Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NGPC520	**Gravity Method**	**3**	**0**	**0**	**3**

Course Objective
To facilitate the understanding and use gravity method in solving exploration problems.
Learning Outcomes
Upon successful completion of this course, students will: • have a broad understanding of Gravity method: theory, acquisition and interpretation. • understand the advantages of Gravity data for delineation earth's subsurface structure. • understand the advantages of Gravity data for mineral, hydrocarbon etc. exploration.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
01	Brief introduction of Principles of gravity methods and its instrument; the gravitational field of the earth and its variation in Space and Time; International Gravity Formula Factors contributing to the gravity variation on the earth's surface; Concept of gravity anomaly and microgravity anomaly.	05	Helps in understanding the basic concept of gravity method and it's application.
02	Gravity survey procedures, scales and accuracy on land, shipborne and airborne; Establishment of gravity base stations.	05	This contains a background of the gravity data acquisition in in calculating the absolute gravity vales.
03	Reduction/correction of land, marine and airborne gravity data including Eotvos correction in marine gravity surveys; Concept of absolute and relative gravity; Interpretation of Freeair and Bouguer gravity anomaly maps, Isostasy and isostatic anomaly.	05	Helps in understanding to process the field gravity data for interpretation.
04	Gravity anomalies expression over simple geometric models such as sphere, cylinder, fault and anomalies over 2D and 3D irregular bodies; Gravity anomalies in time and frequency domain.	08	This section pertains to simulating the gravity effect and approximate geometrical shape of the geological body.
05	Spectral analysis of gravity field data, Depth rules, Spectral analysis for depth estimation; Methods for depth to basement mapping, Talwani's polygonal method in gravity interpretation, Bott's interpretation technique for sedimentary basins.	05	This helps in understanding the techniques and theoretical concepts for the interpretation of the geological body.

06	Qualitative Analysis of gravity anomalies; Kind of methods for Regional-Residual separation; Upward and downward continuations of gravity anomalies; calculation of second vertical derivatives and horizontal gravity gradients, utility of such maps; Ambiguity in gravity data and model interpretation, conditions for unique interpretation.	04	This unit helps in understanding the qualitative interpretation of gravity data using various techniques.

07	Quantitative analysis of gravity anomalies due to various geological structures – dykes and faults; Forward and Inverse modeling of gravity anomalies and indirect interpretation; Concepts of 2D/2.5D and 3D density-depth models; Spectral methods in quantitative interpretation – limitation.	04	This unit helps in understanding the modelling and quantitative interpretation of gravity data using various techniques.
08	Application of gravity methods in (i) regional geological and structural problems, (ii) mineral and hydrocarbon, exploration (iii) groundwater and engineering geological and geotechnical problems (iv) search for metallic and nonmetallic ores (v) coal and lignite; (vi) mapping faults (vii) exploring for salt domes (vii) uplifted horst and graben, (viii) use of gravity in regional geological studies including granitic plutons, thrust belts, accreted terrains, case histories.	06	This unit helps in understanding and determining the numbers of geological bodies using gravity anomalies.
	Total Classes	42	

Textbook

Telford, W. M., Geldart, L. P., Sheriff, R. E., and Keys, D. A., 1988, Applied Geophysics.

References

1. Dobrin, M. B. and Savit, C., Introduction to Geophysical Prospecting,
2. Dehlinger, P., Marine Gravity,
3. Heiskanen, and Veining Meinsez, Gravity Field of the Earth,
4. Nettleton, L. L., Gravity and Magnetics in Oil Prospecting,
5. Rao, B. S. R. and Murthy, I.V.R., Gravity and Magnetic Methods of Prospecting