

IMPORTANCE AND SCOPE

Current research on microwave techniques and applications increasingly focus on novel and engineered materials to fulfill the stringent needs of modern communication. In this respect, metamaterials have played a significant and dominant role in size reduction and performance enhancement of microwave devices including both antennas and guided wave components.

Though the concept of opposing phase and group velocities in a periodic structure has been known to the microwave community, the application of the technology to the design of novel microwave devices has been relatively recent. In one domain, metamaterials have enabled us to very significantly enhance the extent of miniaturization of microwave antennas while maintaining or exceeding their efficiency to close to the physically attainable 'Chu Limit'. The course would focus on the techniques and concepts behind the significant size-reduction of such antennas for planar and non-planar structures.

In addition, metamaterial-based designs have been used for the directivity enhancement of antennas using the mu-near-zero or epsilon-very-large effects. The magnetic resonator behavior under parallel incidence condition can be utilized to realize the enhanced gain characteristic. However, from the perspective of miniaturized antenna with reduced superstrate height, the normal incidence condition is more attractive. Unit cells exhibiting electric resonance are particularly useful to achieve this goal. The course would as such focus on the design and characterization of such metamaterial topologies leading to the development of efficient directive antennas.

Metamaterial-based structures have also been used to overcome traditional limitations of microwave structures like inadequate broadside performance of leaky wave antennas or to mitigate enhanced mutual coupling effects with reduction in element spacing in antenna arrays. In addition, design of metamaterial-loaded guided wave structures with reduced wave interaction at higher frequencies would also be addressed. The course would also focus on the development of efficient radar absorbing materials with reduced thickness, high absorption and wider sensitivity to a large range of incident angles.

KEY TOPICS TO BE ADDRESSED

- Metamaterial design and analysis
- Miniaturized metamaterial antennas
- Gain enhanced metamaterial antennas
- Leaky wave metamaterial antennas
- Metamaterial Cloaks
- Dielectric resonator antennas
- Guided wave structures with metamaterials
- Radar absorbing materials based on metamaterials
- Microwave passive components
- Microwave transitions

SPEAKERS

Faculty / domain experts from IIT, Kharagpur

EXPERIMENTS

Use of HFSS and ADS simulation tool for antenna simulation and design. Familiarity with microwave measuring instruments including return loss and radiation pattern measurements.

Course Schedule

9 am to 7 pm with 1 hour lunch break each day.

IMPORTANT DATES

Last date for receiving application: July 6, 2018
Intimation to the applicants: July 7, 2018 by email
Course duration: July 16 - July 20, 2018

Short term course on “Metamaterials –Design and Applications” July 16-20, 2018

Registration Form

Name _____

Designation _____

Sex (M/F) _____

ORGANIZATION _____

Highest academic qualification _____

Address _____

Phone / Fax _____

Email (Compulsory) _____

Accommodation required Yes / No _____

VGH / NTGH (Tick as appropriate)

Sharing / Single (Tick as appropriate)

Veg. /Non Veg. : _____

Details of electronic transfer:

Amount Rs _____

Transaction No. : _____

Dated: _____ Issuing Bank & Branch: _____

Date:

Place:

Signature

Recommendation and forwarding from the
Organization:

Signature with seal of the
Head of the Organization

General Information

Situated at a distance of 130 km from Kolkata, Kharagpur welcomes you with its green, calm and quiet campus, away from the din and bustle of city life. In winter, Kharagpur is particularly pleasant with bright flowers all around with a mild and comfortable climate. Historically, IIT Kharagpur started its journey in the “Hijli Detention camp”. Presently it houses a science and technological museum known as the Nehru Museum of Science and Technology. Also, the scenic township of Digha on the sea beach is only 120 km away from Kharagpur.

Connectivity

Kharagpur is an important railway junction and is well connected to all parts of the country by rail service (SER). Numerous local & express trains are available from Howrah. The Institute is approximately 5 Kms from the Kharagpur railway station with the bus stand adjacent to the railway station. Rickshaws (Rs. 80), auto-rickshaws (Rs. 80) and taxis (Rs.140) are available from the railway station.

COURSE COORDINATOR

Prof. Bratin Ghosh

Mailing address:

Prof. Bratin Ghosh

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Accommodation & food

Limited shared accommodation is available in the Institute guest houses VGH (*Visveswaraya Guest House*) and NTGH (*New Technology Guest House*) on personal payment basis. The charges are as follows: **VGH:** Daily charges: Rs.400/- (Single

Occupancy) for D/B AC Rooms and Rs. 600/- (Double Occupancy) for D/B AC Rooms; Rs.250/- (Single Occupancy) for D/B Non AC Rooms and Rs.300/- (Double Occupancy) for D/B Non AC Rooms; Rs.150/- per bed for 3 & 4 bedded Non AC rooms. **NTGH :** Daily charges: Rs.1120/- (Single Occupancy) for D/B AC Rooms and Rs. 1680/- (Double Occupancy) for D/B AC Rooms. On prior intimation we will try to arrange accommodation with the above charges. **Accommodation charges would have to be paid on personal payment basis. Breakfast, lunch and dinner are included in the course fee.**

Eligibility for Participation

Teachers from Colleges / Institutions / Universities. Scientific Officers / Instructors / Technical Assistants /Research Scholars/Under Graduate and Post Graduate Students/ Participants from Industries.

How to apply

Interested persons may apply in the form given herewith alongwith the registration fee payable only through ECS transfer. No other form of payment would be accepted. Also include the ECS transaction receipt with your registration form. **The application should be sent to the mailing address of the course coordinator latest by July 6, 2018.** The total number of seats in this course is limited to 50. In view of the limited seats, selection will be made on first come first serve basis.

Course fee for Students: (Including all taxes)

Fees paid on or before June 15, 2018

Individual: Rs.12,000/- (Rupees twelve thousand only)

Group (3 individuals or more): Rs. 10,000/- per individual (Rupees ten thousand only)

Fees paid after June 15, 2018

Individual: Rs. 14000/- (Rupees fourteen thousand only)

Group (3 individuals or more): Rs. 12,000/- per individual (Rupees twelve thousand only)

Course fee for Industry: (Including all taxes)

Fees paid on or before June 15, 2018

Individual: Rs. 22,000/- (Rupees twenty two thousand only)

Group (3 individuals or more): Rs. 20,000/- per individual (Rupees twenty thousand only)

Fees paid after June 15, 2018

Individual: Rs. 24000/- (Rupees twenty four thousand only)

Group (3 individuals or more): Rs. 22,000/- per individual (Rupees twenty two thousand only)

Course fee for Teachers/Others: (Including all taxes)

Fees paid on or before June 15, 2018

Individual: Rs. 18,000/- (Rupees eighteen thousand only)

Group (3 individuals or more): Rs. 16,000/- per individual (Rupees sixteen thousand only)

Fees paid after June 15, 2018

Individual: Rs. 20,000/- (Rupees twenty thousand only)

Group (3 individuals or more): Rs. 18,000/- per individual (Rupees eighteen thousand only)

Course fee includes lecture notes and refreshments during the course.

Short term course

On

**“Metamaterials –Design and
Applications”**

July 16 -20, 2018

***A Continuing Education Programme of
Indian Institute of Technology***

Kharagpur

Prof. Bratin Ghosh

Organized by

**Department of Electronics and Electrical
Communication Engineering
Indian Institute of Technology
Kharagpur – 721 302, India**