



Blended B.Tech. Program Launch
Vanguard Lectures

July – September 2014



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Indian Institute of Technology Jodhpur



IIT Jodhpur is extremely happy to launch the **Blended B.Tech. Program** for First Year B.Tech. Students, who joined the Institute in July 2014. Nine subject specialists from the Indian Industry, R&D Laboratories and Academia flagged-off the nine of the first year courses of the pristine new curriculum, by delivering the inaugural *Vanguard Lectures* during the early part of the semester.

The **Vanguard Lectures** have generated the much needed excitement in the First Year B.Tech. students of the Institute, as was evident from the *Online Questionnaire* circulated after these lectures. The responses to the questionnaire revealed the aspirations and interests of students wanting to work in technology domains. Also, a sizable set of Students (about 75-80% in all questions, and 100% in some questions) expressed their desire to work on projects and gain hands-on experience with the Industry. This is a *perfect* beginning of our *flagship* Blended B.Tech. Program!! The honours of this strong beginning should be shared by our Distinguished Speakers!!

The feedbacks from both the *Distinguished Speakers* and the *Students* are very important to us; they will help improve in the coming days. I thank our *Distinguished Speakers* for agreeing to come to the Institute and giving the needed *shot-in-the-arm* to young teenage Students. We are constantly on the vigil to improve the all new Blended B.Tech. Program that we launched with intent and care; we warmly welcome all thoughts that arise in our *Vanguard Speakers*, *Students* and other *Stakeholders*.

C. V. R. Murty
Director



I am happy that the Vanguard Lecture Series took place at the opportune time and by practicing senior leaders from the Indian Industry. It is an exceptional opportunity for our Students to listen to these Senior Leaders and get unique perspective and understanding that multiple technologies – *just in a single go!*

Speakers skillfully related real life technological challenges to the course curricula that academia has. They talked directly to the Freshmen Students in plain language, providing useful examples and backing up with research problems. I consider this as a great start of *Blended B.Tech. Program* at IIT Jodhpur and feel confident that these wise-discourses will enable our young Students to get inspired towards peak performance during their working career using head and heart.

M. L. Bapna
Consultant



Vanguard Lecture series at IIT Jodhpur has given us an opportunity to know different perspectives from the leaders in industries and academia. The big picture of various fields is being understood precisely through this endeavor. Also, the lecture series has made an impact by providing insight to many emerging fields. The first year students should take advantage of this special opportunity to know spectrum of possibilities in their respective disciplines.

Industry is one of the drivers, among many, to solve societal problems. The Blended B.Tech. Program at IIT Jodhpur gives students an opportunity to solve practical problems through industry interactions, from the early stages of their technical studies. This series is an integral part of Blended B.Tech. Program, which prepares students of understand contemporary practices in industries.

Deepakkumar M. Fulwani
Coordinator (Faculty)



By combining classroom instruction with industrial experiences, the Blended B.Tech. Program at IIT Jodhpur offers a unique platform for Students to interact closely with Industry Professionals and gain practical technical knowledge directly from the Industry. The Vanguard Lecture Series, an integral part of Blended B.Tech. Program, enables the Students to listen to inspirational talks given by experts from Industry and Academia, and to get a *big-picture* of the technological advances and emerging trends in different fields.

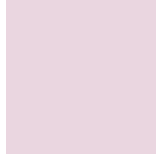
This first Vanguard Lecture Series has included NINE exciting talks across the fields of Engineering, Sciences, and Humanities & Social Sciences. The talks created lot of enthusiasm among the Students and gave much enriching experience to the Faculty Members. Further, the sessions gave an opportunity to students to engage in thought-provoking discussions on various emerging topics, such as Robotics, Data Analytics, Semi-Conductor Devices, Power Engineering, and Automobiles.

We are happy that the excitement created among the students gave a good start to the Blended B.Tech. Program at IIT Jodhpur. We are sure that this excitement will lead to creation of the necessary base for the hands-on grand technology project that spans over 2½ years, from IV Semester to VIII Semester.

Venkata Ramana Badarla
Chairman, Blended B.Tech. Program Committee

The Vanguard Lectures

The Big Picture – the *Technology Vision*, the Synthesis of Ideas, and Opportunities that competent young graduates have in the Indian Industry – all from the eyes of the leaders of the Industry and Academia, formed the core of the *Inaugural Vanguard Lectures* of the new flagship technology education program of IIT Jodhpur, namely the *Blended B.Tech. Program*, which was launched during the beginning of the new Academic Year in July 2014.



Dr. Aravind Bharadwaj

Head-Technology, Automotive & Farm Equipment Sectors

Mahindra & Mahindra Limited

Chennai

Aravind S. Bharadwaj is *Head-Technology, Automotive & Farm Equipment Sectors, Mahindra & Mahindra Limited*, since October 2012. Prior to this assignment, he was CEO of *Automotive Infotronics Limited* (a joint venture between Ashok Leyland and Continental AG) since April 2008, after serving as *Executive Director of Advanced Engineering & Mission Summit* at *Ashok Leyland*. Prior to holding these positions, he has been with *TVS Motor Company (India)*, *Delphi Technical Center (Singapore)*, *GM Powertrain (MI, USA)*, and *GM R&D Center (MI, USA)*. Bharadwaj was *Director* in the *Board of SAE International* from 2008 – 2011, and is currently the *President of SAEINDIA*.

23 July 2014

Design of Machine Elements

M&M Perspective on Emerging Automotive Technology Trends

Identifying himself within the IIT Jodhpur student audience, he made them a partner in his talk. He started off talking in terms of the thoughts that his engineering freshmen audience might have. Aravind congratulated the freshmen on being a part of the commendable Blended B.Tech. Program, an Industry-Academia Collaboration in technical education, which is amongst the much required and long cherished requirements in Indian technical education.

He spoke on the importance of electrical, mechanical and computer engineering in the automotive industry. Present day automotive business successes are dependent technological advancements as a function of requirements by the customer, for human safety, comfort, cost, material use and ease in functionality. In this regard, he expounded that Mechatronics is a prominent area with vast scope of development. In explaining this subject area, he took simple examples from the modern day vehicles – the automatic airbag, gear, and wiper systems, and many more to add.

Also, he pressed on the requirement of an amalgamation between material engineering, sensing technologies, chemical engineering and computational speeds. Some of the very conspicuous moments in the talk were the dramatization that he brought in by discussing technical questions from the history on the light four-wheeler automotive developments. He asked numerous questions – to quote one “Do you know how much computational power a 1998 Cadillac had?” Thus, it was a talk filled with illustration and examples.

Further, he discussed caveats due to which certain technologies did not perform well on the field. A brief history was presented on the development of Mahindra and Mahindra, and its rise as the sole Indian manufacturer of distinct vehicles from the two-wheelers to all types of four-wheelers. Also, he shared his enjoyment in working at the Mahindra and Mahindra, a Fortune 500 firm.

Furthermore, he pressed the need for development of strong foundations in engineering education in India. In closing, he commended IIT Jodhpur for taking this much required and awaited pathway in Industry-Academia Cooperation to launch this Industry-Academia Program to provide the nation with a new breed of technologists with the best engineering training possible.



Dr. Siddhartha SenGupta

Principal Scientist

Tata Consultancy Services

New Delhi

Siddhartha SenGupta is a Physicist and heads the Decision Sciences & Algorithms Laboratory at TCS. He has been an investigator from high school, experimenting with things like "winglets" on model hydrofoils. He completed the PhD Program at IIT Kharagpur, working with tensor polynomials, Boltzmann equation and computational fluid dynamics. Soon after joining "Tata Burroughs" in March 1982, he was sent to MIT (Cambridge, USA) to learn Artificial Intelligence (AI) and to begin research on the subject. Dr SenGupta's 30 years of applied research has covered the sciences of AI, data mining and automated planning in the domains of transportation & logistics, retail and value chains. Currently, he is leading research into the creation of an operational scheduling system for country-wide railway networks, which is several orders of magnitude larger than comparable systems, and will include innovations in context-sensitive methods of rapid but high quality optimization of train schedules and the use of super-computing resources. He has worked closely with IIT Bombay, IIT Kharagpur, IIT Madras and IIM Ahmedabad.

24 July 2014

Artificial Intelligence and Signals & Systems

The Future of Information and Communication Technology

ICT provides the most innovative ways for enterprises to economically prosper and for individuals to entertain themselves. Originating soon after WW-II, ICT assets have helped enterprises in realizing two core values - improving efficiency in routine execution and, to some extent, in innovating their business models. The TCS story begins in this context. Over the last few decades, TCS added another business innovation through outsourcing. As a result, the industry globally has done consistently well, especially the Indian "mega-vendors," with TCS outpacing the pack.

A SWOT shows that the future lies in providing ICT service clients with Values related to improving their own discriminative and competitive advantages. The 5-D Moore's law is an evolving ICT capability that can be leveraged to do so. Here, the lecture focuses on one of these dimensions - Artificial Intelligence. It was hypothesized that traditional and commercial definitions of AI may need a relook to improve its comparative definitions. Also, it was suggested that the ICT architects recognize the emerging possibility of "artificial social intelligence" stemming from learning in communications networks in a world of ubiquitous activity. The lecture ended with an introduction to a TCS research initiative to investigate and leverage the emerging ICT capabilities.



Dr. Barun Chakrabarti

General Manager and Head (R&D)

Larsen & Toubro Limited

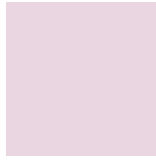
Mumbai

Barun Chakrabarti is working as General Manager and Head (R&D) with L&T Hydrocarbon Engineering Limited, a wholly owned subsidiary of Larsen & Toubro Limited. He is responsible for leading the Company's R&D and Technology functions.

He is a Mechanical Engineer with over 26 years of professional experience. His areas of specialization include Machinery Diagnostics, Vibration & Acoustics, Rotor Dynamics and Tribology. He has professional affiliation with TSI, IIPE and STLE (USA). He is actively involved with major Engineering Colleges in various capacities. He has served on the National Board of Accreditation (NBA) and is part of several major initiatives of FICCI and CII related to Industry-Academia Collaboration, Skill Development and Innovation Management. He has over 40 technical publications in journals, seminars and conferences and has delivered a large number of invited lectures at various events and organizations.

25 July 2014
Engineering Materials and Engineering Mechanics
Engineering – From Classroom to Real World: The L&T Perspective

This lecture set the context for fresh students in Mechanical Engineering, who are beginning their journey into formal engineering education. It provided an overview of state-of-the-art engineering practices in the real world. The presentation gave the Industry perspective of how engineering education should equip students to face the real-life challenges, as they graduate into their professional career. An attempt was made to show how a balance can be achieved between idealization made in the classroom and realities of everyday life. The lecture illustrated a number of interesting Mechanical Engineering case studies from different fields of application.



Dr. Vineet Kshirsagar

Senior Director and Group Head (Government Business)

Oracle India

Bangalore

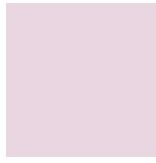
Vineet Kshirsagar is responsible for defining the strategic direction and business for Public Sector for Oracle in India. Also, he has worked for IBM and Microsoft and has diverse experience in these companies. He brings a unique combination of understanding in sales, business development, channels and marketing across segments, industries and product categories. He has been working deeply with different categories of customers and partners in the Small, Medium, Enterprise, Government and Education segment.

He has been closely associated with education segment in his previous and current role with focus on IT as an enabler and has been fortunate to be creating projects, like Project Shiksha and others to increase access to education and employability. He has over 20 yrs of experience in the industry and is a Mechanical Engineer from IT BHU, Varanasi, with an MBA degree from IIM Bangalore.

29 July 2014
Data Structure and Algorithms
e-Governance

Information Technology (IT) touches nearly every aspect of modern life. The growth in Information technology took place in different dimensions from mainframe computers to cloud computing, traditional electronic mails to social networking through Facebook and Twitter. With these technological advancements and availability of global access, there is a significant raise in Citizens' expectation on functioning of the Government and delivery of its services to Citizens. Excellence in Service Delivery is becoming equally as important to Citizens

This talk presented several key challenges that the Government is facing in transforming its service delivery, and the discussed necessary infrastructure required for a common service delivery platform. Further, it presented several interesting case studies on how various government functionaries around the world are making use of the IT infrastructure to serve the citizens better. Case studies were presented, including *New York 311*, *City e-Service in Los Angeles*, *Safe Water Kenya* (an off line mobile based application), and *Hong Kong Housing Society*.



Mr. Ashok Joshi

Head - Vehicle Attributes & Tech Services

Tata Motors Limited

Pune

Ashok Joshi is currently Head of Crash Safety, NVH, AeroThermal, Materials Engineering; Indoor Testing, Prototype Manufacturing; and of all CAE functions at Engineering Research Centre at Tata Motors, Pune.

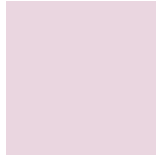
His 36 year professional experience includes leading CAE simulation groups since 1998; leading Vehicle Attributes Group since 2010; leading Chassis Aggregates Design for Light and Medium trucks and Utility Vehicles; Team Leader of Advance Vehicle Engineering for 4 years; project experience in Knowledge-based Automotive Engineering development for 2 years; and Chief Engineer for Tata New Gen UV platform for 6 years.

With an experience of almost four decades in the TATA's, Joshi gave a talk which had a flavor enamoring the TATA as a family. While the students were entering the room he played the video where the technological development of the state of the art sensors for high speed vehicles was very well elaborated. He almost immersed himself in to the niche as if he were one among them. He congratulated each one of the students for joining the Blended Industry-Academia B. Tech Program at IIT Jodhpur after fairing well at the All India Joint Entrance Examinations in 2014.

He touched cases from the latest movies in Bollywood to Hollywood which advertised the TATA automotive products. He took examples from movies like Highway 1, Race etc. He suggested the new generation to watch the movies with an urge to observe how technological advancement is being showcased through infotainment. He furnished his favorites which he had cherished to be a part of. He derived them from the history of automotive industries development. Illustrations were from century old developments of the Ford to the latest TATA Nano. He also encouraged the young engineering freshmen to have their own great ideals and to work towards achieving them.

Speaking about the utmost requirement of safety he spoke of his present expertise in the area and also threw an open invitation to the audience to work on safety and reliability engineering. In here, he also indicated the use of knowledge in engineering statistics. Further he also elaborated the important areas of ergonomics and industrial engineering for the automotive businesses. First information on various software used in the areas of design, safety and industrial engineering were also discussed elaborately.

During the talk he also attracted the freshmen to join the TATA's which has its technical offices in Europe, Asia and South Africa. With a brief video, the working atmosphere at the TATA's was also discussed. With a visually preemptive documentation the talk was very absorbing, clear and did inculcate latest advancements in automotive research.



Dr. S. Sekar

*Executive Director, Corporate (R&D)
Bharat Heavy Electricals Limited
Hyderabad*

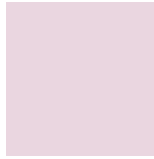
S. Sekar graduated in *Electrical Engineering (Power)* from IIT Madras in the year 1976. He was sponsored by BHEL for training in Electrostatic Precipitation at the *Institute for High Voltage Research, Uppsala University*. He was conferred Doctor of Engineering from Uppsala University in the year 1981, for his work on Electrostatic Precipitators. He has been working in various capacities in Engineering and R&D departments at BHEL units at Trichy and Ranipet, and now he is *Executive Director* heading *Corporate R&D* division at Hyderabad. He has been involved in various research programs of BHEL over last three decades, and was recently conferred Fellow of the *International Society of Electrostatic Precipitation* for his contribution in the field of Electrostatic Precipitation.

30 July 2014

Electrical Machines and Power Systems

Challenges in Power Industry and BHEL's Technology Developments

The lecture discussed different aspects of power generation, transmission and related technologies. Historical perspectives on growth in power transmission also highlighted. Contribution of BHEL in developing different products and new technologies was discussed. Some emerging areas were discussed, like renewable energy and smart grid, in which BHEL is working. Corporate R&D of BHEL has different laboratories in fields of Nano-Technologies, Fluid Dynamics, Robotics, Ultra High Voltage, Surface Engineering and in related fields. Also, the talk discussed several new products introduced by BHEL. Further, several collaborative activities with different institutes were highlighted. Different aspects of Power plant diagnostics and Optimization were presented. Technology developed for Flexible AC Transmission Systems was explained through different illustrative examples. Development of India's first phase changing transformer was narrated. The lecture concluded with a future projection in power sector and need of different technologies.



Professor M. Jagadesh Kumar

*NXP (Philips) Chair Professor, Department of Electrical Engineering
Indian Institute of Technology Delhi
New Delhi*

M. Jagadesh Kumar was born in Mamidala, Andhra Pradesh, India. He received the M.S. and Ph.D. degrees in *Electrical Engineering* from the *Indian Institute of Technology Madras*, India. From 1991 to 1994, he did post-doctoral research on the modeling and processing of high-speed bipolar transistors with the Department of Electrical and Computer Engineering, University of Waterloo, Waterloo, ON, Canada. While with the University of Waterloo, he did research on amorphous-silicon thin-film transistors. From July 1994 to December 1995, he was initially with the Department of Electronics and Electrical Communication Engineering, IIT Kharagpur, India, and then, he was with the Department of Electrical Engineering, IIT Delhi, India, where he became an Associate Professor in July 1997 and a Full Professor in January 2005. Currently, he is the Chair Professor of the NXP (Philips) (currently, NXP Semiconductors India Private Limited) established at IIT Delhi by Philips Semiconductors, The Netherlands. He was the Coordinator of VLSI Design, Tools and Technology interdisciplinary program (September 2009 – September 2011). He is a Principal Investigator of the *Nano-scale Research Facility* at IIT Delhi. Also, he is a Chief Investigator of the *Center of Excellence for Nanodevices and Systems* funded by Ministry of Human Resource Development, Government of India. He has been rated as outstanding by the *Faculty Appraisal Committee*, IIT Delhi, and received the *2013 Award for Excellence in Teaching* (in large class category) from IIT Delhi.

Semiconductors are found almost everywhere in our daily lives, as a key component of key component of Integrated Circuits (ICs) used in mobile and smart phones, televisions, automobiles, washing machines, computers, and many other electronic systems. The dependency of human effectiveness and smartness has increased on the semiconductor devices, such as devices such as diodes and transistors used in integrated circuits. The expectations have increased to deliver higher performance at lower cost. Laptops and lightweight tablets clearly follow this trend. The complexity and performance of the today's electronic systems is increasing following the Moore's law, due to the scaling of Metal-oxide-semiconductor field-effect-transistors (MOSFETs). The important factor which has driven the significant growth of the IC industry is that the technological advances which help the transistor scaling. Semiconductor devices and hence ICs yield better performance, less power consumption, and fabricated at a lower cost. But, the scaling of the devices will be limited soon due to the quantum effects and issues like increase of leakage and power. Professor Kumar summarized the history of evolution of semiconductor devices, and presented the new devices that have potential to mitigating some of these effects.



Dr. N. Kumar

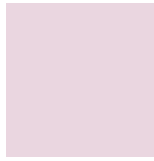
Former Director

Defence Laboratory, DRDO

Jodhpur

In 1984, Dr. N Kumar joined as Scientist at Defence Lab, Jodhpur and retired from there as its Director in Jan, 2012. He pioneered research work in the development of Conducting Polymers, Liquid Foam, nanomaterials and products based on them for various defence applications. Dr. Kumar has authored one book on *Nanotechnology & Nanomaterials in the Treatment of Life Threatening Diseases* published by Elsevier, USA, and published more than 100 research papers.

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Professor S. G. Dani

*Department of Mathematics
Indian Institute of Technology Bombay
Mumbai*

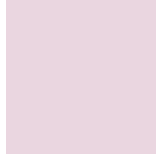
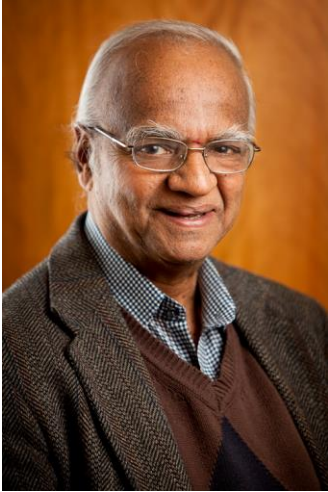
S. G. Dani is one of the eminent mathematicians working actively in the broad area of ergodic theory. He did his Masters from University of Bombay in 1975, followed by a Ph.D. from TIFR, Bombay, in 1975, where he later joined as faculty member. He delivered many invited lectures/talks across the globe. He is a recipient of many awards on various occasions. He was awarded with Shanti Swaroop Bhatnagar Award in 1990. Also, he received Third World Academy of Sciences Award in 2007. He is a member of the NBHM since 1996 and was its Chairman. Also, he is the Chairman, Commission for Development and Exchange (CDE) of International Mathematical Union, during 2007 - 10. He has served as Editor of Proceedings (Mathematical Sciences) of the Indian Academy of Sciences, Bangalore, for many years since 1987.

19 August 2014

Linear Algebra and Calculus

Sequences of Numbers, Distribution, Randomness and Applications

The lecture introduced sequences and discussed concepts, like convergence, oscillation and limits, along with the motivation for studying such concepts. The concept of distribution and random events were discussed, and then they were related to the sequences and their distribution on the real line. The concept of uniformly distributed sequences was introduced and used to explain the Monte-Carlo method of Integration and the Strong Law of large numbers. The lecture ended with the Ergodic Theorem.



Professor Mohan Ramanan
Department of English
Hyderabad Central University
Hyderabad

Professor Mohan Ramanan is Professor of English at the Hyderabad Central University. A teacher with over forty years of teaching behind him, Prof. Ramanan has held positions of Head of the Department of English, Dean School of Humanities and Deputy Director ASRC (American Studies Research Center). He was a British Council Fellow at Merton College, Oxford in 1982-83, Fulbright Scholar in Residence at Amherst College, 1989-90, British Council visitor 1990, Monteserrat Fellow at Barcelona University 2005 and Fulbright-Nehru Teaching Fellow at Missouri Southern State University, 2013.

He has published over a dozen books on Modern Poetry, American Literature and Indian Writing in English. He recently published a monograph on R.K.Narayan and his volume of poetry Grills and other Poems.

25 August 2014
English
Some aspects of English

The leit-motif of the lecture was the significance and relevance of English for a student of engineering. The lecture focused on the three elements namely: Spoken English, Written English and the role of Humanities and Social Sciences in an institute of Technology. With a brief overview of the History of the English language that traced the evolution of English Language and Literature from the King James Version of the Bible and Shakespeare, to Op-Ed pages in Newspapers, the lecture proposed several methodologies to engage with, and to understand the nuances of the language, something that has become inevitable in today's globalized world. The speaker further went on to emphasize the need to articulate one's thoughts clearly and effectively in terms of intonation patterns, stress and the choice of words. This he said would go a long way in maintaining good interpersonal skills in both personal and professional spaces. The relevance of Humanities and Social Sciences, as meaningful support systems to engineering students was stressed upon.



Professor K. Thyagarajan

Department of Physics

Indian Institute of Technology Delhi

New Delhi

K. Thyagarajan is currently a Professor at the Physics Department, IIT Delhi. He has held Visiting positions at Laboratoire Centrale de Recherches, Thomson-CSF France, Department of Electrical Engineering, University of Florida, USA, University of Waterloo, Canada, the City University of Hong Kong and Tokyo Institute of Technology, Japan. He has published more than 140 research papers in international journals, has filed five patent applications and is the co-author (with Professor A. K. Ghatak) of seven books, the latest being *Fiber Optic Essentials*, John Wiley, USA, 2007. In 1998 he was the co-recipient (with Prof B P Pal) of the "Fiber Optic Person of the Year 1997" award by Lucent Technologies- Finolex and Voice and Data, India. In 2003 he was decorated with the title of "Officier dans l'ordre des Palmes Académiques" by the French Government, in 2005 he was elected a Fellow of the Optical Society of America and in 2008 he was elected a Fellow of the Indian National Academy of Engineers. He has been a consultant to Tejas Networks India Pvt. Ltd., Bangalore looking into advanced issues related to high capacity communication through optical fibers. In 2011 he received the "Teaching Excellence Award" from IIT Delhi. His current research interests are in the fields of guided wave quantum optics, optical fiber amplifiers and nonlinear optical effects in waveguides.

15 September 2014

Physics

Electromagnetism and Optics

Basic Laws of Electromagnetism, including Gauss's Law, Faraday's Law and Ampere's Law, will be discussed. Faraday's law relates electric fields and magnetic fields and all the modern day electrical motor's are based on the principles of Faraday's Law. Further, Maxwell established that light is an electromagnetic wave and estimated its speed by modifying the Ampere's law will be highlighted. The wave nature of light and its properties like Diffraction and Interference will be shown. The interference pattern can be used in technological application like in microwave devices will be highlighted. Researchers using quantum nature of light, its implication in developing secure communication and faster computation by Quantum Communication and Quantum Computing are becoming a reality. Yesteryear fantasy (like cloaking) is achievable by understanding the interaction of light with matter.

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