Department of Planning & Geomatics
(DoPG)

Syllabi for Ph. D. Entrance Test
(Geomatics)

2024-2025

Islamic University of Science & Technology

Awantipora-192122, Kashmir

Department of Planning & Geomatics

Islamic University of Science & Technology Kashmir

PhD Entrance Test Syllabus (Geomatics)

Part-A: Research Methodology   Maximum Marks: 35

Section-I:

Research Fundamentals, Aims and Objectives of Research, Types of Research: Basic, Novel and Applied Research. Tools for Searching a Research Topic: Books, Journals, Internet, Discussions, Research Hypothesis; Steps in Research Design. Publication of Research, Plagiarism, Intellectual Property Rights. Quality of Research Work and Papers Indexing, Impact Factor, Citation Index, H Index. Web Resources

Section-II:

Basic Knowledge of Computers and Software. General Awareness of Computer Hardware, CPU and other Peripheral Devices (Input / Output and Auxiliary Storage Devices), Primary and Secondary Memory. Basic Knowledge of Software and Programming Languages. Introduction to Artificial Intelligence.

Section-III

Geospatial Data models and Conversions; Spatial Database concepts and Database Management System. Advanced spatial Analysis tool and techniques; Web and Mobile GIS; Open Source GIS Softwares; Basic programming and problem solving in C and Python: logical, relational, conditional operators, Control statements and Loops, Google Earth Engine.

Sections-IV

Measures of central tendency: mean, median, mode, Measures of Dispersion: range, Variance, standard deviation, Coefficient of variation, Skewness and Kurtosis. Regression and Correlation Analysis; Basic concepts of time series data analysis; Variogram analysis and its applications; Interpolation.

Part-B: Core Paper   **Maximum Marks: 35**

Unit I: Geoinformatics Fundamentals

Computers and Geoinformation Management: Flowcharts, algorithms, and programming basics (C, control statements, loops, arrays, functions). Metadata, data compression, conversion, mining, and warehousing. Cartography & Visualization: Concept of Digital Cartography; Types and uses of maps, Concept of scale; Coordinate systems, Geoid and datums, Map projections, Data sources for mapping, Visualization techniques, Time-series analysis, Accuracy Assessment: Sampling techniques, Error Matrix, Kappa Statistics

Unit II: Remote Sensing Fundamentals and Applications

Fundamentals: Satellite orbits; Electromagnetic Radiation (EMR) and spectrum, Land & atmospheric Interaction of EMR, spectral signatures, aerial photography, image interpretation, Image enhancement techniques; digital data formats (BSQ, BIL, BIP); Imaging sensor and sensor characteristics, Geometric and radiometric; Distortions and corrections. Photogrammetry: Fundamentals of aerial photography; Vertical and oblique aerial photography; Scale, Geometry and Ground coverage of aerial photographs; Stereoscopic vision and image parallax

Unit III: Advanced Remote Sensing

Microwave Remote Sensing: Basic Principles; Space-borne and Air-borne Radar Systems; Synthetic Aperture Radar (SAR); Sensor and Target Characteristics; SAR Interferometry; Geometric distortions. Advanced Image Processing: Hyperspectral Remote Sensing- Basic principles of Spectroscopy; Hyperspectral sensors and platforms; Sensor specifications; Hyperspectral Data Processing; LIDAR: Principles, data processing and platforms, Laser and Scanning System; Accuracy of Lidar measurements, thermal remote sensing, classification techniques (supervised/unsupervised), image indices, and integration of multi-sensor data.

Unit IV: Geographic Information System (GIS)

GIS Basics: Components, data models (raster and vector), spatial/non-spatial data integration, topology, and analysis techniques; Neighborhood Analysis, Network

analysis, Overlay analysis; Buffering; Errors and uncertainty in GIS data: Positional and attribute Accuracy; Data formats. Sampling and Interpolation techniques, Multi-criteria analysis, interpolation, DEM development, land degradation modelling; Spatial Data Infrastructures (SDI), and collaborative platforms; Open-source GIS (QGIS, GRASS) and cloud-based platforms (AWS, Azure, Google Cloud); Geospatial Web Services, Mobile GIS and real-time geospatial applications.

Unit V: Field Techniques, GPS, and Geodesy

Geographic data collection, GPS components, satellite constellations, geo-positioning basics, error corrections, and GPS applications in resource mapping and crustal deformation. Field Survey Techniques: Use of spectrometers, database structures, and validation methods for geospatial data.

Unit VI: Geospatial Data Management and Modelling

Database Management: Concepts, design, SQL querying, and GIS database applications; Global and Regional Geospatial databases. Geospatial Modelling: Estimation, spatial statistics, variogram analysis, time-series applications, and climate change impact modelling (hydrology, land cover, and agriculture).