GIS – 848 Spatial Epidemiology (3+0=3)

1. **Course Objectives:**
   a. To ensure students have a thorough idea of disease types that are common in Pakistan, can identify their clusters, determine risk factors, and inform public health interventions.
   b. To map and analyze the spread of various epidemics, such as covid, dengue, malaria, tuberculosis using spatial programming and statistical analysis software.

2. **Course Outcomes:**
   a. Students will be able to monitor and map the spread of epidemics and assess relevant environmental and visual data.
   b. Students will develop advanced computational and statistical programming skills.

3. **Course Code:**
   a. GIS – 848

4. **Credit Hours:**
   a. Theory   =   03
   b. Practical   =   00
   c. Total =   03

5. **Detailed Contents:**
   a. RS/GIS and spatial epidemiology: Spatial analysis and disease mapping
   b. Data and tools in spatial epidemiology
   c. Data types and visualization
   d. Effective data display
   e. Cartography and ethics in spatial epidemiology
   f. Spatial clustering of disease
   g. Disease alarms and cluster investigation
   h. Methods for aggregated data
   i. Methods for point data
   j. Local estimate of spatial clustering
   k. Generalized additive models
   l. Generalized linear models
   m. Spatial variations in risk
   n. Bayesian hierarchical spatial models I
   o. Bayesian hierarchical spatial models II
   p. Spatial point pattern analysis
   q. Case study I: Fatima, S. H., Atif, S., Rasheed, S. B., Zaidi, F., & Hussain, E. (2016). Species Distribution Modelling of Aedes Aegypti in two dengue-endemic regions of Pakistan. Tropical Medicine & International Health, 21(3), 427-436.
   r. Case study II: Butterworth, M. K., Morin, C. W., & Comrie, A. C. (2017). An analysis of the potential impact of climate change on dengue transmission in the South-Eastern United States. Environmental health perspectives, 125(4), 579.

6. **Field Trip, if applicable:**
   a. National institute of health
   b. Ayub Park and Gulistan colony

7. **Term Project:**
   Students in groups of 2 shall be submitting a term project idea after OHT-I. They will need to submit the project by the end of the semester

8. **Textbooks/Reference Books:**
   a. Lawson, A. B., Banerjee, S., Haining, R. P., & Ugarte, M. D. (Eds.). (2016). Handbook of spatial epidemiology. CRC Press.
   b. Pfeiffer, D., Robinson, T. P., Stevenson, M., Stevens, K. B., Rogers, D. J., & Clements, A. C. (2008). Spatial analysis in epidemiology (Vol. 142). New York, NY,USA: Oxford University Press.
   c. Graham, A. J., Atkinson, P. M., & Danson, F. M. (2004). Spatial analysis for epidemiology. Acta tropica, 91(3), 219-225.
   d. Rytkönen, M. J. (2004). Not all maps are equal: GIS and spatial analysis in epidemiology. International journal of circumpolar health, 63(1), 9-24.