



**INDIAN STATISTICAL INSTITUTE**  
**SYSTEMS SCIENCE and INFORMATICS UNIT**  
COMPUTER AND COMMUNICATION SCIENCES DIVISION  
8<sup>TH</sup> Mile, Mysore Road, R.V. College Post, Bangalore, 560059, India  
<http://www.isibang.ac.in/~ssiu>

**BROCHURE**

**TWO-WEEK DST SUMMER SCHOOL ON**  
**Mathematical Morphology in Geosciences**  
**(24 March–08 April 2015)**  
<http://www.isibang.ac.in/~dst-ss-mmg>

A Two-Week long DST Summer School on "Mathematical Morphology in Geosciences" is scheduled during 24 March-08 April 2015, and would be held at Systems Science and Informatics Unit (SSIU) of Indian Statistical Institute, Bangalore Centre.

This school is being organized with the funding received from the Department of Science and Technology, Government of India. This summer school is also technically co-sponsored by the Indian Statistical Institute, Bangalore Section IEEE GRSS Chapter, and Bangalore IAMG Students' Chapter.

**Prospective Participants:**

Number of participants is restricted to 20. This summer school is mainly intended for Postgraduate students, Ph.D. Scholars, Post-Docs and young faculty members who would like to venture into research on the topics of the summer school. The number of participants is restricted to 20. Selection would be based on the qualification and its relevance to the topic of the summer school. The selected candidates would be provided with train fares in shortest route, and local hospitality during the period of summer school. No registration fee for selected participants. Final decision on selection of candidates lies with DST.

**Application/Registration:**

The Completed application/registration form (scanned or hard copy) must reach us on before 30 January 2015 to:

Dr. B. S. Daya Sagar,  
Coordinator, DST Summer School on "Mathematical Morphology in Geosciences"  
Systems Science and Informatics Unit  
Indian Statistical Institute  
Bangalore Centre  
8<sup>th</sup> Mile, Mysore Road, R.V. College Post  
Bangalore–560059, India

The filled-in application could also be sent via email to: [bsdsagar@isibang.ac.in](mailto:bsdsagar@isibang.ac.in),  
[bsdsagar@yahoo.co.uk](mailto:bsdsagar@yahoo.co.uk).

Applicant needs to write a one-page note on how and why his/her candidature is suitable for attending this course. Incomplete forms would not be processed.

### **Course Summary:**

Of late, the applications of mathematical morphology are realized in the fields of remotely sensed data analysis, Geographical Information Science (GISci), and in geosciences. A host of algorithms developed based on the concepts of mathematical morphology would be covered in a series of several lectures by B. S. Daya Sagar (Coordinator), and by other eminent invited speakers. The sequence of lectures is organized in such a way that there would be an excellent coherence.

### **Schedule of Lectures:**

Inaugural Session on 24 March 2015 (10.00AM - 12.30PM): For more details please see the webpage at <http://www.isibang.ac.in/~dst-ss-mmg> (details would be available soon at this webpage)

### **Mathematical Morphology in Geosciences (Speaker: B. S. Daya Sagar)**

Processing of remotely sensed data in both spatial and frequency domains has received wide attention. The application of remote sensing in various fields is greatly realized in the last three decades. One of the data derivable from remotely sensed data is a Digital Elevation Model (DEM) that provides rich clues about physiographic constitution of Earth planet, and Earth-like planetary surfaces. Remotely sensed data are available for various phenomena related to terrestrial, lunar, planetary surfaces, and atmospheric phenomena such as clouds in spatiotemporal mode. To address the intertwined topics—like pattern retrieval, pattern analysis, spatial reasoning, and simulation and modelling for understanding spatiotemporal behaviours of several of terrestrial phenomena and processes that could be acquired through remote sensing mechanisms—various original algorithms and modelling techniques that are mainly based on mathematical morphology (Matheron 1975, Serra 1982), fractal geometry (Mandelbrot 1982), and chaos theory (May 1976) have been developed and their utility has been demonstrated. During this workshop, a series of lectures on theory and applications of mathematical morphology and scaling concepts in addressing those mentioned intertwined topics would be delivered by the Coordinator of this summer school (B. S. Daya Sagar) during this summer school.

### **These lectures would be on the topics given below:**

- Introduction to Mathematical Morphology;
- Mathematical Morphology in Terrestrial Pattern Retrieval;
- Mathematical Morphology in Terrestrial Pattern Analysis;
- Terrestrial Surface Characterization: a Quantitative Perspective;
- Size distributions, Spatial Heterogeneity and Scaling Laws;
- Morphologic Shape Decomposition: Scale Invariant and Shape-Dependent Measures;
- Granulometries, Convexity Measures and Geodesic Spectrum for DEM;
- Mathematical Morphology in Geomorphologic Modelling and Simulation;
- Fractal-Skeletal-Based Channel Network Model;
- Synthetic Models to Understand Spatiotemporal Dynamics of Certain Morphological Processes;
- Mathematical Morphology in Quantitative Spatial Reasoning and Visualization;
- Mathematical Morphology in Spatial Interpolations;
- Conversion of Point-Data into Polygonal Map via WSKIZ;
- Visualization of spatiotemporal behaviour of discrete maps via generation of recursive median elements;
- Quantitative Characterization of Complex Porous Phase via Mathematical Morphology and Fractal Geometry;

- Several tutorials, Several case studies by eminent speakers.

List of Eminent Speakers:

- See the webpage at <http://www.isibang.ac.in/~dst-ss-mmng>

List of Tutorial Speakers:

- See the webpage at <http://www.isibang.ac.in/~dst-ss-mmng>