

# Smart molecules in research: Self-assembly of programmable molecular building blocks as fundamental tools in basic and applied research

## Overview

The course will generally focus on recently-developed techniques and groundbreaking advances using "programmable materials" such as DNA strands or peptides, as tools for carrying out a broad range of fundamental and applied research. Technologies such as DNA origami, DNA tiles/bricks, phage display, and aptamers have provided the basic components for numerous important studies for elucidating the basic mechanisms of life and nature. By combining these components into functional nanodevices, the ability to "program" matter in ways not possible with naturally occurring components can be gained. The lectures in this course will cover the basic concepts of using molecules to carry out designed, programmed self-assembly reactions to attain precisely-defined nanostructures, as well as several key areas where these methodologies have proven fruitful for researchers. The topics will touch on a variety of fields, including chemistry, biochemistry, cell biology, bio-/soft matter physics, and photonic/plasmonic physics. Due to this highly interdisciplinary structure, it is expected that student participants will come from a broad range of educational disciplines. Therefore, the lecture topics will be given in a way so that the technical topics can be understood by audience members with little or no prior coursework in these specific areas.

<b>Dates of the course</b>	3 December to 7 December, 2018
<b>Host institute</b>	IIT Madras
<b>No. of credits</b>	1
<b>Max. participants</b>	50
<b>You should attend if you are</b>	<ul style="list-style-type: none"> <li>▪ Student at all levels (Senior B.E./B.Tech. / M.Tech. / M.S. / M.Sc. / Ph.D.) interested in the area of thermochemical processes for energy and fuels</li> <li>▪ Faculty from reputed academic and technical institutions or universities</li> <li>▪ Engineer and/or professional from national/multinational industry</li> <li>▪ Engineer and/or researcher from government R&amp;D laboratory</li> </ul>
<b>Course registration fees</b>	<p>The participation fees for taking the course is as follows:</p> <p style="text-align: center;"><b>Student participants: Rs. 1,000</b>  <b>Faculty participants: Rs. 4,000</b>  <b>Government research organization: Rs. 4,000</b>  <b>Industry participants: Rs. 8,000</b></p> <p><b>Modes of payment:</b>  <u>Online transfer:</u> Account Name: <b>CCE IIT Madras</b>  A/c No.: <b>36401111110</b> (SBI, IIT Madras Branch, Chennai)  IFSC Code: <b>SBIN0001055</b>  <b>(OR)</b>  <u>Demand draft</u> in favour of "<b>CCE, IIT Madras</b>" payable at <b>Chennai</b>. The demand draft is to be sent to the course coordinator at the address given below.  The above fee is towards participation in the course and course materials.</p>
<b>Accommodation</b>	<p>The participants may be provided with hostel accommodation, depending on availability, on payment basis. Request for hostel accommodation may be submitted through the link:  <a href="http://hosteldine.iitm.ac.in/iitmhostel/">http://hosteldine.iitm.ac.in/iitmhostel/</a></p>

## Course Faculty



**Dr. David M. Smith** received a degree in Biological Physics in the group of Prof. Josef Käs in the Department of Physics at the University of Leipzig, in 2010 and his Post-doctoral research

in the group of Prof. Tim Liedl (AG DNA Nanotechnology) in Center for Soft Condensed Matter (Lehrstuhl Joachim Rädler) at Ludwig-Maximilians-Universität München. He is now the Leader of research group “DNA Nanodevices” at the Fraunhofer IZI since 2013. His primary research expertise includes Programmed self-assembly of DNA-based nanomaterials, bio-nanotechnology, nano particle-mediated drug delivery, biopolymer self-assembly, soft matter physics and therapy development. He has several awards, patents and research publications to his credit.

He can be contacted at Fraunhofer Institute for Cell Therapy and Immunology (IZI)

Head of DNA Nanodevices Group

e-mail: david.smith@izi.fraunhofer.de

tel: ++49-(0) 341 35536 9311

fax: ++49-(0) 341 35536 89311



**Prof. Rama R** is a chair professor in the Department of Mathematics. During her 25 years of experience in research and teaching she has worked in topics like in DNA computing, Membrane Computing and Contextual Grammars, Cryptography and Picture Generation. You can know more about her research at [http://mat.iitm.ac.in/home/ramar/public\\_html/index.html](http://mat.iitm.ac.in/home/ramar/public_html/index.html)

**Dr. Kalpana Mahalingam** is an associate professor in the department of Mathematics. She has 14 years of experience in teaching and about the same in research. Her research interest lies in DNA computing, theory of codes, formal language theory and combinatorics of words. You can know more about her research at

<https://home.iitm.ac.in/kmahalingam/>



## Course Co-ordinators

**Name: Prof. R. Rama**

**Name: Dr. Kalpana Mahalingam**

Phone: 044-22574616/4630

E-mail: ramar@iitm.ac.in/

kmahalingam@iitm.ac.in

Website:

[http://mat.iitm.ac.in/home/ramar/public\\_html/index.html](http://mat.iitm.ac.in/home/ramar/public_html/index.html)

Address:

Department of Mathematics

Indian Institute of Technology

Madras

Chennai - 600036