Unit-III

Qualitative interpretation. Regional-Residual separation by different methods Derivatives and Continuation techniques, calculation of second derivatives, Reduction to pole

Unit-IV

Quantitative analysis of magnetic data. Concepts of forward & inverse modeling ,Magnetic anomaly expressions over simple magnetic bodies. Structure calculation and Spectral analysis for depth estimation, Ambiguity in magnetic interpretations.

Application of magnetic method in

i) Regional, Geological and Structuralproblems
ii) Mineral& Hydro carbon Explorationand
iii) Groundwater and Engineeringproblems.

Recommended Books:

1. B.S.R. Rao and IVR Murthy, 1978, Gravity and Magnetic Methods of Prospecting Arnold – Henniman Publishing Company, Delhi.390P.
2. D.S. Parasnis 1973, Mining Geophysics, Amsterdam, Elsevier Publishers, The Netherlands, 354 P.
3. Edwin S. Robinson and CahitCoruh, 1988 Basic Exploration Geophysics John Wiley & Sons, New York Toronto/Brisbane/Singapore, 562P.
4. Grant F.S. and West G.F. 1964, Interpretation Theory in Applied Geophysics McGra Hill Publication, New York.
5. I.V.Radhakrishna Murthy & D.C. Mishra – 1989, Gravity and Magnetic Anomalies in space and Frequency domain. AEG Publications.
6. I.V.Radhakrishna Murthy 1998, Gravity and Magnetic Interpretation in Exploration Geophysics. Geological Society of India, Bangalore.363P.
7. L.L. Nettleton, 1976, Gravity and Magnetics in Oil Prospecting McGraw Hill Publication, New York.464P.
8. S Mares et al., 1984, Introduction to Applied Geophysics D. Reidel Publishing Company, Dordrecht Boston.581p.
9. S.H. Ward (Ed.), 1967, Mining Geophysics, Vol. I and Vol. II SEG Publication. Tulso, Oklahoma, USA.
10. Telford, W.M. Geldart. L.P. Sheriff, R.E. and Keeves. D.A. 1981 Applied Geophysics, Cambridge University Press Cambridge, U.K. 860P.
11. V.L.S. Bhimasankaram& V.K. Gaur, 1978, Lectures and Exploration Geophysics AEG, Publications, CEG, O.U.Hyderabad.

M. Sc. GEOPHYSICS I YEAR II SEMESTER

Subject: ELECTRICAL METHODS

Course No: GP203T Max Marks: 100/Max Credits: 04

Unit-I

Basic Principles of electrical methods of prospecting. Classification of methods. Electrical properties of rocks and minerals Influence of (1) mineral composition (2) moisture and salinity (3) Temperature on resistivity.

DC methods of laboratory determination of resistivity. Two electrode, four electrode and bridge methods.

Basics of theory of DC Propagation in resistivity methods. Flow of current through the earth media- Description of the potential and electrical field due to simple source of current (monopole, dipole and linear sources). Current distribution. Solution of Laplace equation in layered media.

Unit-II

Basics of Resistivity methods of prospecting: Concepts of True and Apparent resistivities. Two electrode, Three electrode Dipole, Schlumberger, Wenner arrays and their Geometric factors, Principle of reciprocity.

Electrical Profiling (EP): Basics of electrical resistivity profiling. Response of EP with, Two electrode, Three electrode, Dipole- Dipole, Schlumberger &Wenner arrays over a vertical contact. The Unipole, combined and Schlumberger arrays and their use in different cases of prospecting, double and multi separation profiling. Field procedure and illustration of results and interpretation.

Unit-III

Vertical Electrical Sounding (VES): Apparent Resistivity over a layered earth. Master curves for Schlumberger arrays- Types of two, three and multiplayer VES curves. Principles of Equivalence and Principle of suppression. Construction and interpretation of VES curves by graphical (Curve matching) and Computer technique (Resistivity transforms, principles of linear digital filtering). Field procedures and examples of applications.

Buried electrode method: Principle of operation of charge body (buried electrode) method & its uses Resistivity imaging: Some fundamental concepts. Methods in resistivity imaging, field survey & uses.

Unit-IV

Electrochemical Methods: Origin and nature of electro-chemical processes (spontaneous polarization) in the earth. exploration of sulphide ore bodies. Typical responses over sphere and rod like bodies. Field procedure for S.P. surveys and interpretation techniques.

Geological applications:

Induced Polarization (IP) Method: Introduction, sources of IP, membrane and electrode polarizations, Time domain and Frequency domain measurement of IP, chargeability, percent frequency effect and metal factors, apparent chargeability over layered earth.Field Procedure, Simple Interpretation Techniques and Applications of IP Methods.

Recommended Books:

1. E.I. Parkhomenko – 1967 Electrical Properties of Rocks – Plenum Press, NewYork.
2. Keller and Frischkeicht, 1966, Electrical methods in Geophysical Prospecting Pergaon.
3. Telford W.N., Geldart, L.P. Sheriff, R.F. and Keys, D.A., 1985 Applied Geophysics, Cambridge Univ. Press.
4. Stanislav Mares et al..1984, Introduction to Applied Geophysics, D. Reidel Publishing.
5. D.S. Parasnis, 1977, Introduction to Applied Geophysics, Published by Chapman &Hall, London.
6. Patra and Bhattacharya 1969, Direct Current Geoelectrical Sounding, Elsevier.
7. Koefeed C, 1980, Principles of Geoelectrical Soundings, Elsevier.
8. Ward S.H., 1969 Mining Geophysics, SEG.
9. Electrical Imaging surveys for environmental and engineering studies by M.H.Loke

M. Sc. GEOPHYSICS I YEAR II SEMESTER

Subject: SEISMIC METHODS

Course No: GP204T Max Marks: 100/Max Credits: 04

Unit-I

Historical Development and Background of Refraction and Reflection Methods, Difference between Refraction and Reflection Surveys, Propagation of Seismic Waves in Linear and Nonlinear medium, N Layered case, continuous increase of velocity. Waveforms and their characteristics, Elastic wave velocities in rocks,

Unit-II

Basics of Seismic data Acquisition systems, Explosive and Non Explosive sources Seismic operation on Land and sea, Grouping of Geophones and shot points, Recording formats.[SEG B,SEG C,SEG D &SEG Y], Different Types of Display of Digital and Magnetic Recordings, Wiggle Trace, Variable Area and Variable Density Records Telemetric Seismic systems, Common Depth Point technique, 2D, 3D and 4D Seismic, Vertical Seismic Profiling, Deep Seismic Sounding

Unit-III

Sequence of Digital Seismic data Processing, Seismic data reduction, Static and dynamic corrections Analysis of Multiples and Ghost Reflections, Processing of Seismic Data, Imaging, Time and Depth Sections, Seismic Inversion, Migration Techniques, Wave Equation Migration, Time and Depth Migration, Determination of Average Seismic Velocities, Synthetic Seismograms.Tomography.

Processing and interpretation of Refraction Seismic data – Methods based on first and later arrivals, Hidden layer.

Unit-IV

Application of Seismic methods in Hydrocarbon, Mining, Groundwater and Engineering studies. Mapping of Geological Structures (Faults, Reef, Pinchouts, Anticlines), Depositional Sequence and Pit Falls of Seismic Interpretations, Seismic Stratigraphy and Sequence Analysis, Seismic Facies Analysis, Reflection Character Analysis, Bright Spots, Seismic Lithologic Modelling, Vp/Vs and Lithology, AVO Analysis.

Recommended Books:

1. AnsteyN.A., 1971, Seismic Prospecting Instruments Vol, II.GebrudevBorntraege Stuttgart.
2. Att. Balch and M.W. Lee, 1984, Vertical Seismic Profiling. Technique, Applications and case histories, D. Reidal Publishing Company, Boston,USA.
3. Dobrin M.B. Savit C.H. 1988 Introduction to Geophysical Prospecting. Mc. Graw Hill Book Company,Singapore.
4. Evenden B.S. and Stone, D.R., 1971, Seismic Prospecting Instruments, GebrudevBorntraege, Berlin,Stuttgart.
5. Gurvitch, II, Seismic Prospecting, MirPublications.
6. Robinson, E.A., 1988, Migration of Seismic data SEGPublication.
7. Sheriff R.E. 1989, Geophysical Methods, prentice Hall, Englewood cliffs, NewJersey.
8. Sheriff R.E. and Geldart L.P. 1987 Exploration Seismology, Vol. II, Cambridge Univ.Press,Cambridge.
9. Sheriff, R.E. and Geldart, L.P. 1987 Exploration Seismology, Vol. I, Cambridge Univ. Press,Cambridge.
10. Telford, W.M., Geldart, L.P. Sheriff, R.E. and Keys, D.A. 1981, Applied Geophysics, Cambridge University Press,Cambridge.
11. Verma, R.K. 1986, Offshore Seismic Exploration Gulf PublishingCo.,
12. Yilmaz, O, 1987, Seismic Data Processing, SEGPublication.

M. Sc. GEOPHYSICS I YEAR II SEMESTER

Subject: APPLIED GEOLOGY

Course No: GP251P Max Marks: 50/Max Credits: 01

Practicals:

Structural Geology:

1. Calculation of true thickness ofstrata.
2. Calculation of true and apparentdips.
3. Three point problem.
4. Completion of outcrops in the geologicalmaps
5. Drawing cross sections of the geological maps with inclined strata, folds,faults, unconformities and theirinterpretation.

Economic Geology:

Megascopic study of the following ore minerals with special reference to their Diagnostic physical properties, composition, mode of formation, distribution and industrial applications.

1. Magnetite
2. Bauxite
3. Hematite
4. Talc
5. Galena
6. Gypsum
7. Chalcopyrite
8. Kyanite
9. Sphalerite
10. Pyrolusite
11. Muscovite
12. Psilomel
13. Barite
14. Graphiteand
15. Chrysotile(asbestos)

M. Sc. GEOPHYSICS I YEAR II SEMESTER

Subject: MAGNETICMETHODS

Course No: GP252P Max Marks: 50/Max Credits: 01

Practicals:

1. Reduction & Corrections of field magneticdata.
2. Preparing magnetic anomaly contour map from fielddata.
3. Regional-Residual separation by different methods inmagnetic.
4. Construction of magnetic profile on some simple geometric models. (Sphere, Cylinder & Faults)
5. Computations pertaining to basement depth estimation from magnetic data by Peters half slope method.
6. Interpretation of magnetic anomaly profile across adyke.
7. Upward & Downward Continuation of Magnetic fields.

M. Sc. GEOPHYSICS I YEAR II SEMESTER

Subject: ELECTRICAL METHODS

Course No: GP253P Max Marks: 50/Max Credits: 01

Practicals:

1. Calculation of normal field due to a point source and dipolesource
2. Calculation of normal field between two pointsource
3. Computation of Resistivity profiling curve with a Three Electrode Spread over a verticalcontact
4. Computation of Resistivity profiling curve with a Four Electrode Spread over a verticalcontact
5. Graphical construction of VEScurves
6. Analytical construction of VES curves
7. Application of Curve matching techniques in interpretation of VES curves
8. Computer interpretation of VES data
9. Computation and interpretation of S.P anomaly over a sphere
10. Computation and interpretation of S.P anomaly over a slab

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M. Sc. GEOPHYSICS I YEAR II SEMESTER

Subject: SEISMIC METHODS

Course No: GP254P Max Marks: 50/Max Credits: 01

Practicals:

(A) Computation:

1. Construction of travel time curves of direct and refracted waves (Horizontallayer)
2. Construction of travel time curves of direct and refracted waves (Dippinglayer)
3. Construction of travel time curves of reflected waves. (Horizontallayer).
4. Construction of travel time curves of reflected waves (Dippinglayer).
5. Processing and interpretation of given refractionseismograms.
6. Processing and interpretation of given reflectionseismograms.
7. Velocityanalysis.
8. Signal and noise statistics from seismic traces.

(B) Practical's:

1. Study of elements of seismic channel.
2. Study of the Seismic refraction reflectionunit.
3. Acquisition of shallow depth seismic refractiondata.
4. Processing and interpretation of acquired shallow depth Seismic refractiondata.

M. Sc. GEOPHYSICS I YEAR II SEMESTER

Subject: GEOLOGICAL and GEOPHYSICAL FIELD WORK-I

Course No: GP255F Max Marks: 50/Max Credits: 01

Fieldwork-I

GEOLOGY FIELD PRACTICE

1. Measurement of Dip, Strike using clinometers and Brintoncompass
2. Study of out crops. Identification of Rocks & their Structures i.e. Faults, Folds, Joints, and fracture detectionetc.
3. Preparation of Geological Map, showing Structures, Lithology & Other Geological features.

Note: Fieldwork will be conducted in a suitable location.

Field Report in Surveying Field Practice & Geological Field Practice will be submitted at the end of 2nd Semester.

GEOPHYSICAL FIELD PRACTICE

1. ElectricalMethods

a) Profiling

b) Vertical Electrical Sounding usingSymmetrical

c) Schulmberger 4- Electrode Configuration & RadialVES

d) SP Potential Profiling over a Geological target & RadialSP

2. Seismic Methods

a) Testing of Geophones & Recording Equipment including Identity.

b) Refraction Seismic Field Surveys.

3. Magnetic Methods

1 Acquaintance with Field Magnetometer & itsOperation.

2 Measurement of Diurnal Variation

3 Establishment of Base station. Reduction of Magneticdata

4 Magnetic Profiling across a chosen Geological contact

Note: Fieldwork will be conducted in O.U Campus only. The Fieldwork consists of acquisition, Processing & Interpretation of data by the respective methods. Field Report on Geophysical Field Practice -1 will be submitted at the end of 2nd Semester.

OSMANIA UNIVERSITY

CHOICE BASED CREDIT SYSTEM IN P.G.COURSES

CENTRE OF EXPLORATION GEOPHYSICS,

DEPARTMENT OF GEOPHYSICS, HYDERABAD-500007.

M.Sc. Geophysics, I Year III Semester

Scheme of Instructions and Examination

(Effective from the Academic Year 2022-2023)

Duration: 16 Weeks Max. Marks: 650 / Max. Credits: 21

Theory:

Sl. No.	Subject Code	Subject	Instruction Hrs/Week	Exam Duration	Max Marks		Total Marks	Credits
					Int. Asses.	Sem. Exam		
1	GP301T	Gravity Methods	4	3	20	80	100	4
2	GP302T	Electromagnetic Methods	4	3	20	80	100	4
3	GP303T	Signal Processing & Geophysical Inversion	4	3	20	80	100	4
4	GP304T	Electives: a. Mineral Exploration b) Hydrocarbon Exploration c) Radiometry & Nuclear Geophysics	4	3	20	80	100	4
Total:			**16**	**12**	**80**	**320**	**400**	**16**

Practicals:

Sl. No.	Subject Code	Subject	Instruction Hrs/Week	Exam Duration	Marks Total	Credits
1	GP351P	Gravity Methods	2	2	50	1
2	GP352P	Electromagnetic Methods	2	2	50	1
3	GP353P	Signal Processing & Geophysical Inversion	2	2	50	1
4	GP354P	Electives: a) Mineral Exploration b) Hydrocarbon Exploration c) Radiometry & Nuclear Geophysics	2	2	50	1
5	GP355F	Geophysical Fieldwork – 2	2	Viva-Voce	50	1
Total:			**10**	**10**	**250**	**5**

Note:

1. **Electives:** To be offered depending on the availability of facilities.
2. Practical Examination will be conducted at the end of 3rd Semester. Every Practical Examination will be of 50 marks.

Field Work: At the end of 3rd semester II year, the students will submit a Field Report on the Fieldwork Geophysical field practice-2 (GP 355 F) conducted in 3rd semester, Field Reports are assessed by conducting a viva- voce consisting of a committee (External Examiner, HOD, Chairman BOS and the concerned teacher) and the Marks are awarded for their performance.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: GRAVITY METHODS

Course No: GP301T Max Marks: 100/Max Credits: 04

Unit-I

Principles of gravity method, the gravitational field of the earth and its variation in space and time.Concept of gravity potential, Poisson's& Laplace's. Equations International Gravity Formula Factors contributing to the variation of gravity on the surface of the earth.

Concept of anomaly& Definition of micro gravity anomaly.

Density of rocks and minerals and their variations – Laboratory methods of determining density of rocks.

Unit-II

Basic principles of Asiatic Gravimeters (Lacoste - Romberg, Worden gravimeters) &Modern Gravimeters, Gravity survey procedures on land, at sea and in satellite gravity .Scales of survey. Establishment of gravity base stations, Reduction of land gravity data. Determination of surface rock densities using Nettleton and other empirical methods. Various corrections (Free air, Bouguer, Terrain etc), Reduction of marine and airborne gravity data, Accuracy of Anomalies, Concept of absolute & relative Bouguer anomalies, preparation of Bouguer anomaly maps.

Unit-III

Qualitative Analysis of gravity data – Key Variables in Gravity, Regional – Residual separation, Various techniques i.e., graphical & averaging methods-Least squares methods, Green's Equivalent layer, Gravity anomalies over common geological features. Continuation techniques, calculation of second verticalgradients.

Unit-IV

Quantitative analysis of gravity data, application of characteristics curves, logarithmic charts. Gravity anomaly expressions over simple geometric models.Concepts of 2D, $2^1/_2$ D and 3D models.Computation of anomalies over irregular bodies.Spectral methods in quantitative interpretation – limitation.Ambiguity in gravity interpretations.

Application of gravity methods in

i. Regional geological and structural problems.
ii. Mineral Exploration and Hydrocarbons Exploration, application of micro gravity techniques (Structural traps, Stratigraphic Pinchouts, locating secondary faults).
iii. Groundwater and Engineering problems

Recommended Books:

1. B.S.R.Rao and IVR Murthy, 1978, Gravity and Magnetic Methods of Prospecting Arnold – Henniman Publishing Company, Delhi.390P
2. D.S Parasnis, 1973, Mining Geophysics, Amsterdam. Elsevier Publishers, The Netherlands; 354P.
3. Edwin S.Robinson and CahitCoruh, 1988.Basic Exploration Geophysics John Wiley & Sons, New York Toronto/ Brisbane/ Singapore.562P.
4. Grant F.S. and West G.F., 1964, Interpretation Theory in Applied Geophysics McGraw Hill Publication, New York.
5. I.V.Radhakrishna Murthy & D.C Mishra 1989, Gravity and Magnetic Anomalies in space and Frequency domain, AEG,Publications.
6. I.V.Radhakrishna Murthy 1998, Gravity and Magnetic Anomalies Geophysics. Geological Society of India, Bangalore 363P.
7. L.L.Nettleton, 1967, Gravity and Magnetics in oil Prospecting McGraw Hill Publication, New York.464P.
8. S.H.Ward (Ed.), 1967, Mining Geophysics, Vol .1 and Vol.II SEG Publication, Tulso, Oklahma, USA.
9. Stanislav Mares et al., 1984, Introduction to Applied Geophysics D. Reidel Publishing Company, Dordrecht/Boston.581p.
10. Telford, W.M., Geldart, L.P. Sheriff, R.E and Keys, D.A., 1981 Applied Geophysics, Cambridge University Press Cambridge, U.K.860P
11. V.L.S.Bhimasankaram&V.K.Gaur, 1978, Lecturers and Exploration Geophysics AEG, publications.CEG. O.U.,Hyderabad.

Subject: ELECTROMAGNETIC METHODS

Course No: GP302T Max Marks: 100/Max Credits: 04

Unit-I

Principles of Electromagnetic method: Primary field, Secondary field, Total field, Anomaly field, amplitude, phase, real and imaginary components

Description of elliptic polarization, relation between the major and minor axis of ellipse of polarization with real and imaginary components of secondary field.

EM wave propagation in conductive medium-skin depth. Classification of Electromagnetic methods:

Methods using artificial sources (consisting of two groups) (1) Harmonically varying field,(2) transient fields, of which the first can be sub-divided into (a) Low frequency (b) Radio frequency method and Natural field methods (Magneto telluric group of methods and AFMAC). Sub-classification based on application (ore prospecting, oil and gas investigations) and source employed. Different variants (surface, sub-surface and airborne).

Unit-II

Methods using Man-made fields:

A. Surface low frequency methods: Effect of the change in the Frequency on the primary field, conductivity and magnetic permeability on the secondary field, discussion using the response of a conducting permeable sphere in uniform E.M. field. Effect of over burden and ore bearing rocks on the response of local conductor (only discussion)

a) Description of dipole induction profiling (horizontal loop or Slingram Method). Principles of the equipment, field procedure, quantitative Interpretation of anomalies for plate shapebodies.

b) Tilt Angle Technique – Schematic representation of results over conductive bodies (as given in Mining Geophysics by Parasnis.)

c) Turam Method – principles of equipment, field procedures, some qualitative interpretation techniques (as given in the book Electrical Methods in Geophysical Prospecting by Keller and Frischnet').

Unit-III

B. Transient Methods: Comparison with harmonic methods, description of different configurations, principles of equipment, general field procedures, simple, interpretation techniques.

C. High Frequency Methods: General principles, equipment, field procedure and interpretation of a) Radiowave mapping, b) Radiowave absorption c) Ground-penetrating radar

D. Airborne EM Methods: Principles, advantages and disadvantages, General description of TEM, FDEM.

E. General Principles of Borehole EM Methods: Advantages and Capabilities

F. Principles of EM Sounding by using (a) Harmonic field (b) Transient field, Principles of equipment, field procedure, description (without mathematical treatment) of theoretical curves and interpretation.

Unit-IV

Methods using Natural Fields:

a) AFMAG Method-Surface and Airborne versions

b) Telluric Current Method – Basic equations governing telluric field, field procedure, principles of equipment, processing of records by method of ellipses and interpretation of telluric parameters and maps.

c) Magnetotelluric method: Sources of MT signal, impedance tensor. Theory of electromagnetic wave propagation in horizontally layered earth and response over multi layered earth. Principles of Equipment & Field procedure. Data processing and analysis auto and cross spectra. Processing & interpretation of MT data over a two /multi layered earth, strike, rotation, polar diagram, tipper, skew, ellipticity,TE and TM modes, Magneto-Telluric Profiling and their applications

Application of MT methods.

Applications of EM prospecting in geological mapping, mineral and Groundwater exploration

Recommended Books:

1. Keller, G.V. Electrical Methods in Geophysical Prospecting – Frischnett,Pergamon.
2. Parasnis, D.S., 1973, Mining Geophysics –Elsevier.
3. Patra, H.P. &Mallick, K., Principles of Geoelectric Soundings Vol. II –Elsevier.
4. Telford, W.K., Geldart, L.P., Sheriff, R.F. and Keys, D.A. Applied Geophysics – Cambridge Univ.Press.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: SIGNAL PROCESSING and GEOPHYSICAL INVERSION

Course No: GP303T Max Marks: 100/Max Credits: 04

Unit-I

Basics of Data Processing and Integral Transforms:

Introduction, definition of signal and noise, types of signals, Analog and Digital signals, Stationary time series, Fourier transforms, Fourier series, Gibbs phenomenon, Sampling theorem. Nyquist frequency and Aliasing.auto and cross correlations.

Definition of System, Types of systems, Impulse response, transfer function, (input and output relation) Convolution theorem in time and frequency domains.

Unit-II

Hartley transforms. Discrete transforms and FFT and FHT algorithms Z- transform.

Properties, relation between Z and Fourier transforms, Hilbert transform, analytic signal,Amplitude, phase, instantaneous frequency and envelope of time series.

Defination of Radon, Walsh and Mellin transforms.

Unit-III

Spectrum in terms of correlation functions. Techniques for Spectral Estimation: Power spectrum, method for calculation of power spectrum, three basic data models, Moving Average (MA) method, Maximum Likelihood Method (MLM), Autoregressive process (AR), Concept of maximum entropy.

Windowing: Concepts of Windows Criteria for optimum window. Triangular, Rectangular, Hanning, Hamming windows.

Filtering: Principles of digital filtering intime and frequency domains. Amplitude and Phase characteristic of digital filters, Low pass, high pass, and band pass. Velocity filters, and Weiner filter. Deconvolution and predictive Deconvolution techniques.

Application: Applications in gravity magnetic, seismic, electrical and electromagnetic methods

Unit-IV

Definition of the forward and inverse problems in geophysics: definition of model, relation between model and data space, examples of forward and inverse problems, Probability, Backus-Gilbert inverse problem, Applications of inverse theory to geophysics, Combination of states of information ; Defining solution of inverse problem – Combination of experimental, a prior and theoretical information, Montocarlo methods. Solution of inverse problems using the Bayesian paradigm.

Recommended Books:

1. A Populis, 1962, The Fourier integral and its applications, MC Graw HillPublishers.
2. A.V. Oppenheium and R. W. Schafer. Digital signal processing, Prentice hall ofIndia. D. Reidal Pub. Co., Tokyo.
3. E.A. Robinson and S. Treitel, 1983, Digital Seismic inverse methods, D. Reidel PublishingCo.
4. E.R. Kanasewich, 1975, Time sequence analysis in geophysics, The University of AlbertaPress.
5. Hjelt, S.E., 1992 pragmatic Inversion of Geophysical Data, Springer –Verlag.
6. J.B. Thomas, 1969, An introduction to statistical communication Theory, John – Wiley Publishers,
7. J.F. Clarbout, 1976, Fundamentals of geophysical data processing.Mc. Graw Hill Publishers.
8. M. Bernbii, P. Carrion, G. Jacoviti, F. Rocca, S.Treitel, 1987. Deconvolution and inversion. Blackwell Scientific Publication Oxford.
9. Marcus Bath, 1974, Spectral Analysis in Geophysics,Elsevier.
10. N.J. Vlar, E. Nolet, M.J.R. Wortel, S.A.P.L. Cloetingh, 1988, MathematicalGeophysics
11. R.N. Bracewell, 1986, Fourier transform and its applications, McGraw Hill Publishers.
12. Silvia, M.T. and Robinson, E.A. Deconvolution of geophysical time series in the exploration for Oil and Natural gas. Elsevier Scientific PublishingCo.
13. Tarantola A 1984, Inverse Problem Theory, Elsevier,Amsterdam.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: MINERALEXPLORATION(Elective)

Course No: GP304T(a) Max Marks: 100/Max Credits: 04

Unit-I

Different types of mineral deposits and associated ore minerals, Stratigraphic, Lithologic and structural controls of mineralization and their significance in geophysical prospecting Problems in exploration geophysics, location, depth, dimension and extension of ore bodies.

Unit-II

Gravity, Magnetic, and Radiometric surveys in surface exploration for mineral deposits. Scales of surveys.Density of data collection, field procedures, data corrections and error.Some case histories and interpretation concept.

Unit-III

Electrical and electromagnetic methods, well-logging in mineral exploration.Special techniques and analysis of data.The importance of seismic, thermal and other methods in mineral prospecting.Suitable case histories with their data processing and interpretation. Special techniques and procedures used in subsurface geophysical exploration by geophysical methods.

Unit-IV

Integrated approach in geophysical exploration for mineral deposits. Optimization of exploration strategy.Computer applications in processing and interpretation of geophysical data. Application of GIS in mapping reserves and estimation.(Base metals, ferrous, precious and non-metallic ore deposits, placer deposits, Uranium deposits etc.)

Recommended Books:

1. Introduction to Mineral Exploration by Charles J, Moon, MKGWhatel
2. Introduction to mineral exploration, AuthorM.EVANS
3. Mining Geophysics, D. S.Parasnis.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: HYDROCARBONEXPLORATION (Elective)

Course No: GP304T(b) Max Marks: 100/Max Credits: 04

Unit-I

An overview of Hydrocarbon Exploration and Production Industry- Exploration in New and proven ventures, Evaluation of exploration blocks (basin scale to block scale), Field Life cycle from discovery to abandonment;

Petroleum Geology: Types of Hydrocarbons - Heavy and Light oils, Natural Gas, Condensates; Elements of Petroleum system; Source Rock- Generation,Types of kerogen, thermal maturity; Reservoir rocks (Clastic and Carbonate reservoirs); Types of Cap rocks, vertical and lateral seals,; Structural, Stratigraphic and combination traps; Hydocarbon migration; Analysis of GME cycle (Generation, Migration and Entrapment).

Unit-II

Basin evolution and structural styles of Extensional, Compressional and Strike slip basins; Depositional history reconstruction;

Gravity, Magnetic, Seismic, Electromagnetic methods in the search of Hydrocarbons in Frontier and explored areas.

Seismic Data acquisition- 2D and 3D Field parameters their designing and optimisation- Advances in seismic methods (Ocean Bottom Seismics, 4D seismics, Multi-component surveys, Multi Azimuth surveys); Seismic Processing-Basic processing sequence;

Unit-III

Use of wells logs in formation evaluation and understanding depositional environments.

Principles of seismic stratigraphy

Seismic-well ties: VSP/ check shot data, Synthetic Seismogram.

Interpretation workflow of 2D & 3D seismic data on Interactive Interpretation Work Stations, Project creation, SEG Y data analysis, data loading, Well creation and log data loading, Types of displays/ data visualisation, Horizon correlation (Point or manual, fill and auto/seed propagation modes), Fault Mapping, Gridding and contouring, Generation of Isochron/Isopach Maps and their analysis; Prospect identification.Seismic attributes- Physical and geometric attributes their use in interpretation; Role of Horizon slices in stratigraphic interpretation.

Unit-IV

Direct detection of oil and gas deposits: Oil seeps, DHI (Bright spots, dim spots and flat spots), Velocity Anomalies, Gas Chimneys, Pock marks. Impedance Inversion and AVO methods; Pitfalls in structural interpretation.Prospect Risk assessment and Resource estimation.

Unconventional hydrocarbons, Gas Hydrates, Shale Oil/Gas exploration, Coal-bed Methane exploration

Recommended Books:

1. Alistair Brown, 2010 Interpretation of Three Dimensional Seismic Data, AAPG Memoir 42/ SEG Investigations in GeophysicsNo.9.
2. Geophysics, The Leading Edge of Exploration issues of SEG
3. Milton B Dobrin and Carl H Savit, 1988, Geophysical Prospecting (Fourth Edition) – McGraw-Hill BookCompany.
4. Nigel Anstey, 1977 Seismic Interpretation - The Physical Aspects. IHRDC
5. RE Sherif and H Savit : Exploration Geophysics
6. Richard C Selley, 1983: Petroleum Geology for Geophysicists and Engineers, IHRDC, USA.

M. Sc. GEOPHYSICS II YEAR IV SEMESTER

Subject: RADIOMETRY AND NUCLEARGEOPHYSICS

Course No: GP304T(c) Max Marks: 100/Max Credits: 04

Unit- I

Radioactivity: Introductory.

General remarks on radiometric and nuclear geophysical methods.Brief review of radioactivetransformations and equilibrium.Natural and artificial radioactive elements.Stable andradioactive isotopes in nature.

Radiation Sources, Units of Radioactivity, Gamma and X-radiation sources generator and nuclearreactor. Isotopic neutron sources generator and nuclear reactor as a source of neutrons.

Elementary concepts of safety considerations in handling of gamma and neutron sources.

Unit- II

Radiation detectors and basic equipment's: Geiger-Muller and proportional counters, scintillationdetectors-NaI (TI) gamma ray spectrometer. Outlines of semiconductor radiation detectors.

Elements of neutron detectors.

Principles of counting systems - total and differential counting, Basic principles of alpha, beta and gamma methods.

Laboratory Radiometric analysis: Beta gamma method. Gamma spectrometric technique for U, Th, K determinations.Alpha spectral analysis, Emanation methods of analysis.Application of radiometric methods for radioactive and non-radioactive ores.

Unit- III

Brief revision of radiometric methods. Evaluation of anomalies,Gamma radiation techniques in Nuclear Geophysics: Gamma absorption method for adetermination of rock densities and estimation of total heavy elements. Gamma scatter principlefor the estimation of insitu densities and ore as saying. Field applications of method in mineworkings and boreholes.

Unit- IV

Neutron methods: Neutron-Neutron absorption and scatter principles. Field applications formoisture and porosity estimations.

Principles of application of the n-gamma method for determinations of elements such a Fe, Cr,Ni, Cl in the laboratory and in logging investigations.Summary and Revision of gamma and neutron techniques.

Recommended Books:

1. VLS Bhimasankaram (1974) Radiometric methods of Exploration, Published byCEG.
2. VLS Bhimasankaram, EI Savenko, and N. VenkatRao (1973) Laboratory and fieldMethods of radiometry and nuclear geophysics, published byCEG.
3. VLS Bhimasankaram, N. VenkatRao, K. Sreeramamurti and EI Savenko (1985) Principlesand Methods of Nuclear Geophysics, Published byAEG.
4. W.M. Telford, L.P. Geldart and R.E. Sheriff (1990) Applied Geophysics published byCambridge University Press.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: GRAVITY METHODS

Course No: GP351P Max Marks: 50/Max Credits: 01

Practicals:

1. Computations regarding determining average density of surface rocks from Gravity data.
2. Reduction of field gravitydata.
3. Preparing gravity anomaly contour map from fielddata.
4. Regional-Residual separation by (a) Graphical method & (b) Gridmethods.
5. Construction of gravity profiles on some simple geometrical models.(Sphere, Horizontal Cylinder & Fault)
6. Computations pertaining to basement depth estimation fromGravity.
7. Interpretation of gravity anomaly profile across adyke.
8. Upward & Downward continuation of Gravity fields

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: ELECTROMAGNETIC METHODS

Course No: GP352P Max Marks: 50/Max Credits: 01

Practicals:

1. Normal field due to an underground loop source.Frequency characteristics.
2. Secondary field due to a conductive Sphere.
3. Response due to a spherical conductor in UL method.
4. Computation of Geometric factor due to a Spherical conductor in drillhole version of Transient EMmethod.
5. Computation of Geometric factor due to cylindrical conductor in drill hole version Transient EMmethod.
6. Processing of VLF EM data using Fraser Filter.
7. Interpretation of Transient EM data – Calculation of generalized induction parameter.
8. Computation of normalized response due to a conducting sphere in transient pulse inductionmethod.
9. Computation of normalized response due to a conducting cylinder in transient pulse inductionmethod.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: SIGNAL PROCESSING and GEOPHYSICAL INVERSION

Course No: GP353P Max Marks: 50/Max Credits: 01

Practicals:

Computations on

1. Noise estimation using Auto and Cross Correlations.
2. Hilbert Transform.
3. Mellin Transform.
4. Amplitude and Phase Characteristics of Digital Filter.
5. Weinerfilter.
6. Estimation of the epicentre coordinates of a seismic event.
7. Using least – square regression find the solution for experimental points assuming Gaussianun certainties.
8. Two variables y and t are related through a linear relationship
   a. y = at + b determination of parameters a and b using experimental points
   b. (y_i and ti).
9. Some problems of error estimation.
10. Some problems on stability analysis.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: MINERAL EXPLORATION (Elective**)**

Course No: GP354P(a) Max Marks: 50/Max Credits: 01

Practicals:

1. Study of the characteristics features of various minerals anomalies of different geophysical methods Gravity/magnetic, electrical and E.Mmethods
2. Interpretation and processing of associatedanomalies
3. Collection of radioactive and other mineralsamples
4. Laboratory measurements of minerals associated properties like Density /electrical/ radioactive andmagnetic.
5. Acquaintance with modern mineral exploration processingsoftware.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: HYDROCARBON EXPLORATION (Elective)

Course No: GP354P(b) Max Marks: 50/Max Credits: 01

Practicals:

1) Computation of Interval, Average and RMS Velocities from Check shotdata.
2) Identification of structural and stratigraphic features on seismic sections (Manual).
3) Contouring exercises over different structural and stratigraphic features (structural highs, faults, wedge-out,etc.).
4) Horizon correlation, timing and contouring(Manual).
5) Interpretation on Interactive Interpretation Workstations -2Dseismic.
6) Interpretation on Interactive Interpretation Workstation-3DSeismic.
7) Gridding and Mapping, AnalysingIsochronmaps.
8) Depositional history reconstruction by Structural Restoration throughHorizon flattening on 2Dseismic.
9) Computation of HC Resources/Reserves.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: Radiometry & Nuclear Geophysics (Elective)

Course No: GP354P(c) Max Marks: 50/Max Credits: 01

Practicals:

1. Problems on basics of radioactivity related to the calculation of radiation activities, units, attenuation of gamma radiation, principles of counting statistics, and errors of radiation measurements.

2. Problems on laboratory radiometric practice – Estimations of U-Ra and U-Th by beta – gamma method and U, Th, K determinations by gamma spectrometry.

3. Calculation of gamma intensities of ore bodies – evaluation of concentration of an ore body from measured intensity anomalies.

4. Calculation of effective atomic numbers for some rooks/ores for different predominant processes of gamma-ray interaction.

5. Determination of parameters of neutron activation analysis.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: GEOPHYSICAL FIELD PRACTICE-2

Course No: GP355F Max Marks: 50/Max Credits: 01

Fieldwork:

II. Gravity Methods

1. Acquaintance with Field Astatic Gravimeter their Operation & Procedure of measurement
2. Measurement of Static & DynamicDrift.
3. Calibration of the Gravimeter
    a) Tower Experiment
    b) Tilt Method.

4.Base Stations

    a) Establishment ofBase Stations and Tying of BaseStations.
    b) Reduction and correction of Gravity data.

III. Electromagnetic Methods

a) Acquaintance with VLF equipment & Profiling with VLF to detectfractures

b) Profiling with GPR and Application of GPR in GroundwaterStudies

Note:

Fieldwork will be conducted in Osmania University Campus only. The fieldwork consists of Acquisition, Processing & Interpretation of data by the respective methods. At the end of the III semester II year, the students are required to submit 2 copies of Field Training Report on Geophysical Field Practice-2 to the Head of the Department, OU.The field reports area assessed by conducting a viva-voce consisting of (External examiner, HOD, Chairman BOS and the concerned teacher) a committee and the marks are awarded for their performance.

OSMANIA UNIVERSITY

CHOICE BASED CREDIT SYSTEM IN P.G.COURSES

CENTRE OF EXPLORATION GEOPHYSICS,

DEPARTMENT OF GEOPHYSICS, HYDERABAD-500007.

M.Sc. Geophysics, I Year IV Semester

Scheme of Instructions and Examination

(Effective from the Academic Year 2022-2023)

Duration: 16 Weeks Max. Marks: 550 / Max. Credits: 17

Theory:

S. No.	Subject	Sub. Code	Instruction Hrs/week	Exam Duration	Max Marks		Total Marks	Credits
					Int. Asses.	Sem. Exam		
1.	Remote Sensing and GIS	GP401T	4	3	20	80	100	3
2.	Well Logging	GP402T	4	3	20	80	100	4
3.	Groundwater, Environmental & Eng. Geophysics	GP403T	4	3	20	80	100	3
4	Dissertation (Project Work)	GP404PW	8	Viva-voce			100	4
Total			**16**	**12**	**80**	**320**	**400**	**14**

Practicals

S. No.	Sub. Code	Subject	Instruction Hrs/week	Exam Duration	Marks Total	Credits
1	GP451P	Remote Sensing and GIS	2	2	50	1
2	GP452P	Well Logging	2	2	50	1
3	GP453P	Groundwater Geophysics	2	2	50	1
Total			**16**		**150**	**3**

Note:

1. Practical Examination will be conducted at the end of each semester. Every Practical Examination will be of 50 marks.
2. Seminar: The student shall compulsorily deliver one seminar lecture (at end of IV semester) from the core subject which will be evaluated internally within the department.
3. Project Work/Field Training: During the 4th Semester, the students will undergo Geophysical project work for familiarization at specialized centers for about 6 weeks. At the end of II year 4th semester the students will submit a Comprehensive Project Report on the Training (GP 454 PW) conducted in 4th semester. The Project Reports are assessed by conducting a viva- voce by a committee consisting of (External Examiner, HOD, Chairman BOS and the concerned teacher) and the Marks are awarded for their performance. The student shall compulsorily deliver the presentation of the project work. The students are required to submit 2 copies of Project work / Dissertation Reports to the Head, Department of Geophysics, OU.

M. Sc. GEOPHYSICS II YEAR IV SEMESTER

Subject: REMOTE SENSING and GIS

Course No: GP401T Max Marks: 100/Max Credits: 03

Unit-I

Principles of Remote Sensing:

Electromagnetic Radiation (EMR) and its spectrum.Source of EMR and governing laws;interaction of EMR with atmosphere and surface of the earth. Atmospheric windows; spectralsignature and spectral reflectance, spectral responses of vegetation, water, soil etc.

Remote Sensing Observation Platforms.Characteristicsof remote sensing sensors: (spectral,spatial, temporal and radio metric resolutions).

Satellites:

Types of satellites, Data reception.Characteristics of the IRS, Remote sensing satellites.

Unit-II

Image Interpretation: Principles of image interpretation, Visual image interpretation–imageelements, geo-technical elements and visual interpretation aids.

Digital processing – Image enhancement, Image classification and image process systems.Advantages and limitations of visual and digital interpretation for geological studies.

Application of remote sensing in Geological and structural mapping.General application of satellite data for various Geological, Groundwater, Mineral prospectingand Environmental impact and Hydrocarbon studies.

Airborne Geophysical Methods:

Introduction: Status of airborne geophysical methods.Factors controlling airborne geophysical surveys.Characteristics and effective assemblage ofairborne geophysical Surveys.Advantages and disadvantage of airborne geophysical surveys.

Unit -III

GIS: Principles and application of geographic information system, introduction, definitionand scope, components of GIS (hardware and software requirement for GIS application);

Maps: Maps and their different features/themes/layers, map projections-different types andtheir properties, GIS software in use; topology and attributes.

Datum Coordinate systems UTM, UPS and SPC system.

Definition and types of database, vector and raster data and their relative merits;Data management: Data quality, data manipulation and analysis, advantages and disadvantages of database approach; Types of Input data –Digitizing, scanning; GPSsystem;

GIS applications and recent trends.

Recommended Books:

1. Floyd, F., Sabins, Jn., 1987, Remote Sensing Principles and Interpretation, W.H.Freeman, Company, NewYork.
2. Joseph Lintz, Jr. David, S. Simorelt, S, 1976 Remote sensing environment, Addisen-Wesly Publ. Co., Inc., Canada.
3. Landsberg H.E., 1952advanced in Geophysics. Vol. I, Academic Press Inc., Publ. New York.
4. Landsberg H.E., 1969, Advanced in Geophysics Vol. 13, Academic Press Inc., Publ. New York.
5. Paul, J Currian, 1988 Principles of Remote Sensing ELBS, London
6. Photo Geology-Miller, V.C., 1961 McGraw Hill, NewYork
7. RamadassG. and Himabindu, D., 2001, Prinples and Application of Remote Sensing Techniques in Mineral Groundwater and Oil & Gas Studies.
8. Rao, D.P., 1955 Remote sensing for Earth Resources, AEG Publ., Hyderabad.
9. Shiv Panedy 1987, Principles and Application of photo Geology, Wiley Eastern Ltd., New Delhi.
10. Thomas, M. Lillesand, Raphw and Kiefer, 1987 Remote Sensing and image interpretation. John Wiley & amp; Sons, NewYork.
11. Ward, S.H., 1967 Mining Geophysics, SEGPubl.

M. Sc. GEOPHYSICS II YEAR IV SEMESTER

Subject: WELL LOGGING

Course No: GP402T Max Marks: 100/Max Credits: 04

Unit-I

Reservoirs characteristics and objectives of well logging. Reservoir Rocks: Clastic and carbonate rocks.

Reservoir Properties: Porosity, permeability, fluid saturation, need of drilling fluids & their properties.

Borehole environment- invasion process and various profiles. Classification of well logging methods,

Spontaneous Potential (SP) logging: Spontaneous potentials in boreholes and its sources. SSP and its measurements. SP curves and its interpretation, factors affecting the shape and amplitude of SP curve. Determination of formation water resistivity from SP logs.

Unit-II

Principles of non-focused resistivity logging: Single Point Resistance (SPR) log, Conventional (normal, lateral) resistivity logs and their response across a layer of anomalous resistivity

Principles of operations of Focused current logs: Laterolog-3, Laterolog-7 and Dual Laterolog. Pseudo geometrical factor, environmental corrections.Interpretation of Laterologs.Principles of Micro Resistivity (Wall) logging.micro-normal, micro-lateral and focused micro logs and applications. The Induction log principles, Geometric theory, Dual Induction Focused Logs and its uses.

Unit-III

Radioactivity and Nuclear Logging Methods**:** Principle of natural gamma logging – Causes of natural radioactivity in Rocks and use of gamma logs for lithological &shaliness identification. Spectral Gamma Ray log & uses.

Principle of gamma-gamma (density) logging, Litho-Density tool (LDT) - Compensated Density tool (CDL) and their uses. Principles of Neutron–Neutron logs and their uses.

Acoustic (sonic) logging-Principle and uses.Thermal, Calliper, Nuclear Magnetic Resonance (NMR) logging and their applications.

Unit-IV

Field Instrumentation for Geophysical Logging and Field Procedures.

Well log interpretation - Quick look techniques, Hingle, Pickett& M-N cross plots, saturation estimation, lithology, porosity (primary and secondary) determination, Log interpretation case studies. Sub-surface correlation and mapping from log data. Production logging.

Application of Well logging for (a) Groundwater, (b) Ore Minerals, (c)Petroleum & Gas.

Recommended Books:

1. Borehole Geophysics Applied to Ground water investigations by W.Scott Keys.US Geological Survey Open File Report,87-539.
2. Brock, James.G.1986. Applied open – hole log analysis, Gulf Publ. Co., Houston,Texas
3. Dresser Atlas, 1982 Well Logging and Interpretation techniques - Dresser IndustriesInc
4. Ed.J.Lynch .,1964, Formation and evaluation, Harper and Row , Japan andUS.
5. Itenberg, S.S. 1971, Study of oil and gas series from Well logs, Mir. Pub.Moscow.
6. John T.Dewan,1983, Essential of Modern open –hole log interpretation, Pennwell Books, Pennwell Publ. Co., Tusla,Oklahoma
7. Schlumberger, 1969, Log interpretation Principles and charts, Schlumberger. Ltd.,USA.
8. Schlumberger, 1972, Essential of log interpretation Practice. Schlumberger,France
9. Serra, 1984, Fundamentals of well log interpretation-1.The acquisition of Logging data. Elsevier Science Publishers,B.V.
10. Serra, 1986, fundamentals of well log interpretation-2.The acquisition of Logging data. Elsevier Science Publishers,B.V.
11. Syllvin, J, Pirson, 1963. Hand Book of Well log Analysis, Prentice, Hall,Inc.
12. The Geological Interpretation of Well Logs byM.H.Rider-1986.
13. Vaish, J.P.1997, Geophysical Well logging: Principles and practices, Asian Books PVT Ltd., NewDelhi.

M. Sc. GEOPHYSICS II YEAR IV SEMESTER

Subject: GROUNDWATER GEOPHYSICS

(Groundwater, Environmental and Engineering Geophysics)

Course No: GP403T Max Marks: 100/Max Credits: 03

Unit-I

Importance and Mode of Occurrence of Groundwater, Hydrologic cycle, subsurface water and its distribution, classification of rocks as aquifers. Hydrological Properties of Rocks. Aquifer Characteristics

Fundamentals of Well hydraulics: Darcy`s law, General flow equations, steady unidirectional flow, steady radial flow to a well, unsteady radial flow in a confined and unconfined aquifer. Water level fluctuation: Causative factors;

Groundwater Provinces of India. Role of geophysical methods in solving hydro geological problems.Artificial recharge- Need for artificial recharge – Recharge Methods – Geophysical Methods for site selection for recharge operations.

Application of Geophysical methods in solving Groundwater problems. Case studies in soft and hard rock areas. Delineation of salt & fresh water boundary

Unit-II

Different types of environmental pollutants, Landfills, Waste disposal- Industrial waste, mining activity, nuclear waste, etc. Causes of Groundwater pollution: Industrial, geological, Sea water intrusion and major engineering projects. Effects of Environmental pollution on the human body and human civilization.Environmental Degradation, geophysical studies for water logged areas with a view to reclamations.

Application of Geophysical methods in solving environmental problems, case studies.

Unit-III

Engineering properties of soils and rocks: Characteristics of important engineering problems – landslides, tunnels, cavities, roads etc., foundation and archaeological problems. Landslides – types of mass movements, identifications of land slide zones. Characteristics of Near surface geophysical Investigations, types of methods used, scales of survey and peculiarities of Near surface geophysics.

Application of geophysical methods in foundation and road investigations (depth, aerial extent, fractures, rip ability etc.), case studies

Recommended Books:

1. John M.Reynolds 2011.An Introduction to Applied and Environmental Geophysics.
2. Karant, K. 1987, Ground water assessment, development and management Tata.McGrawHill.,New Delhi.
3. Kelly,KE. and Mares, S., 1993,Applied Geophysics in Hydro Geological and Engineering Practice, Elseiver , Amsterdam.
4. Lillesand,T.M. and R.W.Keiffer , 1994., Remote Sensing and Image Interpretation,John Wiley & Sons.,
5. Mares.S, 1984. Introduction to Applied Geophysics, D.Redial,PublishingCo.,Dordrecht.
6. Murali,S. and N.S.Pathangay ,1998, Principles and applications of ground water geophysics, AEG. Publications, Hyderabad.

7. P.V.Sarma, 1986, Geophysical methods in Geology.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: REMOTE SENSING and GIS

Course No: GP451P Max Marks: 50/Max Credits: 01

Practicals:

1. Generation of image from digitaldata.
2. Identification of Spectral signatures of different ground features from theimage.
3. Identification of features like tone, texture, pattern on satellite Images forInterpretation.
4. Applications of Remote Sensing techniquesto
   a) GeologicalMapping.
   b) Groundwaterstudies.
   c) Oil and Gasstudies.
5. Qualitative and quantitative Interpretation of Airborne Gravity and Magneticdata

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M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: WELL LOGGING

Course No: GP452P Max Marks: 50/Max Credits: 01

Practicals:

1. Demarcation of bed boundaries from the given (a) Electrical resistivity – Potential and Gradient logs.(b) S.P.Logs.
2. Determination of resistivity of formation water from S.P Log.
3. Determination of true resistivity using nomograms.
4. Interpretation of micro logs.
5. Determination of (a) radioactive beds and their percentages of radioactivity (b) Shaliness from natural gamma ray log.
6. Demarcation of bed Boundaries and identification of lithological Units from the complex geophysical logs of. (a) Hard rock Terrain, b) Soft rock terrain.
7. Demarcation of bed boundaries and identification of aquifer horizons for groundwater utilization from well logdata.
8. Demarcation of bed boundaries and identification of mineralized zones from well log data.
9. Demarcation of bed boundaries and identification of oil and gas horizons from well log data.
10. Computation of following Reservoir properties from well log data (a) Formation Factor, (b) Porosity from Resistivity, Density, Neutron & Acoustic Logs(c) Water Saturation (d) Hydrocarbon Saturation.

M. Sc. GEOPHYSICS II YEAR III SEMESTER

Subject: GROUNDWATER and ENVIRONMENTAL GEOPHYSICS

Course No: GP453P Max Marks: 50/Max Credits: 01

Practicals:

1. Interpretation of VES data, in solving hydrogeological problems (a) Hardrocks, (b) Sedimentary area.
2. Exercise on relation between electrical conductivity and TDS.
3. To prepare apparent resistivity graphs and contour maps
4. To construct polar diagram from RVES data and Estimation of Coefficient of electrical anisotropy.
5. To determine the geochemical quality indicator from geochemical analysis of water samples.
6. Computation of engineering properties of rocks and rip ability from the P&S wave velocities.
7. Determination of Groundwater salinity from VES data.
8. Interpretation of T.S. values from pump test data using Jacob's method.
