DEPARTMENT OF REMOTE SENSING AND GIS APPLICATION

FACULTY OF SCIENCE

A.M.U., ALIGARH

Syllabus for Ph.D Admissions Test 2020-21

SECTION-B

1. Fundamental of Remote Sensing

Historical perspective of Remote Sensing; Physics of Remote Sensing: Electromagnetic Radiation (EMR), Characteristics; Electromagnetic Spectrum (EMS); Interactions Between Matter and Electro-Magnetic Radiation; Radiation Laws. Atmospheric Windows; Types of Remote Sensing with Respect to Wavelength Regions, Platforms. Map Projection and Co-Ordinate System; Datums; Ellipsoid and Geoid, Elements of Image Interpretation.

2. Fundamental of Geographic Information System (GIS) and GPS

History and Evolution of GIS; Components of GIS; Applications Areas of GIS; GIS Data Types (Raster and Vector); Spatial and Non-Spatial Data; Attributes. Thiessen Polygon; Raster Data Analysis; WEB GIS; Various Software in GIS; Introduction to Open Source GIS; Concept and History of Web GIS; Components of Web GIS; Introduction to Global Positioning System; GPS Satellite Constellations; GPS Segments: Space; Control; User; Signals & Codes; GPS Receivers.

3. Photogrammetry and Digital Image Processing

History of Aerial Photographs; Classification and Types; Characteristics of Aerial Photographs; Geometry of Aerial Photographs Elements of Aerial Photos, Photogrammetry and Mapping: Photogrammetry, Fundamentals of Human Stereoscopy; Methods of Stereoscopic Viewing – Lens and Mirror Stereoscopes; Unmanned Aerial Vehicle (UAV).

Introduction to Digital Image Processing (DIP); Formats of Digital Imagery. Data Analysis and Elements of Image Interpretations. Principal Component Analysis; The Fast Fourier transform; Minimum Noise Fraction (MNF) Transformation; Unsupervised classification; supervised classification.

Lithosphere origin and evolution, continental drift and plate tectonics; Atmosphere, components, structure; hydrosphere, ocean basins, evolution through time; cryosphere; ground water and global water cycle, Darcy's law, well hydraulics; surface and sub surface Geophysical and geological methods of ground water exploration; global climatic changes, Theory of climate change, Green house gases etc.

4. Fundamental of Thermal, Microwave and Hyperspectral Remote Sensing

Fundamentals of Thermal Remote Sensing: Thermal Radiation Principles - Kinetic Heat; Temperature; Radiant Energy and Radiant Flux. Blackbody Radiation; Thermal Radiation Laws- Stephen Boltzmann Law; Wien's Displacement Law; Emissivity; Kirchhoff's Radiation Law. Microwave Remote Sensing: Basics of Microwave Remote

Sensing; Advantages; And Inconveniences; Wavelength and Frequencies; Passive and Active Systems.

Understanding Hyperspectral Imaging; Multispectral Vs Hyperspectral Remote Sensing-Advantages; History and Evolution of Hyperspectral Imaging; The Physical-Chemical Interactions of The Electromagnetic Radiation with the Atmosphere and the Geosphere. Spectral Radiometry: Principles – Radiance Vs Reflectance; Spectral Angle Mapper; Spectral Feature Fitting; Sub-Pixel Analysis - Linear Spectral Unmixing; Matched Filtering.

5. Digital Terrain Modeling and Statistics

Digital Terrain Model (DTM); Digital Elevation Model (DEM) and Digital Surface Model (DSM); Digital Elevation Data Sources and Structures; DTM/DEM Production Methods; DEM Interpolation Methods; Early DEMs; Availability of Global and Regional DEMS. Applications of DEMs

Basic Concepts: Data Mining; Data and Patterns; Review of Statistical Techniques for Data Mining: Discriminant Analysis; Cluster Analysis; Outlier Analysis. Data Mining of Spatial Data: Geospatial Grids; Data Structures for Spatial Grids.

6. Applications of Remote Sensing and GIS

Remote sensing and GIS Application in Urban Planning, Ecosystem Management, Agriculture, Resource Management, Forest Studies and Disaster Management. Role of Remote Sensing in Monitoring and Management of Natural Hazards.