Indian Institute of Technology Delhi

TEQIP-III Sponsored Short-Term Course

Advanced Polymer Composites & Nanocomposites

(13-17 March 2020)

Course Coordinator

Prof. Bijay P. Tripathi

Department of Material Science and Engineering

IIT Delhi Hauz Khas, New Delhi, 110016

SCOPE OF THE COURSE

Learning objective

The course focuses on relevant topics on composites and nanocomposites, which is regarded as the alternative to replace conventional materials. Apart from improving overall performance and reducing the weight, these materials provide opportunities to tailor its properties by tuning various components and structures. Recent scientific and technological developments in this area show that composite materials can be used in various applications ranging from automobile, space, agriculture, building construction, to medical. The objective of this course is to provide a common platform to scientists, engineers, technologists working in academia and industry, to discuss the fundamental and recent advances in the field of processing and application of composite and nanocomposite materials.

Learning outcomes

Knowledge: Upon successful completion of this course, participants will have a clear understanding of properties of polymer composites and nanocomposites, nanomaterials, matrix, material selection, fundamental relations, variety of characterization and manufacturing methods and how to apply this knowledge to the design and analysis of composite structures.

Skills: After this course, the participants will be able to perform basic engineering of components and products made of polymer composites as well as preliminary material selection, material evaluation, simple mechanical analysis, and failure analysis using fundamental relations for the materials and structures.

General competence: This course will also inculcate communication and discussion skills in participants on polymer composites and nanocomposites related technical terms along with the ability to answer questions on feasibility and awareness of the importance of these materials for the modern society.

COURSE CONTENTS

Introduction to Polymer Materials for Composites: Matrix; High and low temperature resins; Chemical structure & properties; Ceramic/polymer based fibres as reinforcements; polymer based processing aids, etc.

Polymer Composite Fabrication and Properties: Matrices; reinforcements; interfaces; fibre/reinforcement length, distribution, dispersion etc; Particulate/filler/hybrid composite; formulation development, composite structure and properties; testing and performance evaluation of composites.

Polymer Processing Techniques for Composites: Dispersion and Rheology; viscosity; shear flow; elongational flow; Processing techniques: extrusion, moulding, compounding and mixing, thermoforming and other processing methods; processability of composites.

Polymer technology: Polymers of commercial importance; additives to modify polymer matrices for composites; functional additives; modification of fibre/fillers.

Polymer Nanocomposites: Basics of polymer nanotechnology; Nanomaterials and properties; common nanomaterials for nanocomposites; Concepts of nanocomposites; Nanomaterials dispersion and processing of nanocomposites; properties of nanocomposites and comparative study.

Polymer composite characterizations: Thermal properties (DSC / TGA, heat distortion temperature, Vicat softening temperature); dynamic mechanical analysis; morphological analysis using SEM.

Lab Session (Afternoon): The course will have lab sessions to enhance the understanding and have practical knowledge of composite processing. Following lab sessions will be conducted:

a) Preparation of fabric reinforced composite by Compression Moulding
b) Preparation of filler reinforced composite using Twin Screw Extruder and Injection moulding
c) Preparation of nanocomposite using Micro compounder and Micro injection moulding

TARGET AUDIENCE

The course is designed for faculty members and research scholars (Ph.D. students) at TEQIP-III institutes. Participants from non TEQIP-III institutes and industry are also welcome to register by paying the fee.

We intend to keep the course strength to under 30 participants to maintain high quality of instruction. An earlier registration implies a greater chance of being accepted for this short-term course.

COURSE COORDINATOR

Prof. Bijay P. Tripathi
Assistant Professor, Dept. Mater. Sci. & Eng., IIT Delhi, New Delhi-110016

FOR ANY QUERY

For any query (registration, course content, travel or accommodation), please send an email to dmsepolymer@gmail.com

ABOUT OUR INSTRUCTORS

Prof. A. K. Ghosh

Prof. Ghosh obtained Ph.D. in Chemical Engineering from the State University of New York at Buffalo, USA (1986). He worked as a Post-Doctoral Research Fellow at the University of Pittsburgh, USA, till 1990, and then joined the Indian Institute of Technology, Delhi in 1991. He is a distinguished and renowned Professor in the field of Polymer Science & Engineering with more than 30 years of research and teaching experience. He is known for his accomplishments in the field of Polymer Processing and Rheology, having significantly contributed to the areas of reactive processing of polymer blends and alloys, polymer packaging and microcellular processing of polymeric materials.

Prof. J. Jacob

Prof. Jacob received his Ph.D. from Iowa State University, USA, where he worked on various aspects of catalysis under the guidance of Prof. James H. Espenson. Subsequently, he did postdoctoral studies initially at the University of Rochester, USA (with Prof. William D. Jones) and then at Max-Planck-Institute for Polymer Research in Mainz, Germany (with Prof. K. Muellen). In 2006, he joined as an assistant professor at IIT Delhi, where he is currently a Professor. His group has broad research interests in the area of polymer synthesis with a current focus in the areas of semiconducting polymers, biodegradable polymers and catalysis/Metallopolymers.

Prof. B. K. Satapathy

Prof. Bhabani K. Satapathy did his Ph.D. from IIT Delhi in the area of polymer composites and specifically on the tribological aspects of composites for automotive braking applications. He subsequently pursued his research career as a Postdoctoral fellow at Leibniz Institute of Polymer Research Dresden and Friedrich Schiller University Jena, Germany. His main research interests are on phase behavior, tribology and fracture mechanics of polymer-based blends, composites, block copolymers and allied materials.

Prof. Sampa Saha

Prof. Sampa Saha received her Ph.D. in Polymer Chemistry from Michigan State University, USA, under the guidance of Professor Gregory L. Baker. After a brief stay at the University of Michigan, Ann Arbor, as Postdoctoral Research Associate under Professor Joerg Lahann, she moved to Singapore to join as a Research Scientist, BASF South East Asia Pvt. Ltd. After that, she joined as Research Fellow at School of Materials Science and Engineering, Nanyang Technological University, Singapore. Since 2015, she is working as Assistant Professor at IIT Delhi.

Prof. Leena Nebhani

Prof. Leena Nebhani completed her Ph.D. in Polymer Chemistry from the Karlsruhe Institute of Technology, Germany, after which she was working at the Goodyear Tire & Rubber Company, USA as a Senior Scientist. Dr. Nebhani joined the Indian Institute of Technology Delhi as an Assistant Professor in April 2015. Prof. Nebhani's research interests include macromolecular surface engineering, synthetic 'grafting-to' and 'grafting-from' routes for conjugating macromolecules, synthesis of antimicrobial hydrogels and cryogels, etc.

Prof. B. P. Tripathi

Prof. Tripathi received his Ph.D. from CSIR-CSMCRI, Bhavnagar, in 2011. He was an Alexander von Humboldt postdoctoral fellow from 2011-13 in the group of Prof. M. Stamm at the Leibniz Institute of Polymer Research Dresden, Germany, where subsequently undertook Group Leader position prior to starting his independent career as an Assistant Professor at IIT Delhi. During his research career, he has been awarded prestigious fellowships such as DAAD and Humboldt fellowship (Germany), JSPS (Japan), Marie-Curie Fellowship (Eur. Comm.), DST-INSPIRE and UGC-FRP. Prof. Tripathi's research spreads around polymer and nanomaterials synthesis, surface functionalization, nanoporous and charged membranes, and nanocomposites for applications ranging from energy, water, separation, catalysis, & environmental remediation.

REGISTRATION

A scanned copy of the duly filled registration form with a digital payment receipt must be sent to the course management team through email on dmsepolymer@gmail.com. The selection will be made on a first come first serve basis. Accordingly, the confirmed candidates will be notified.

<table>
<tr><th colspan="2">Participants</th><th>Registration fee</th><th>Accommodation</th><th>Travel</th></tr>
<tr><td>TEQIP-III institutes</td><td>All participants</td><td>0
(refundable Rs. 2000 security deposit payable)</td><td>0*</td><td>0*</td></tr>
<tr><td rowspan="3">Non TEQIP-III institutes</td><td>Industry</td><td>Rs. 20,000+18% GST
(non-refundable)</td><td colspan="2" rowspan="3">To be arranged externally by the participant at their own expense</td></tr>
<tr><td>Research Scholars</td><td>Rs. 5,000+18% GST
(non-refundable)</td></tr>
<tr><td>Faculty</td><td>Rs. 10,000+18% GST
(non-refundable)</td></tr>
</table>

ACCOMMODATION

Boarding and lodging will be arranged for the selected candidates, as per TEQIP-III norms, on sharing basis from 13th March to 17th March 2020. However, due to a limited number of rooms in the guest house, the allotment will be on first-come, first-served basis. Any stay outside this duration will have to be paid by the participant to the guest house directly.

TRAVEL

Travelling Allowances will be provided for the candidates (belonging to institutions listed under TEQIP-III) from their hometown to IIT Delhi up to a maximum of the 3rd A/C train fare.

Bank Details for e-transfer/RTGS/NEFT

Bank account no.	36819334799
Bank address	State Bank of India, IIT Delhi, Hauz Khas New Delhi, 110016
Beneficiary	IITD CEP ACCOUNT
IFSC code	SBIN0001077
MICR code	110002156
Account type	Saving

Important dates

1. 15 February 2020: Receipt of the registration form with proof of necessary payments.
2. 25 February 2020: Intimation to confirmed participants.

Registration Form A

(Faculty from TEQIP-III institute)

Advanced Polymer Composites & Nanocomposites

(13-17 March 2020)

Name	
Designation	
Department	
Organization	
Gender	
Address	
Date of birth (DD/MM/YY)	
Email id	
Mobile Number	
Twin-sharing accommodation required within IIT Delhi (tick)	Yes ( ) No ( )
Transaction number for refundable security deposit of Rs. 2,000 into IIT Delhi CEP account	(a copy of transaction slip must be appended as a PDF to this registration form)

I am a faculty at my institute. The above information is true. I understand that I will have to make my own travel arrangements and can claim return reimbursement up to a maximum of third AC train from my institute to IIT Delhi on production of original bills/tickets. I will claim my refundable security deposit back after attending all sessions on all days of this short-term course.

Signature of participant with date

Prof./Dr./Ms./Mr. is a faculty at this institute and is permitted to attend the course on "Advanced Polymer Composites & Nanocomposites" at IIT Delhi during 13-17 March 2020. Ours is an institute under TEQIP-III.

Signature of competent authority with date and seal

Note: Please send duly filled form along with a copy of transaction slip as a single PDF file to dmsepolymer@gmail.com before the deadline.

Registration Form B

(Student from TEQIP-III institute)

Advanced Polymer Composites & Nanocomposites

(13-17 March 2020)

Name	
Designation	
Department	
Organization	
Gender	
Address	
Date of birth (DD/MM/YY)	
Email id	
Mobile Number	
Twin-sharing accommodation required within IIT Delhi (tick)	Yes ( ) No ( )
Transaction number for refundable security deposit of Rs. 2,000 into IIT Delhi CEP account	(a copy of transaction slip must be appended as a PDF to this registration form)

I am a full-time PhD student at my institute. The above information is true. I understand that I will have to make my own travel arrangements and can claim return reimbursement up to a maximum of third AC train from my institute to IIT Delhi on production of original bills/tickets. I will claim my refundable security deposit back after attending all sessions on all days of this short-term course

Signature of participant with date

Ms./Mr. is a research scholar at this institute and is permitted to attend the course on "Advanced Polymer Composites & Nanocomposites" at IIT Delhi during 13-17 March 2020. Ours is an institute under TEQIP-III.

Signature of competent authority with date and seal

Note: Please send duly filled form along with a copy of transaction slip as a single PDF file to dmsepolymer@gmail.com before the deadline.

Registration Form C

(Student/Faculty from Non-TEQIP-III institute)

Advanced Polymer Composites & Nanocomposites

(13-17 March 2020)

Name	
Designation	
Department	
Organization	
Gender	
Address	
Date of birth (DD/MM/YY)	
Email id	
Mobile Number	
Twin-sharing accommodation required within IIT Delhi (tick)	Yes ( ) No ( )
Transaction number for fee deposit into IIT Delhi CEP account	(a copy of transaction slip must be appended as a PDF to this registration form)
The above information is true. I understand that I will have to make (and bear) my own travel and external accommodation arrangements to attend this course Signature of participant with date	
Ms./Mr. is a faculty / research scholar at this institute and is permitted to attend the course on "Advanced Polymer Composites & Nanocomposites" at IIT Delhi during 13-17 March 2020. Signature of competent authority with date and seal	

Note: Please send duly filled form along with a copy of transaction slip as a single PDF file to dmsepolymer@gmail.com before the deadline.

Registration Form D

(Industry participant)

Advanced Polymer Composites & Nanocomposites

(13-17 March 2020)

Name	
Designation	
Department	
Organization	
Gender	
Official Address	
Date of birth (DD/MM/YY)	
Email id	
Mobile Number	
Twin-sharing accommodation required within IIT Delhi (tick)	Yes ( ) No ( )
Transaction number for refundable security deposit of Rs. 20,000+GST into IIT Delhi CEP account	(a copy of transaction slip must be appended as a PDF to this registration form)

The above information is true. I understand that I will have to make (and bear) my own travel and external accommodation arrangements to attend this course.

Signature with date

Dr./Ms./Mr. is an employee at this organization and is permitted to attend the course on "Advanced Polymer Composites & Nanocomposites" at IIT Delhi during 13-17 March 2020.

Signature of competent authority with date and seal

Note: Please send duly filled form along with a copy of transaction slip as a single PDF file to dmsepolymer@gmail.com before the deadline.

IIT Delhi CEP Account Details (for depositing security fee and registration fee)

गुणवत्ता सुधार एवं अनुवर्ती शिक्षा कार्यक्रम
भारतीय प्रौद्योगिकी संस्थान दिल्ली
हौज खास, नई दिल्ली - 110 016 , भारत
OFFICE OF QUALITY IMPROVEMENT &
CONTINUING EDUCATION PROGRAMME
INDIAN INSTITUTE OF TECHNOLOGY DELHI
Hauz Khas, New Delhi - 110 016, India

Phone : +91-11-26597118, 26591343
E-mail : hodqipcep@admin.iitd.ac.in
qipiitd@admin.iitd.ac.in
Web : http://cepqip.iitd.ac.in

संदर्भ/Ref. No..... दिनांक/Date.....

ELECTRONIC CLEARING SERVICE (CREDIT CLEARING)/ REAL TIME GROSS SETTLEMENT (RTGS)
FACILITY FOR RECEIVING PAYMENT

A. DETAIL OF ACCOUNT HOLDER

NAME OF ACCOUNT HOLDER	IITD CEP ACCOUNT
COMPLETE CONTACT ADDRESS	1st floor, Wing-B, Vishwakarma Bhawan I I T Delhi, Hauz Khas, New Delhi – 110 016
TELEPHONE NUMBER/EMAIL	011-26591343, 011-26591915, 011-26597996 E-mail: hodqipcep@admin.iitd.ac.in

B. BANK ACCOUNT DETAILS

BANK NAME	STATE BANK OF INDIA
BRANCH NAME WITH COMPLETE ADDRESS	INDIAN INSTITUTE OF TECHNOLOGY, HAUZ KHAS, NEW DELHI-110016
IFS CODE OF THE BRANCH	SBIN0001077
MICR CODE	110002156
TYPE OF BANK ACCOUNT	SAVING ACCOUNT
BANK ACCOUNT NO.	36819334799
SWIFT CODE	SBININBB547
CURRENCY IN WHICH THE ACCOUNT IS HELD	INDIAN RUPEES

IITD PAN No. AAATI0393L
GST No. 07AAATI0393L1ZI

I hereby declare that the particulars given above are correct and complete.

19/3/2019

DEBRANJAN MUKHERJEE
Assistant Registrar (CEP Account)
Indian Institute of Technology Delhi
Hauz Khas, New Delhi-110016, India

Date: 19-03-2019 signature of the Competent Authority of the Institute

Certified that the particulars furnished above are correct and signature of Authorized Signatories are verified as per our records

22/3/19

Date: signature of the Competent Authority Official of the Bank
(with Bank's Stamp)