

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.

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 and 1 Km from the Hijli railway station with the bus stand adjacent to the Kharagpur railway station. Rickshaws (Rs. 100), auto-rickshaws (Rs. 100) and taxis (Rs.200) are available from the Kharagpur railway station. Taxis also available from Hijli railway station.

KEY TOPICS TO BE ADDRESSED

- Basic electromagnetic theory
- 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

- EMI / EMC
- Microwave components

EXPERIMENTS

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

SPEAKERS

Faculty / domain experts from IIT, Kharagpur

Course Schedule

9 am to 6 pm with 1 hour lunch break each day. Fully offline mode.

Important dates :

Last date for receiving application: May 1, 2024

Short term course

on

"Design and Applications of Metamaterials"

May 13- 18, 2024

*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



COURSE COORDINATOR

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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

The course fee can be paid online through IIT Kharagpurweb-portal by following the steps given below (candidates applying in a group can however pay their fees offline through demand draft drawn in favour of 'CEP-STC, IIT Kharagpur', payable at Kharagpur.)

How to apply

Use the link: <https://erp.iitkgp.ac.in/CEP/courses.htm>

to apply ONLINE.



Payment if applicable is to be done **ONLINE** after being shortlisted for the program.

Course fee:

- For Students: Rs.10,000/- (including application fees & all taxes)
- For Industry: Rs. 18,000/- (including application fees & all taxes)
- For Teachers/Others: Rs. 14,000/- (including application fees & all taxes)

(Application fees are non-refundable and non-transferable under any circumstances)

Accommodation & food

Limited accommodation is available in the Institute guest houses TGH (*Technology Guest House*) on personal payment basis. The charges are as follows: **TGH:** Daily charges: Rs.1500/- (Single Occupancy) for D/B AC Rooms and Rs. 2000/- (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.** Course fee includes lecture notes and refreshments during the course.

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