भारतीय
प्रौद्योगिकी
संस्थान
काशी हिन्दू विश्वविद्यालय

IIT INDIAN INSTITUTE OF TECHNOLOGY
BANARAS HINDU UNIVERSITY

Information Brochure
(2019-2020)

M.Tech. Programme
in
Microwave Engineering

About Us

Microwave Engineering specialization was offered to the UG, PG and Ph.D. students since the year of establishment (1971) of the Department. Due to significant R&D contributions in this area, DST, Govt. of India sanctioned ~ Rs. 1 crore fund in late 1970's for the project entitled 'High Power Microwave Tubes', Which was later converted to Centre of Research in Microwave Tubes (CRMT) in 1980's funded by UGC. Further, UGC funded Special Assistance Programme (SAP) at the level of Departmental Special Assistance (DSA) began in 1983 in two thrust areas including Microwave Engineering thrust area. The pace of R&D activities in the area accelerated with the approval of DSA programme by UGC in 1983 and continued unabated till date. After successful completion of the DSA programme in 1988, four phases of UGC funded CAS programmes were sanctioned which included Microwave Engineering thrust area. CAS-Phase-IV programme was terminated in 2012 after conversion of our Institute into an IIT. Sponsored research projects in the areas of Microwave and Millimeter Wave Tubes- TWTs, Gyro-TWTs and Gyrotrons , High Power Microwave Devices for Directed Energy weaponry, Type MM cathodes for Microwave Tubes, Broadband Microstrip Antennas, and Dielectric Horn Antennas funded by DST, MHRD, DOE, DRDO and AICTE have been successfully completed by the Microwave Engineering Group. Starting from the year 1998, on the average more than three Ph.Ds. per year have been awarded and over twenty two (22) research papers per year have been published in international journals/national journals/conference proceedings from this specialization. One DSc degree in Electronics Engineering from this specialization was also awarded in 2006.

Dr. Surya Pal Singh
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Area of Interest:
Bioelectromagnetics, Antennas, Microwave Circuits and Measurements, Telemedicine

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Area of Interest:
High Power RF / Microwave Devices, Circuits and Systems. RF MEMs, Metamaterial devices Microwave Imaging and Remote Sensing

Dr. Manoj Kumar Meshram

Associate Professor

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Area of Interest:
Microwave and Millimeter Wave Technology, Microstrip Antenna, MIMO/Diversity Antennas for Mobile Phones, Reconfigurable Antennas, UWB Antennas, Implanted Antennas, Metamaterial

Dr. M. Thottappan
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Area of Interest:
RF & Microwave Engineering, High Power Microwave (HPM) Devices

Dr. Amit Kumar Singh
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Area of Interest:
Microstrip Antennas, Shorted Microstrip Antenna, UWB/SWB antenna, RFID antenna for Tag and Reader, Optical antenna, MIMO Antenna, Optical Antenna, Nano Antenna

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Area of Interest:
Microwave Engineering, Meta-surface

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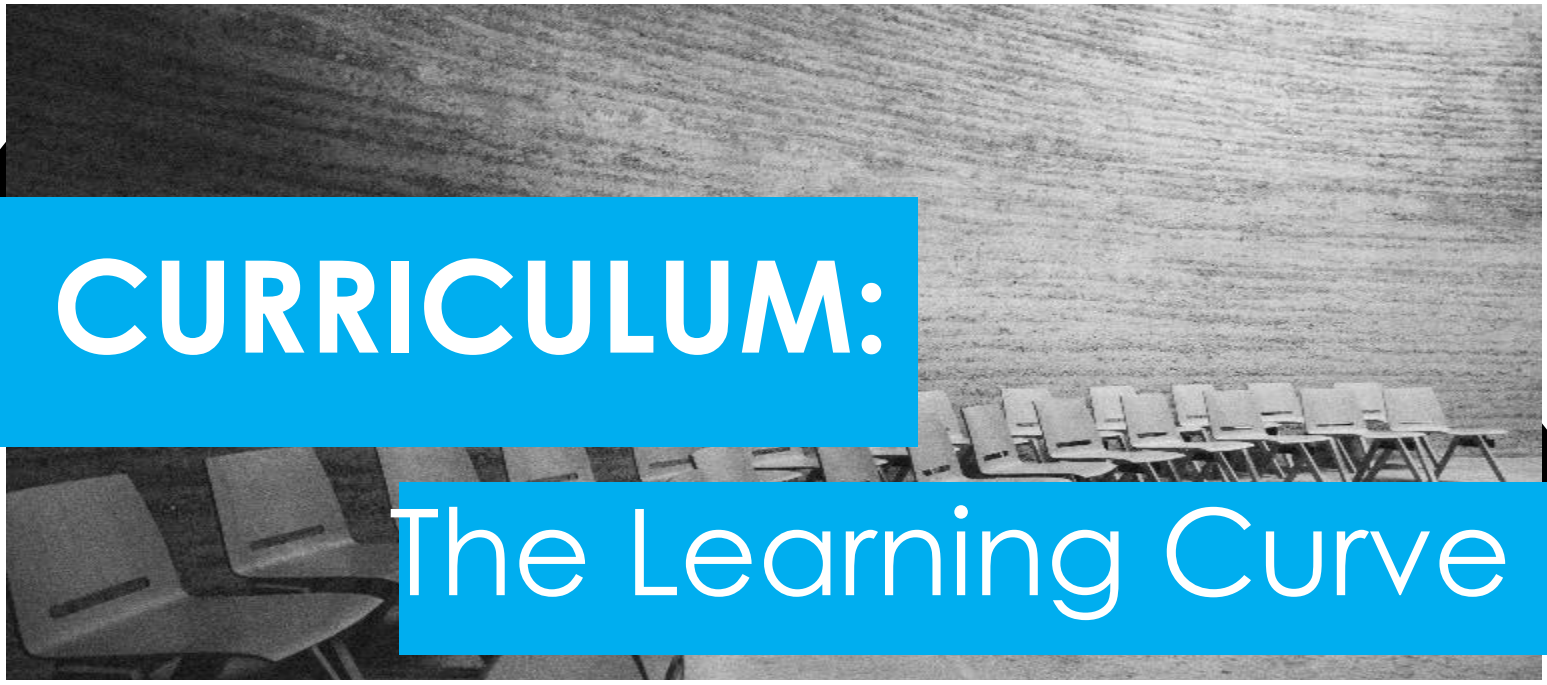
Area of Interest:
High Power Microwave Devices, Conventional vacuum Electron Devices, Smart Antennas for new generations, Electromagnetic Modeling

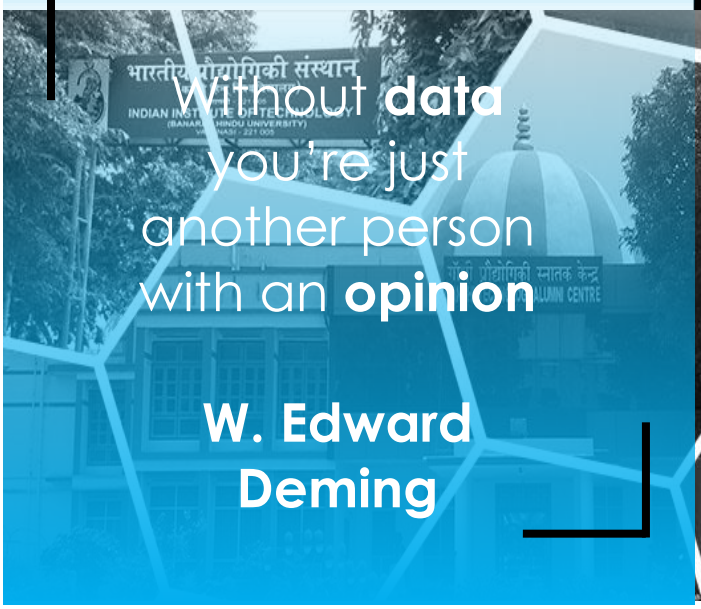


CURRICULUM:

The Learning Curve

The main objective of Microwave Engineering branch is to educate young engineers & to conduct research in the wider field of organisation and management. Our Microwave Engineering branch has different sub areas :-

- Microwave and Millimetre Wave Tubes
- Microwave and Millimetre Wave Antennas
- MIC Passive Devices.
- Dielectric Horn and Dielectric Resonator Antennas
- Remote Sensing.
- Biological Effects and Medical Applications of Microwaves.
- PBG Structures and Meta-materials.



Lab Facilities: Being Practical

MICROWAVE ENGINEERING LAB

The microwave engineering lab is primarily used by the UG, PG, and Ph.D. students for the fabrication and characterization of microwave Devices and Components. The lab is equipped with conventional microwave test benches of S, C, X, and Ku bands along with microwave generators, spectrum analysers, and vector network analyzer. Students can perform various microwave measurement experiment simultaneously on 15 benches. This lab is equipped with the following equipment:

- Vector Network Analyzer (MS2038C VNA Master, Anritsu)-1
- Spectrum Analyzer (PSA Spectrum Analyser 3 Hz-42.98 GHz, E4447A, Agilent)-1
- Analog Signal Generator (100kHz-20 GHz, N5183A, Agilent)-1
- Analog Signal Generator (8.2GHz-12.4 GHz, 86250D, HP)-1
- Function Generator (1012, 1402, SYSTRONICS)
- VSWR Meters (SW-115, SICO)-5
- Analog microvoltmeter (411) -5
- AC millivoltmeter -6
- Microwave Waveguide Test Benches (15 Nos) each of which consists of the following:
  - Klystron Power Supply (KP-151, 825, Vidyut Yantra)/SICO
  - Gunn Power Supply (6S:610, 261, SICO)
  - Isolators/Circulators
  - Direct Reading Frequency Meters (SICO)
  - Slotted Line Sections
  - Tunable detectors
  - Variable attenuators
  - Directional couplers
  - Matched terminations (Fixed, variable)
  - Short circuits (Fixed, variable)
  - Microwave Devices: Horn antennas, planar antennas, reflector antennas, Filters, four ports waveguide components
  - CRO

- Microstrip Test Bench (C-Band, SICO)
- Milling Machine (Brazing)
- Micro Milling Machine (T-Tech Q-5000)
- Lathe machine (HMT)
- Shearing and Power Saw Machines (bending and cutting)
- Chemical Etching Prototyping Machine

ANTENNA ENGINEERING LAB

This lab is primarily used by the UG and PG students for the simulation, fabrication and characterization of various types of antennas such as waveguide, planar, Yagi, reflector, wire antennas, etc. The lab is equipped with following softwares and hardwares:

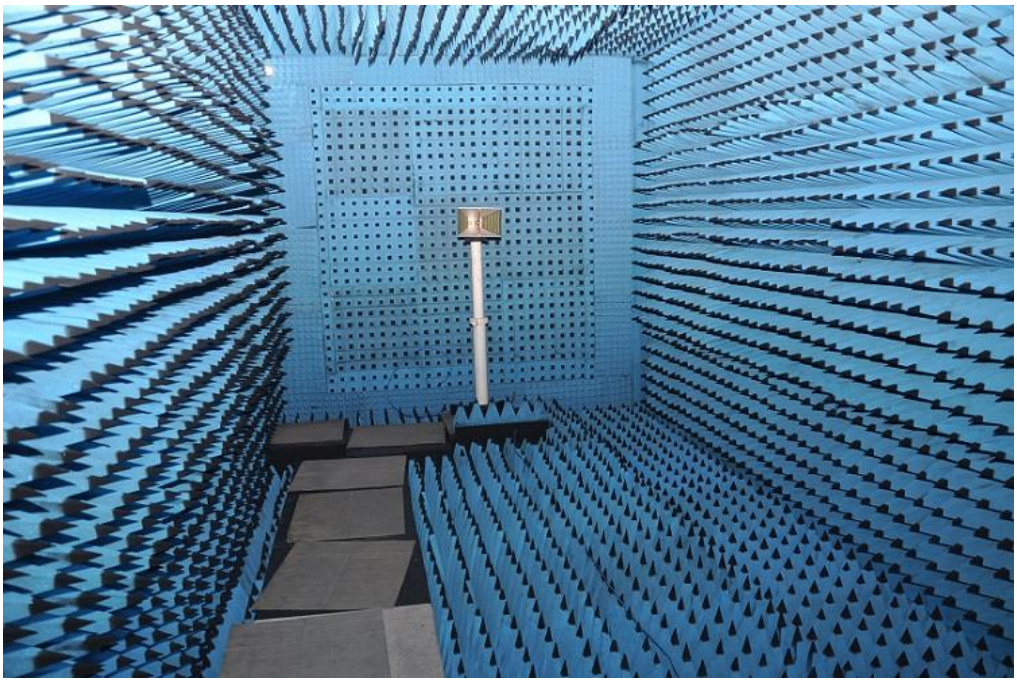
Softwares:

- Ansys HFSS
- CST Microwave Studio
- Customized software for characterization of antennas

Hardwares:

- Vector Network Analyzer (MS2038C VNA Master, Anritsu)-1
- Vector Network Analyzer (E8364B Agilent)-1
- Spectrum Analyzer (PSA Spectrum Analyser 3 Hz-42.98 GHz, E4447A, Agilent)-1
- Analog Signal Generator (100kHz-20 GHz, N5183A, Agilent)-1
- Analog Signal Generator (8.2GHz-12.4 GHz, 86250D, HP)-1
- Analog Signal Generator (250kHz-20GHz, E8257D, Agilent)-1
- PSA Spectrum Analyser (3 Hz-42.98 GHz, E4447A, Agilent)-1
- Anechoic Chamber with six-axes antenna positioner
- Antenna characterization setup consisting of Transmitting and Receiving antennas, Microwave Generators and Detectors, Automatic pattern plotters

- LCR meters
- Transmission Line Trainer (RFL-TLC)
- Microstripline Trainer (RFL-TLM)
- Antenna Trainer System (RFL-AMS-A)- 10
- 3 GHz Microwave Generators and Detectors (RFL-RFGD3G)
- Digital Storage Oscilloscope (DSO-100 C)
- Bench Top 4.5 digital multimeter (DMM-50)
- Waveguide based radiation pattern setups



Anechoic Chamber

Major Achievements: Recent Publications:

- **Dr. Somak Bhattacharyya** has received Early Career Research Award (ECRA) from SERB, DST.
- **Prof. P. K. Jain** has been appointed as the Director of NIT Patna since November 2017.
- **Mr. Rajan Agrahari** (Ph.D student of **Prof. P. K. Jain**) has been appointed as Adjunct Research Assistant in the Department of Engineering Science and Mechanics, Pennsylvania State University, USA for the period 26 May 2017 to 31 July 2017.
- **Dr. M. Thottappan** has received the UK Commonwealth Professional Fellowship-2017 to work at the Department of Engineering, Lancaster University, Lancaster, UK
- **Dr. Somak Bhattacharyya** has received Lifetime Honorary Membership by International Union of Radio Sciences (URSI) effective from September, 2017.
- **Dr. M. K. Meshram** has received prestigious INSA-DGF Fellowship 2017 to visit Germany for three months (1 June 2017 to 31 Aug 2017).
- **Dr. M. K. Meshram** has won the Gandhiyan Young Technological Innovation Award 2015, Festival of Innovations, Rashtrapati Bhawan, New Delhi, 7-13 March, 2015.
- **Dr. M. K. Meshram** has made a technology transfer to Defense Avionics Research Establishment (DARE), DRDO, Bengaluru
- **Dr. M. K. Meshram** has received the BOYSCAST Fellowship in 2009-2010 to work at at McMaster University, Hamilton, Ontario, Canada for 12 months.
- **Dr. M. K. Meshram** had received the INSA fellowship to work at Hanyang University, South

- R. Agrahari, A. Lakhtakia, and **P. K. Jain**, "Towards Information Transfer Around a Concave Corner by a Surface-Plasmon-Polariton Wave," *IEEE Photonic Journal*, 11 (1), 6100112 (2019).
- V. Kumar, **S. Dwivedi**, **P. K. Jain**, "Circular Sectoral Waveguide TM01 to TE11 Mode Converter", Microwave and Optical Technology Letters, 61 (7), 1-5, (2019).
- Sukesh Kumar Gupta, Shishir Kumar Patel, Munendra Singh Tomar, Shio Kumar Singh, **Manoj Kumar Meshram**, and Sairam Krishnamurthy, "Long-term exposure of 2450 MHz electromagnetic radiation induces stress and anxiety like behavior in rats," accepted for publications in *Neurochemistry International*.
- Mayank Agarwal and **Manoj Kumar Meshram**, "An Active Polarization-Insensitive Ultrathin Metamaterial Absorber with Frequency Controllability," *Advances in Signal Processing and Communication*, 157-163, 2019.
- Mumtaz Ali Ansari and **M. Thottappan**, "Design and Performance Analyses of High Efficiency X-band Relativistic Backward Wave Oscillator using an Improved Resonant Reflector under Low Guiding Magnetic Field," *IEEE Transactions on Plasma Science*, vol. 47, no. 4, pp. 1754-1761,

Korea during June-August, 2008

- **Mr. Mayank Agarwal** (Ph.D student of **Dr. M. K. Meshram**) has been selected for Ph.D. Student Initiative Program under the sponsorship of the education committee of IEEE MTT-S during the International Microwave and RF Conference (IMaRC 2017), Ahmedabad, Dec. 11-13, 2017.
- **Mr. Mayank Agarwal** (Ph.D student of **Dr. M. K. Meshram**) has received the prestigious Raman-Charpak Fellowship-2016 instituted by Indo French Centre for the Promotion of Advanced Research (IFCPAR/CEFIPRA), New Delhi to conduct part of Ph.D. in France for 6 months.
- **Mr. Manpuran Mahato** (Ph.D student of **Prof. P. K. Jain**) has won the Navkriti Medal on Institute day 2017.
- **Mr. Mayank Agarwal** (Ph.D student of **Dr. M. K. Meshram**) has won the Best Poster Award at 104th Indian Science congress (ISC), Tirupati, AP, Jan. 03-07, 2017.
- **Mr. Mayank Agarwal** (Ph.D student of **Dr. M. K. Meshram**) has won the 1st prize at department level (Ph.D. category) in poster presentation event in "Institute Day, 2016" celebrated at IIT (BHU), Varanasi during April 2-3, 2016.
- **Mr. Mayank Agarwal** (Ph.D student of **Dr. M. K. Meshram**) was the Finalist for Young Scientist Award (YSA) and received partial financial support in International conference, IEEE Radio and Antenna Days of the Indian Ocean (RADIO 2015), Mauritius, Sep. 21-24, 2015.
- **Mr. Mayank Agarwal** (Ph.D student of **Dr. M. K. Meshram**) has won the Gandhian Young Technological Innovation Award (Appreciated under Technology Edge Category) 2015 (GYTI Award) under "Festival of Innovation" held at Rastrapati Bhawan, New Delhi during March 7-13, 2015.

2019.

- Sudhir Bhaskar, **Amit Kumar Singh**, "A Dual Band Dual Antenna with Read Range Enhancement for UHF RFID Tags," *International Journal of RF and Microwave Computer Aided Engineering*, e21717, 2019.
- Sudhir Bhaskar, **Amit Kumar Singh**, "Meandered Cross-shaped Slot Circularly Polarised Antenna for Handheld UHF RFID Reader," *International Journal of Electronics and Communications*, Vol. 100, pp. 106-113, 2019.
- Nilotpal, Lavesh Nama, **Somak Bhattacharyya**, and **P. Chakrabarti**, "A Metasurface-based Broadband Quasi Non-dispersive Cross Polarization Converter for Far Infrared Region," accepted for publication in *Wiley International Journal of RF and Microwave Computer-Aided Engineering*.
- Akhlesh Lakhtakia, **Somak Bhattacharyya**, and Sambit Kumar Ghosh, "Comment on: Wide incidence angle and polarization insensitive dual broad-band metamaterial absorber based on concentric split and continuous rings resonator structure," *IOP: Materials Research Express*, vol. 6, no. 8, pp. 088002, 2019.

Message from Prof. Incharge:

It gives me immense pleasure to extend you a most cordial invitation to participate in the Campus Recruitment Program of the Indian Institute of Technology (BHU), Varanasi. With an increasing thrust being placed on Institute-Industry Interaction, it is my sincere belief that your esteemed organization and IIT (BHU) Varanasi will stand to gain immensely from this symbiotic relationship.

Our Institute holds the pride of place being pioneer in the field of engineering and technical education in this country and has a glorious heritage. We have been continuously ranked amongst the elite by all peers and stakeholders. Our constant pursuit of excellence has made our institute a focal point in technical education for students and faculty members alike. Admissions to the institute take place through the reputed Joint Entrance Examination (JEE) and Graduate Aptitude Test in Engineering (GATE).

At this institute, we take utmost care to groom our students according to the needs of the industry. We seek to open frontiers of knowledge and reveal new horizons of change to broaden mindset and to create positive attitude in our students. Our students receive industrial exposure by their frequent industrial visits. Besides, our undergraduate students undergo an eight-week training during summer vacation in reputed industries/institutions/organizations (in India as well as abroad) as part of their academic requirements.

We would be most delighted to host you for campus recruitment and beyond. I am looking forward to a mutually beneficial relationship,

Professor **Anil Kumar Agrawal**
Training & Placement Officer, IIT (BHU) Varanasi

Past Recruiters:

TATA
TATA COMMUNICATIONS
TEXAS INSTRUMENTS
Mercedes-Benz
NXP

Placement Team:

Dr. Anil Kumar Agrawal

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