## HARD CORE COURSE: GYH 503: Fundamentals of Cartography, GIS & GNSS Course Learning Outcomes:

CO1: Understand the history and development of spatial technology.

CO2: Locate the significance of GIS in contemporary world.

CO3: Explore and generate GIS data from open source.

CO4: Analyze methodological aspects of GIS

CO5: Apply GNSS in different real-world situations

Units	Course Content	Teaching Hours
1	<b>Basic spatial perspective and GIS concepts:</b> GIS definitions, concept of spaces, approaches and components, history and development of GIS. Spatial & Non-spatial Data: Data information, data type, data sources, characteristics of spatial and non-spatial data, raster and vector data models, geographical matrix, data stream	13
2	<b>Data Collection:</b> Data capture & geo-processing sources, input methods for spatial & non-spatial data, editing, re-projection, geometric transformation, geo- referencing, display. Map scale precision & accuracy. Database management system: Characteristics, components, data quality: Definition, components of geographic data quality. Accuracy, precision, error and uncertainty. Data assessment and evaluation. Linking spatial & non-spatial data. Database types: Hierarchical, network, relational and object oriented	13
3	Manipulation and Analysis of Data: Measurement of lengths, perimeter and areas, queries, buffer analysis, topology, neighborhood operations, network operations, overlay analysis, location-allocation analysis problems, and surface analysis. Interpolation and its methods.	13
4	<b>Global Navigation Satellite System:</b> Concept, GNSS reference systems, components space segment, control segment, user segment. GNSS signal propagation and quality, GPS observations: Pseudo ranges, differential GPS, relative positioning, errors in GNSS observations, GPS observation techniques-Static, rapid static, Pseudo kinematic, kinematic, real time kinematic (RTK).	13

**Essential Readings:** 

- 1. Abdul-Rahman, Alias, Pilouk, and Morakot (2008): Spatial Data Modelling for 3D GIS, Chang, K, Introduction to Geographic Information Systems. (5th Ed.), McGraw Hill.
- 2. Hanan Samet (2006): Foundations of Multidimensional and Metric Data Structures, Morgan Kaufmann Publishers.
- 3. Okabe, A., Boots, B., Sugihara, K. and Chiu, S. N (2000): Spatial Tessellations Concepts and Applications of Voronoi Diagrams (2ndEd.), John Wiley and Sons.
- 4. Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind, Geographic Information Systems and Science, John Wiley & Sons Ltd.
- 5. Peter A. Burrough, Rachael A. Mcdonnell and Christopher D. Lloyd (2014): Principles of Geographical Information Systems, International Third Edition, Oxford University Press, United Kingdom,
- 6. Raper, J (2000): Multi-Dimensional Geographic Information Science, Taylor and Francis. Springer.