

## DISCIPLINE SPECIFIC CORE COURSE – ADVANCED SPATIAL ANALYSIS (DSC 20 PRACTICAL)

Course title & Code	Credits	Duration (Hrs per week)			Eligibility Criteria	Prerequisite
		Lecture	Tutorial	Practical/ Practice		
Advanced Spatial Analysis (DSC 20 Practical)	4	01	0	03	NIL	NIL

### Learning Objectives:

- To process statistical and geospatial data with different tools
- To learn thematic application of geospatial techniques
- To develop case study on a selected spatial association/ problem
- To test a spatial hypothesis of causal relationship between variables.

### Learning Outcomes:

After studying this course, students will be able to:

- Handle spatial data and recognize its errors with degrees of confidence
- Analyze and display result in digital format
- Understand nature of software package related to spatio-temporal analysis of selected dataset

### Course Outline:

- **Unit 1: Spatial Data: (Theory- 15 hours):** Principles of Statistical data entry into digital format, methods of coding and storage; editing and missing data analysis; understanding spatial samples
- **Unit 2: Qualitative Analysis: (Practical- Lab component- 30 hours):** Geo-visualization of virtual and interactive maps, Constructing concept map, story maps, mental maps, conducting content analysis (segmentation and classification), coding of open-ended records, types of rating scales (Thurstone, Likert, Guttman),

- **Unit 3: Quantitative Analysis (Practical- Lab component- 30 hours):** Statistical indices of inequality, Time-series analysis; nearest neighbour analysis; multiple correlation and regression with residual error analysis; hypothesis testing and its significance (t-test)
- **Unit 4: Digital Image Analysis and advanced Geospatial Analysis (Practical- Lab component- 30 hours):** Image transformation, image statistics and indices, mosaics and image fusion, 3D visualization; digital image classification accuracy assessment; Object-based Image Analysis (OBIA); change detection; Spatial interpolation; Spatial multi-criteria analysis for site selection; Spatial composites; Web-GIS based spatial query analysis; mobile mapping

### Practical Record (Soft Copy):

Statistical data will be processed using any statistical software - EXCEL/R/SPSS/Stata. For visualization softwares like Google Earth/NASAWorldWind can be used. Spatial data will be analysed using any open-source software like SAGAGIS/QGIS/GRASS GIS/ILWIS and cloud based softwares like Google Earth Engine, ESRI ArcGIS Online, Bhuvan Apps can be used for Web-GIS.

1. Students will create a dataset in digital format on any given area and selected topic.
2. All statistical and spatial analysis will be done on the above dataset, selected satellite images of the same area will be used for geospatial analysis.
3. The practical file will be submitted in a digital format.

### Readings:

- Acevedo, M.F. (2013). Data Analysis and Statistics for Geography, Environmental Science, and Engineering (1st ed.). CRC Press. Available at: <https://doi.org/10.1201/b13675>
- Albert, D.P., Gesler, W.M., & Levergood, B. (Eds.). (2000). Spatial Analysis, GIS and Remote Sensing: Applications in the Health Sciences (1st ed.).CRCPress.Boca Raton. Pp 240.eBook ISBN: 9780429219931.Available at: <https://doi.org/10.1201/b12416>
- Bhattacharjee, A.(2012), Social Science Research: Principles, Methods, and Practices. Textbooks Collection. Book 3. [http://scholarcommons.usf.edu/oa\\_textbooks/3](http://scholarcommons.usf.edu/oa_textbooks/3)
- Blaschke, T., Lang, S., & Hay, G. (2008). Object-Based Image Analysis. Springer Science & Business Media.
- Bluman, A. G. (2023). Elementary Statistics: A Step-by-Step Approach, 11th Edition. Publisher: McGraw-Hill Education. Pp. 892. ISBN10: 1260360652 | ISBN13: 9781260360653
- Conrad, O., Bechtel, B., Bock, M., Dietrich, H., Fischer, E., Gerlitz, L., Wehberg, J., Wichmann, V., and Böhner, J. (2015). System for Automated Geoscientific Analyses (SAGA) v. 2.1.4, Geosci. Model Dev., 8, 1991–2007, Available at: <https://doi.org/10.5194/gmd-8-1991-2015>

- Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (3rd ed.). Thousand Oaks, CA: Sage Publications. ISBN: 9781506386690
- Fotheringham, S., Brunsdon, C., & Charlton, M. (2000). *Quantitative Geography: Perspectives on Spatial Data Analysis*. Sage Pub. Ltd. London. ISBN-10 : 0761959483 ISBN-13 : 978-0761959489
- Graser, A. (2016). *Learning QGIS - Third Edition: Create great maps and perform geoprocessing tasks with ease*. Packt Publishing Limited; 3rd edition. Pp. 210. ISBN-10 : 1785880330 ISBN-13 : 978-1785880339
- Lang, S. (2008). Object-based image analysis for remote sensing applications: modeling reality – dealing with complexity. In: Blaschke, T., Lang, S., Hay, G.J. (eds) *Object-Based Image Analysis. Lecture Notes in Geoinformation and Cartography*. Springer, Berlin, Heidelberg. [https://doi.org/10.1007/978-3-540-77058-9\\_1](https://doi.org/10.1007/978-3-540-77058-9_1)
- Mather, P.M. and Koch, M. (2010). *Computer Processing of Remotely-Sensed Images: An Introduction*, Fourth Edition. Available at: <https://doi.org/10.1002/9780470666517>.
- Montello, D. R. (2006). *An Introduction to Scientific Research Methods in Geography*. SAGE Publications.
- Nussbaum, S., & Menz, G. (2008). *Object-based image analysis and treaty verification: new approaches in remote sensing - applied to nuclear facilities in Iran*. Springer. ISBN: 978-1-4020-6960-4 e-ISBN: 978-1-4020-6961-1
- Schowengerdt, Robert. A. (2006). *Remote sensing: Models and methods for image processing*. Academic Press; 3rd edition (September 11, 2006). Pp. 560. ISBN-13 : 978-0123694072
- Solari, O. M., Demirci, A., & Schee, J. A. v. d. (2015). *Geospatial technologies and geography education in a changing world: Geospatial practices and lessons learned*. Springer. Available at: <https://doi.org/10.1007/978-4-431-55519-3>
- Tiwari, A. and Jain, K. (eds.). (2017) *Concepts and Applications of Web GIS*. Hauppauge, New York: Nova Science Publisher's, Inc., 2017. ISBN 9781536127805 (ebook)
- Triola, M. F. (2017). *Elementary Statistics Using Excel Plus New Mystatlab with Pearson Etext*. Pearson College Div. ISBN 13: 9780134506623 ISBN 10: 0134506626
- Walford, N. (2011). *Practical Statistics for Geographers and Earth Scientists*. John Wiley & Sons. Pp. 440. ISBN: 978-0-470-84914-9

#### **LIST OF DISCIPLINE SPECIFIC ELECTIVES OFFERED IN GEOGRAPHY FOR SEMESTERS VII AND VIII**

**Note:** Discipline Specific Electives (DSE) represent specialized subfields in emergent and important areas of the discipline. DSE 11, 12, 13 and 14 to be offered in Sem VII, DSE 15, 16, 17 and 18 to be offered in Sem VIII