

# Modeling Cerebral Cortex and Plasticity

## Overview

To simulate computational cognition, it is necessary to understand the workings of brain and cognitive processes. The study of the development of the cortex and the precise orderly connections within and between cortical areas, which enable the processes that underlie sensation and perception, control of action, learning and memory etc., can lead to simulation of those processes on a computational system. These theoretical studies offer the prospect of connecting diverse research constructs and paradigms, and of providing a new understanding of the algorithms that drive our mental "machinery."

The primary objectives of the course are as follows:

- Exposing participants to the fundamentals of functions and development of cerebral cortex,
- Application of tools and techniques in the field of computational neuroscience.

Providing exposure to practical problems and their solutions, through demonstration of some computational models of cortex processing.

## Modules

- Course Start Date: 07/08/2016; Course End Date:16/08/2016
- Number of Participants (maximum): 50 (Preference will be given to the participants registering against 2 Credits)
- Lecture 1: Cortical Development: Early events  
Development of the cortex, Targeting and innervation of cortex, Interaction between ingrowing thalamic axons and the developing cortex
- Lecture 2: Activity-Dependent Development and Plasticity  
Activity-Dependent development of functions, Hebbian process, Synaptic efficacy during cortical development
- Lecture 3: Development of Interacortical Connections and Cortical Dynamics  
Functional segregation of processing streams,

Who can attend...

Fees

pattern of thalamocortical and intracortical projections in adults

- Lecture 4: Cortical Circuits and Computations  
Orientation and direction selectivity in visual cortex
  
- Lecture 5: Information Processing and Transfer in Visual Cortical Areas  
Information processing in the visual system, Vision modulation by voluntary attention
  
- Faculties, engineers and researchers from academic, industrial and government organizations including R&D laboratories from India and abroad.
  
- Students at all levels (BTech/MSc/MTech/PhD) from reputed academic and technical institutions from India and Abroad.

Number of participants for the course will be limited to fifty. Preference will be given to the participants opting against credits.

The participation fees for taking the course is as follows:

Participants from abroad : US \$500

Industry/Research Organizations: INR 10,000

Academic Institutions: INR 2,000 (half for SC/ST students)

The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hours free internet facility. The participants will be provided with accommodation on payment basis.

## The Faculty



**Dr. Mriganka Sur** is the Paul E. and Lilah Newton Professor of Neuroscience and Director of the Simons Center for the Social Brain at MIT. Dr. Sur studies the organization, development and plasticity of the cerebral cortex of the brain using experimental and theoretical approaches. He has discovered fundamental principles by which networks of the cerebral cortex are wired during development and change dynamically during learning. His laboratory has identified gene networks underlying cortical plasticity, and pioneered high resolution imaging methods to study cells, synapses and circuits of the intact brain. Recently, his group has demonstrated novel mechanisms underlying disorders of brain development, and proposed innovative strategies for treating such disorders.



**Prof. U.S. Tiwary** is a Professor at Indian Institute of Information Technology Allahabad. His research interests are in the field of Image Processing, Computer Vision, Medical Image Processing, Pattern Recognition & Script Analysis, Digital Signal Processing, Speech and Language Processing, Wavelet Transform, Soft Computing & Fuzzy Logic, Neuro-computing and Soft-computers, Speech driven computers, Natural Language Processing, Brain Simulation, Cognitive Science.

### Course Coordinator

Prof. U.S. Tiwary

Phone: 0532-2922237

Email: `ust {at} iiita {dot} ac {dot} in`

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Web: <https://gian.iiita.ac.in/>

## Course Registration Process

### Step 1: One Time Registration

Registration for GIAN courses is not free because of constraint in the maximum number of participants allowed to register for a course. In order to register for any course under GIAN, candidate will have to get registered one time first to GIAN Portal of IIT Kharagpur using the following steps:

1. Create login and password at <http://www.gian.iitkgp.ac.in/GREGN/index>
2. Login and complete the Registration Form
3. Select Courses
4. Confirm your application and payment information
5. Pay Rs. 500/- (non-refundable) through online payment gateway
6. Download and print “pdf file” of your enrolment application form for your personal records and copy of the same to be sent to the Course Coordinator

### Step 2: Institute Registration

1. Institute registration process is an online process through Google Forms. Shortlisted candidates will be provided to fill this form for submission to the Coordinator at appropriate time.

2. Course Fee (Non-refundable): The participation fee to attend the short course shall be:

Participants from abroad	:	US \$500
Industry/Research Organizations	:	INR 10,000
Academic Institutions	:	INR 2,000 (half for SC/ST students)

The above fee includes the instructional materials, internet facility and snacks between the sessions. The accommodation will be provided on payment basis subject to availability on request otherwise participants will have to make their own stay arrangement.

3. The Registration fee has to be paid through National Electronic Funds Transfer (NEFT) to the account of “Indian Institute of Information Technology, Jhalwa Allahabad” (Account No. : SB A/c. 35465510718, SBI, Branch Jhalwa, Allahabad, Branch Code: 10891, MICR Code: 211002057, IFSC Code: SBIN0010891.

4. Scan copy of the Bank Transfer Certificate “Receipt” must be sent via Email to the GIAN Coordinator of the [gian@iiita.ac.in](mailto:gian@iiita.ac.in) on or before June 20, 2016.

5. Postal address for any correspondence, though email is preferable.

Dr. Satish Singh  
GIAN Courses coordinator, IIIT Allahabad  
Department of Information Technology, IIIT Allahabad  
Devghat, Jhalwa, Allahabad 211012  
E-mail: [sk.singh@iiita.ac.in](mailto:sk.singh@iiita.ac.in)  
Mobile: +91-9532096413

6. Selection will be made purely on First Come First Serve basis according to eligibility and subject to fulfilling of the available seats.

7. Maximum fifty (50) participants will be accommodated in the course.

8. The Brochure and the Registration Form may be downloaded from the Institute website <https://gian.iiita.ac.in>.

### **Important Information**

1. The students will obtain academic credits for this course, if opted, based on the evaluation rules and grading process of the GIAN and IITA.

2. After successful completion of the course, all participants will get participation certificates along with grades and credits, if registered against credits, as per Institute norms.

3. No TA, DA will be provided to the participants.

4. Limited accommodation is available in the Institute campus which will be provided on First Come and First Serve Basis on payment mode.

5. Additional Fees for accommodation (if required):

Rs. 100/- per day per person in Boys/Girls Hostels (50 beds)

Rs. 150/- per day per person on twin sharing in Non-AC room in Guest House (16 beds)

Rs. 250/- per day per person on twin sharing in AC room in Guest House (50 beds)

\* Food Charges extra on actual basis.