



## Analytical Systems Biology and Characterization of Biotherapeutics

**Overview:** Development of protein based medicines is the current burgeoning segment of the global pharmaceutical industry. India has successfully placed itself as a leader in “generic” segment and is now steadily working its way up to make a global mark in the “biotherapeutic” segment as well. Unlike a “generic” drug that is a chemically synthesized identical copy of the innovator drug, production of biotherapeutics is a complex process as it involves recombinant expression of the specific protein/ peptide in a biological host. Therefore, the amount and type of permissible structural and functional variations have to be strictly controlled to avoid adverse immunogenic responses arising from the different proteoforms. This requires extensive physicochemical characterization of the structure, structural variation and impurities that may arise from the manufacturing process itself or the host used for the protein production. The potential for the presence of multiple variants in protein-based pharmaceuticals highlights the indispensability of state of the art analytical techniques that can measure these variants in a reliable and accurate manner. As no one technique can capture all possible structural variants of a protein in a high-throughput manner, multiple methods are used to study the different characteristics of each protein. The four day workshop organized by GIAN at IITD will thus broadly cover the various aspects of Analytical Systems Biology and Characterization of Biotherapeutics including hands-on-training on the cutting edge techniques used in the Industry as well as academia.

<b>Dates</b>	11 <sup>th</sup> December to 14 <sup>th</sup> December 2018
<b>Host Institute / Venue</b>	Indian Institute of Technology (IIT), Delhi Lecture Hall Complex (LHC), IIT Delhi
<b>Participants</b>	Limited to 20
<b>Who Should Attend</b>	<ul style="list-style-type: none"><li>❖ Executives, engineers involved in chemical engineering/Life-sciences from academia and manufacturing, service and government organizations including R&amp;D laboratories.</li><li>❖ Students at all levels (BTech/MSc/MTech/PhD) or Faculty Members/Scientists from reputed academic institutions and technical institutions.</li></ul>
<b>Course Registration Fees</b>	The participation fees for taking the course is as follows: <ul style="list-style-type: none"><li>✚ <b>Research Scholars/Students:</b> Rs.5000/-</li><li>✚ <b>Faculty:</b> Rs.10000/-</li><li>✚ <b>Working Professionals:</b> Rs.15000/-</li><li>✚ <b>Participants from Abroad:</b> USD 250</li></ul> The above fees ( <b>inclusive of GST</b> ) includes the use of all instructional materials assigned for the course and laboratory equipment usage charges.

## Registration Process

**Step 1: GIAN web Portal Registration:** Register in the GIAN portal i.e. <http://www.gian.iitkgp.ac.in/GREGN/index> by paying Rs. 500/- online. Registration to this portal is a one-time affair and will be valid for the lifetime of GIAN. Please note that course fee is separate.

**Step 2:** Login to the GIAN portal with the registered User ID and Password. Choose the Course registration option. Select the course titled "Analytical Systems Biology and Characterization of Biotherapeutics" from the list and click the "Save" option. Confirm your registration by clicking the suitable option.

**Step 3: Course Shortlisting:** Candidates will be intimated through email regarding their selection.

**Step 4: Course Fee Remittance:** Once you receive the intimation from the Course Coordinator, the fee (as applicable) needs to be paid.

**Step 5: Mode of payment:** The details of fee payment by Electronic Clearing Service/ RTGS/ Demand Draft in the name of "**IITD CEP ACCOUNT**". The bank details are as follows:

1	Bank Account No.	36819334799
2	Bank Address	State Bank of India, IIT Delhi, Hauz Khas New Delhi-16
3	MICR Code	110002156
4	Beneficiary	IITD CEP ACCOUNTS
5	IFSC Code	SBIN0001077
6	MICR Code	110002156
7	SWIFT Code	SBININBB547
8	IITD PAN No.	AAATI0393L
9	Account Type	Saving

The participants are required to send the Demand Draft for the registration fee to the Coordinator:

**Prof. Anurag S. Rathore**  
**Department of Chemical Engineering**  
**Room no 94, Block 2, Indian Institute of Technology, Delhi**  
**Hauz Khas, New Delhi-110016**

**Step 5:** Fill up the registration form (**Given in Page no. 7 of this brochure**), by providing details of the bank transaction. Send the scanned copy of registration form to the Course coordinator at [coe.biopharma.course@gmail.com](mailto:coe.biopharma.course@gmail.com) before **7<sup>th</sup> December 2018**

**Lecture Schedule**

<b>Day 1 (11<sup>th</sup> December 2018)</b>			
<b>Timing</b>	<b>Session 1</b>	<b>Duration</b>	<b>Teaching faculty</b>
9:00 AM to 10:00 AM	Lecture: Introduction, Molecular biology as part of systems biology: analytical aspects	1 hr	Prof. Andras Guttman
10:00 AM to 10:30 AM	Tea break	30 min	
10:30 AM to 11:30 AM	Lecture: The human genome project: genetic variations in medicine	1 hr	Prof. Andras Guttman
11:30 AM to 12:30 PM	Lecture: Analytical characterization of biotherapeutics: An Overview	1 hr	Prof. Anurag S. Rathore
<b>Timing</b>	<b>Session 2</b>	<b>Duration</b>	
12:30 PM to 1:30 PM	Lunch break	1 hr	
1:30 PM to 4:30 PM	GROUP 1: HPLC based separation of biotherapeutics GROUP 2: Binding kinetics using Surface Plasmon Resonance GROUP 3: Spectroscopic tools: Fourier Transform Infra-Red and Fluorescence Spectroscopy GROUP 4: Biotherapeutic characterization using Gel Electrophoresis	3 hrs	Prof. Andras Guttman
<b>Day 2 (12<sup>th</sup> December 2018)</b>			
<b>Timing</b>	<b>Session 1</b>	<b>Duration</b>	<b>Teaching faculty</b>
9:00 AM to 10:00 AM	Lecture: Gene amplification, sequencing and DNA chip technology, from mutation to disease	1 hr	Prof. Andras Guttman
10:00 AM to 10:30 AM	Tea break	30 min	
10:30 AM to 11:30 AM	Lecture: An Introduction to Spectroscopic tools – Fluorescence, FTIR, CD, UV VIS, Raman, NIR Spectroscopy	1 hr	Dr. Shashank Deep
11:30 AM to 12:30 PM	Lecture: Computational modeling in microfluidics: simulation and microfabrication	1 hr	Prof. Andras Guttman
<b>Timing</b>	<b>Session 2</b>	<b>Duration</b>	
12:30 PM to 1:30 PM	Lunch break	1 hr	
1:30 PM to 4:30 PM	GROUP 2: HPLC based separation of biotherapeutics GROUP 3: Binding kinetics using Surface Plasmon Resonance GROUP 4: Spectroscopic tools: Fourier Transform Infra-Red and Fluorescence Spectroscopy GROUP 1: Biotherapeutic characterization using Gel Electrophoresis	3 hrs	Prof. Andras Guttman
<b>Day 3 (13<sup>th</sup> December 2018)</b>			
<b>Timing</b>	<b>Session 1</b>	<b>Duration</b>	<b>Teaching faculty</b>
9:00 AM to 10:00 AM	Lecture: Introduction to analytical tools for thermodynamic characterization – ITC, QCM	1 hr	Dr. Sudip K. Pattanayek
10:00 AM to 10:30 AM	Tea break	30 min	
10:30 AM to 12:30 PM	Lecture: Miniaturization and microreactors in bioanalysis and biotechnology	2 hrs	Prof. Andras Guttman
<b>Timing</b>	<b>Session 2</b>	<b>Duration</b>	
12:30 PM to 1:30 PM	Lunch break	1 hr	

	1:30 PM to 4:30 PM	GROUP 3: HPLC based separation of biotherapeutics GROUP 4: Binding kinetics using Surface Plasmon Resonance GROUP 1: Spectroscopic tools: Fourier Transform Infra-Red and Fluorescence Spectroscopy GROUP 2: Biotherapeutic characterization using Gel Electrophoresis	3 hrs	Prof. Andras Guttman
	<b>Day 4 (14<sup>th</sup> December 2018)</b>			
	<b>Timing</b>	<b>Session 1</b>	<b>Duration</b>	<b>Teaching faculty</b>
	9:00 AM to 10:00 AM	Lecture: Systems biology in drug discovery, biomarkers, validation and applications	1 hr	Prof. Andras Guttman
	10:00 AM to 10:20 AM	Tea break	20 min	
	10:20 AM to 10:50 AM	Lecture: Biological assays and Case Studies	30 min	Prof. Anurag S. Rathore
	10:50 AM to 11:30 AM	Lecture: Library Screening methods for development of drug candidates and purification ligands	40 min	Dr. Richard Willson
	11:30 AM to 12:30 PM	Lecture: Future prospective of systems biology: proteomics and glycomics	1 hr	Prof. Andras Guttman
	12:30 PM to 1:15 PM	Lunch	45 min	
	<b>Timing</b>	<b>Session 2</b>	<b>Duration</b>	
	1:15 PM to 4:15 PM	GROUP 4: HPLC based separation of biotherapeutics GROUP 1: Binding kinetics using Surface Plasmon Resonance GROUP 2: Spectroscopic tools: Fourier Transform Infra-Red and Fluorescence Spectroscopy GROUP 3: Biotherapeutic characterization using Gel Electrophoresis	3 hr	Prof. Andras Guttman
	4:15 PM to 4:45 PM	Valedictory Session	30 min	
<b>Accommodation</b>	<ul style="list-style-type: none"> <li>✚ The participants (students) may be provided with hostel accommodation, depending on the availability, on payment basis.</li> <li>✚ The faculty &amp; working professional may be provided with faculty guest house accommodation, depending on the availability, on payment basis.</li> </ul>			



## The Faculty



*Prof. András Guttman, MTA-PE Lendület Professor of Translational Glycomics, is the head of the Horváth Csaba Memorial Institute of Bioanalytical Research in University of Debrecen, Hungary. He also contributes to the separation/application efforts at Sciex. His work is focused on capillary electrophoresis and CE-MS based glycomics as well as glycoproteomics analysis of molecules of biomedical and biopharmaceutical interests. Prof. Guttman had previous academic appointments at Northeastern University (Boston, MA) and at University of Innsbruck (Austria) holding the Marie Curie Chair of the European Commission. His former industrial affiliations included Novartis (La Jolla, CA), Genetic BioSystems (San Diego, CA), and Beckman Instruments (Fullerton, CA), where he developed high resolution capillary electrophoresis and microfluidics based bioanalytical methods. Professor Guttman has close to 300 scientific publications, wrote 35 book chapters, edited 4 textbooks and holds 23 patents. He is a member of the Hungarian Academy of Sciences, past president of the American Chemical Society Hungary Chapter, on the board of the Society of Hungarian Academicians in America, associate director of CASSS and serves on the editorial boards of a dozen international scientific journals. Dr. Guttman graduated from University of Veszprem (Hungary) in chemical engineering, where he also received his doctoral degree. Professor Guttman has been recognized by numerous awards including the Analytical Chemistry Award of the Hungarian Chemical Society (2000), named as Fulbright Scholar of the US Department of State (2012), received the CASSS CE Pharm Award, the Arany Janos Medal of the Hungarian Academy of Sciences, the Pro Scientia award of University of Pannonia in 2013, and the Dennis Gabor Award of the Novofer Foundation (2014). Dr Guttman is also the recipient of the 2017 Dal Nogare Award of the Delaware Valley Chromatography Forum.*

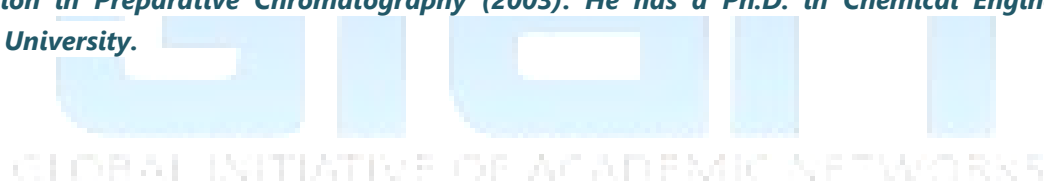
## Course Coordinator

Prof. Anurag S Rathore  
Department of Chemical  
Engineering  
Indian Institute of Technology  
(IIT Delhi)  
Mobile: +91-9650770650  
Landline: +91-11-26591098  
Fax: +91-1126596279  
E-mail:  
asrathore@biotechcmz.com  
Website: www.biotechcmz.com

<http://www.gian.iitkgp.ac.in/GR>  
EGN



***Prof. Anurag S Rathore is Professor at the Department of Chemical Engineering, Indian Institute of Technology, Delhi, India. His previous roles included management positions at Amgen Inc., Thousand Oaks, California and Pharmacia Corp., St. Louis, Missouri. His areas of interest include process development, scale-up, technology transfer, process validation, biosimilars, continuous processing, process analytical technology and quality by design. He has authored more than 400 publications and presentations in these areas. He is presently serving as the Editor-in-Chief of Preparative Biochemistry and Biotechnology and Associate Editor for Journal of Chemical Technology and Biotechnology and PDA Journal of Science and Technology. He also serves on the Editorial Advisory Boards for Biotechnology Progress, BioPharm International, Pharmaceutical Technology Europe and Separation and Purification Reviews. Prof. Rathore has edited books titled Novel Bioprocessing Technology for Production of Biopharmaceuticals and Bioproducts, Preparative Chromatography for Separation of Proteins and Peptides, Quality by Design for Biopharmaceuticals: Perspectives and Case Studies (2009), Elements of Biopharmaceutical Production (2007), Process Validation (2005), Electro kinetic Phenomena (2004) and Scale-up and Optimization in Preparative Chromatography (2003). He has a Ph.D. in Chemical Engineering from Yale University.***





**GIAN COURSE REGISTRATION FORM**

**(11<sup>th</sup> December 2018 to 14<sup>th</sup> December 2018)**

**NAME:** .....

**DESIGNATION:** .....

**ORGANIZATION:** .....

**ADDRESS:** .....

Government of India  
Ministry Of Human Resource Development

**EMAIL ID:** .....

**MOBILE NO.** .....

**COURSE NAME:** .....

**Fees payable to "IITD CEP ACCOUNT" , SBI , IIT DELHI**

**TRANSACTION NO. (e-transfer/RTGS/NEFT)** .....

**DEMAND DRAFT NO.(If paid by Demand Draft)**.....

**Place :** .....

**Date :** .....

**Signature of the Applicant:** .....