Semester II

Paper 203: Digital Image Processing

Unit 1: Photogrammetry **15 Lectures**

1. Fundamentals of aerial photography, Vertical and Oblique aerialphotography, Aerialcameras, Photogrammetry; Basic concepts of scale,object height and length, objectarea and perimeter, grayscale tone/colorof objects, Photo interpretation techniques,Stereo photogrammetry andstereovision, Parallax bar and its applications.
2. Stereo Photogrammetry: Stereovision & Stereoscopes, StereoscopicParallax & Parallax Equations
3. Digital photogrammetry: Model deformation & Rectification, Reliefdisplacement,Vertical exaggeration, Triangulation, Control &Mapping. Digital Terrain Model(DTM/DEM)

Unit 2: Digital image classification & Image Interpretation **15 Lectures**

1. Supervised classification: Training sites selection and statistical information extraction, Discriminate functions. Classifier: Maximum Likelihood, Euclidian distance, Mahalanobis distance, Paralellopiped. Unsupervised classification. Classification accuracy assessment and error matrix
2. Digital Image interpretation, Pattern recognition, shape analysis, Textural analysis, Decision concepts, fuzzy sets and Evidential reasoning, Change detection, multitemporal data merging, multi sensorimage merging- merging image data with ancillary data, Expert system,Artificial Neural Network; Integration with GIS.

Unit 3: Thermal and Hyperspectral Remote Sensing **15 Lectures**

1. Thermal Infrared: Introduction, Radiation Properties, Kinetic Heat,Temperature, Radiant Energy and Flux, methods of transferring heatThermal properties of terrain: Heat Capacity, conductivity, Inertia,Infrared, Interpreting Thermal Scanner Imagery, RadiometricCalibration of Thermal Scanners, Temperature mapping with ThermalScanner Data
2. Comparison of Multispectral and Hyperspectral Image Data,Hyperspectral sensors and image characteristics, (Spectrographicimagers- hyperspectral sensors, AVIRIS, CASI, NOAA, ModerateResolution Imaging Spectrometer (MODIS), Hyperion.

Unit 4: Introduction to LiDAR **15 Lectures**

Concepts of LiDAR sensor system Introduction to Lasers and Lidar –Definitions - History of Lidar Development - Lidar SystemComponents - LIDAR sensors single-return, multi return, waveform,Characteristics of Lidar Data - interaction of laser energy with earthsurface features

References:

1. Campbell, J. B. (2002): Introduction to Remote Sensing. 5th ed. Taylor & Francis, London.

2. Burrough, P.A. and McDonnell, R. (1998): Principles of Geographic Information Systems. OxfordUniversity Press, Oxford.

3. Cha, B., Dattaa, D., Majumdar (2001): Digital Image Processing Analysis, PrenticeHall of India, New Delhi

4. Curran, P.J. (1985): Principles of Remote Sensing, Longman, London.

5. George, J. (2003): Fundamentals of Remote Sensing. Universities Press (Pvt.) Ltd, Hyderabad.

6. Girard, M. C. and Girard, C. M. (2003): Processing of Remote Sensing Data. Oxford & IBH, New Delhi.

7. Floyd, F., Sabins, Jr. (1986): Remote Sensing : Principles and Interpretation, W.H. Freeman, New York

Jensen, J. R. (2005): Introductory Digital Image Processing, Prentice Hall, New Jersey

8. Guham, P. K. (2003): Remote Sensing for Beginners. Affiliated East-West Press Pvt. Ltd., New Delhi.

9. Harry, C.A. (ed.) (1978): Digital Image Processing, IEEE Computer Society.

10. Hord, R.M. (1982): Digital Image Processing of Remotely Sensed Data, Academic Press, New York.

11. Leuder, D.R. (1959): Aerial Photographic Interpretation: Principles and Application. McGraw Hill, NewYork.

12. Lillesand, T. M., Kiefer, R. W. Chipman, J. W.(2008): Remote Sensing and Image

Interpretation, John Wiley & Sons, New Delhi

13. Nag, P. Kudrat, M. (1998): Digital Remote Sensing, Concept Publishing Company,

New Delhi

14.Reeves, R.G. (ed.) (1983): Manual of Remote Sensing, Vols. 1 & 2, American Society of Photogrammetry &Remote Sensing, Falls Church, Virginia.

15.Richards, J. A, Jia, X. (1999): Remote Sensing and Digital Image Processing,

Springer, Verlag Berlin

16. Sabins, F. F. (1996): Remote Sensing: Principles an Interpretation, W. H. Freeman Company, New York

17. Swain, P.H. and Davis, S.M. (ed.), (1978): Remote Sensing: The Quantitative Approach. McGraw Hill, NewYork.