Center for Nanoscience & Technology

Information Brochure

Submitted by Dr. L. Srinivasa Rao, Coordinator, CNST



VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY (A College with potential for Excellence, UGC Autonomous, Accredited 'A' grade by NAAC, Accredited by NBA)



There is plenty of Room at the Bottom...

"You would be able to write the entire Encyclopedia Britannica on the head of a pin, with huge amounts of room to spare. You would be able to build miniature machines so small that they could manipulate at a nearly molecular scale. And you would be able to build things, atom by atom"

Nobel Laureate Richard Feynman - 1959

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The center for Nanoscience is established on 14-06-2016 under the Department of Humanities and Sciences as an interdisciplinary platform of both academic and research activities.

VISION

To build a center with excellence in research with global standards and developments in Nanoscience and Technology.

MISSION

A true interdisciplinary center for research in Nanoscience for developing relevant technologies with commitment to social and ethical values & training manpower through undergraduate and graduate courses.

OBJECTIVES

- > To create sustained research activities in cutting edge Nanoscience and technology.
- To pursue sponsored projects funded by agencies like DST, CSIR, MHRD, MCI, AICTE, UGC &DRDO etc., thereby creating self sustained maintenance.
- To develop partnerships with industry in developing technologies and set up consultancy and technical knowhow hubs.
- To train manpower by offering Ph.D, M.Tech, M.Sc, B.Tech., certificate and diploma courses.

Group Members

S.No.	Name of the faculty	Designation	Department	Area
1	Dr. L. Srinivasa Rao COORDINATOR	Asst. Professor	H&S (Physics)	Oxide glass materials and Nanophotonic materials
2	Dr. C. Kiran	Assoc. Professor	EIE	MEMS, Simulations, Nanophotonics, Nano-bio-mimetic
	Ms. S. Bharathi	Asst. Professor	EIE.	MEMS, Simulations, Nanophotonics
3	Ms. D. Kanthi Sudha	Asst. Professor	ECE.	Nano-electronics, MEMS, Simulation work
4	Dr. T. Rajani	Asst. Professor	H&S (Physics)	Nanoferrites and nanoferromagnetic materials
5	Dr. T. Anil Babu	Asst. Professor	H&S (Physics)	Nanoferrites and nanoferromagnetic materials
6	Dr. Suchi Tiwari	Asst. Professor	H&S (Envi. Sci.)	Nanocomposites
7	Dr. Thirmal Chinthakuntla	Asst. Professor	H&S (Physics)	Nano-Ferroelectric memory device applications
8	Dr. Vidya Sagar	Professor	EIE	Nanocomposites and Simulations.
9	Dr Pushpagiri	Asst. Professor	ECE.	ZnMgO nanocomposites
10	G. Shanthi	Asst. Professor	ECE.	Nanoelectronics

List of Important Activities of CNST (2016 - 2017)

S No	Date	Activity			
1		A guest lecture on "Nanoscience and Nanotechnology for sustainable			
	06.07.2016	infrastructure" was organized by CNST, H&S. The resource person			
		"Dr. Sesha S. Srinivasan, Florida Polytechnic University, USA			
		emphasized on synthesis of Nanocomposites by chemical reaction			
		techniques, thermal evaporation, spin coating, chemical vapor			
		deposition and ball milling methods. He explained the sustainable			
		energy resources and the manufacturing of hydrogen fuel based energy			
		storage systems. Around 150 students of ECE, EIE and EEE have			
		attended. Also, twenty (20) faculty members of ECE, EIE, AE, MECH			
		and H&S (Physics and Chemistry) took part in the session.			
2	30.12.2016	A guest lecture on two different topics viz., "i) Paper based lithium			
		ion batteries for flexible hybrid electronics and ii) Analytical analysis			
		of human breath for identifying significant changes in composition			
		induced from Hypoglycemia" is held on 30.12.2016 addressed by Dr.			
		Mangilal Agarwal, Indiana University–Purdue University Indianapolis			
		(IUPUI, USA) Approximately, one hundred and fifty (150) Students of			
		IV. B.Tech. ECE and EIE have attended. Also, twenty (20) faculty			
		members of ECE, EIE, MECH and H&S (Physics and Chemistry) took			
	07.04.004.7	part in the session.			
3	05. 01.2017	As a part of 7th IEEE International Advance Computing Conference			
		(IACC-2017) a preconference workshop entitled "Nano & Quantum			
		<i>computers - The Future of Computing</i> ?" Is conducted by Center for			
		Nanoscience & Technology on Stri January 2017. The Resource Persons			
		Krishna IIT Hyderahad Fifty five (55) registered Students of variou			
		Engineering Colleges have attended the workshop			
4	22.04.2017	The meeting Conter for Nanoscience and Technology (under USS			
4	22-04-2017	Department) have conducted three special lectures on "Elements of			
	24-04-2017	Nanoscience & Technology" for a few sections of P Tech Students of			
	20-04-2017	our Institution			
5	10.12.2016	The members of Center for Nanoscience and Technology started two			
5	17.12.2010	elective papers (interdisciplinary courses) in IV B Tech even			
		semester (2016-17) (i) Basics of Nanoscience and Technology (BNST)			
		for ECE students (83) and EEE students (55); and ii) Micro-Electro-			
		Mechanical Systems "MEMS" for EIE students (72).			
6	31.12.2016	Project proposals: Dr. L. Srinivasa Rao, Asst. Prof. (H&S) has			
		submitted a research proposal on "Silver Nanoparticles for Ionic			
		Devices" as a Principal Investigator to SERB on 31-12-2016. Moreever,			
		Mr. S.V. Amarnadh, Asst. Prof. (ME) has submitted another research			
		proposal on "Solar Energy Systems" as a Co-Investigator to SERB on			
		30-12-2016.			

Guest lecture on "Nanoscience and Nanotechnology for sustainable infrastructure"

A guest lecture on "Nanoscience and Nanotechnology for sustainable infrastructure" was organized by CNST, H&S on 06.07.2016. **Dr. Sesha S Srinivasan** was invited for a guest lecture on "Nanoscience and Nanotechnology for Sustainable Infrastructure" by Center for Nanoscience & Nanotechnology, Dept. of Humanities and Sciences. Dr. Srinivasan is currently working as an Assistant Professor at Florida Polytechnic University, Florida, USA.Dr. Srinivasan explored teaching practices at their university and his research experiences. Around 150 students of ECE, EIE and EEE have attended. Also, twenty (20) faculty members of ECE, EIE, AE, MECH and H&S (Physics and Chemistry) took part in the session.



Dr. Srinivasan emphasized on synthesis of Nanocomposites by chemical reaction techniques, thermal evaporation, spin coating, chemical vapor deposition and ball milling methods. He explained the sustainable energy recourses and the manufacturing of hydrogen fuel based energy storage systems. Also, he shared his views on the current research on Nanoscience and technology with the students and faculty personally. He motivated the students to claim the Patents and faculty to carry cutting edge research in energy storage systems and materials processing.

Dr. Srinivasan visited the institute on 6th of July 2016 and delivered his lecture in three different modules. In the first module, he introduced state of art infrastructure, cutting edge labs and various advanced courses at his home university - Florida Polytechnic University. He suggested students to take up such new and job oriented courses. A glimpse of Innovation, Science & Technology Building that won the International Architectural Award – 2015 was also given. In the second module he gave an overview of STEM Innovation Teaching methods and challenges associated. He briefed on MOOCs, Project Based Learning, Flipped Technology, Hybrid Learning and Active Learning. Few ideas on teaching-learning techniques were suggested to the faculty and students. In his final module, he spoke about the core of his lecture - Nanoscience and Nanotechnology for Sustainable Infrastructure. Insights on how nanoscience & nanotechnology could immensely help to create sustainable world were provided. He gave an overview on how different types of nanomaterials can be used in various sustainable applications. Examples of possible applications of nano-structured materials in the sectors of Energy, Nuclear, Transport, Life Sciences, Environment, Defense, Aerospace, Biotechnology, Chemical, Pharmaceutical, Food and Buildings were dealt. Later he spoke on his research on Hydrogen Storage and gave a brief overview of his patents on the subject. Few examples of how hydrogen can be stored with the help of nanoparticles were discussed. He also spent a lot of time with the faculty and students to clarify their doubts on patenting, HHO gas and nanotechnology.



Dr. T. Jayashree, HOD, H&S honored the guest with a memento.



The research group of Center for Nanoscience and Technology and other research fellows with the guest exchanged their experiences in this specialization.

A guest lecture on two different topics viz., "i) Paper based lithium ion batteries for flexible hybrid electronics and ii) Analytical analysis of human breath for identifying significant changes in composition induced from Hypoglycemia"

A guest lecture on two different topics viz., i) Paper based lithium ion batteries for flexible hybrid electronics and ii) Analytical analysis of human breath for identifying significant changes in composition induced from Hypoglycemia is held on 30.12.2016. The resource person **Dr. Mangilal Agarwal** is the Director, Integrated Nanosystems Development Institute (INDI), Indiana University–Purdue University Indianapolis (IUPUI, USA) and an Associate Professor of Mechanical Engineering, Purdue School of Engineering Technology (USA).



Dr. D.N. Rao, President, VJ conversation with Dr. Agarwal



Dr. A.S. Rao welcomes Dr. Agarwal



Students, Faculty and HODs along with Dr. D.N. Rao at Dr. Abdul Kalam Auditorium



Talk by Dr. Mangilal Agarwal

Dr. D.N. Rao, President, VJ took part in the lecture and he has enlightened the importance of interdisciplinary courses in present scenario. Dr. A.S. Rao, Director, Center for Projects Mobilization and Globalization; Dr. T. Jaya Shri, HOD, H&S; Mr. T. Srinivasa Rao, HOD, AE; and all the members of CNST attended the lecture. Approximately, one hundred and fifty (150) Students of IV. B.Tech. ECE and EIE have attended. Also, twenty (20) faculty members of ECE, EIE, MECH and H&S (Physics and Chemistry) took part in the session.

The impact of the lecture is as follows:

- i. The students and faculty are exposed to front end research topics, both in flexible hybrid electronics and in nanobiotechnology.
- ii. Students have interacted actively with the Resource person by asking questions.
- iii. Students also have received guidance and direction to pursue higher education in India and aboard.



Students' personal interaction with Dr. Agarwal



Dr. T. JayaShri, HOD H&S and Members of CNST with Dr. Agarwal

Preconference workshop IACC-2017

A pre conference workshop on "Nano & Quantum computers – The Future of Computing!" was conducted on 5th January 2017, as a part of IEEE - International Advanced Computing Conference 2017, VNR VJIET, Bachupally. The workshop has been organized by the team of Center of Nanoscience and Technology, VNR VJIET. The workshop has been organized in three sessions viz., First - Quantum mechanics for quantum computing, second - advances in nanoscale manufacturing and devices and third - advances and limitations of quantum computing. Experts from IIT Hyderabad delivered the sessions and the key notes of the workshop are discussed below:

Dr. M. V. Panduranga Rao, Associate Professor, Department of Computer Science & Engineering, IIT Hyderabad delivered the first lecture on Quantum mechanics for quantum computing. Fundamental concepts of quantum mechanics required for quantum computation have been covered along with basic mathematical understanding of quantum computation.



Dr. M. V. Panduranga Rao, IIT Hyderabad delivers on Quantum mechanics for quantum computing.

Dr. Siva Rama Krishna, Assistant Professor, Department of Electrical Engineering, IIT Hyderabad gave a brief of latest advances in nano-manufacturing and devices in the second session after lunch. The advances in reduction in device dimensions especially in basic electronic devices and transistors were covered. Techniques like optical/ UV/ X-Ray lithography were explained and the possibilities of device manufacturing for quantum computing applications were discussed.



Dr. Siva Rama Krishna, IIT Hyderabad speaks latest advances in nano-manufacturing and devices

The third session was continued by Dr. M. V. Panduranga Rao on advances and limitations in quantum computing. A thorough mathematical treatise has been taken up in the third session to explain the advances and limitations in quantum computing. Based on the mathematical theories, the possible opportunities in future quantum devices and quantum cryptography were discussed.

All the sessions have been very interactive with students, faculty and researchers from prestigious institutes like Indian Statistical Institute, Kolkata as audience. The workshop provided a basic mathematical understanding of quantum computation and discussed possible opportunities in the future of computing and cryptography – quantum computation.



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Dr. P. Raghavendra Rao Presenting a memento to Dr. Siva Rama Krishna

Nano & Quantum Computers – Pre Conference Workshop, IACC 2017 – Report

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Special lectures conducted by CNST

The faculty members of Center for Nanoscience and Technology (under H&S Department) have conducted three special lectures on "Elements of Nanoscience & Technology" for a few sections of B.Tech Students of our Institution with the schedule given below. This activity has not disturbed the routine class work.

S.No.	Date & Time	Room	Branch	Торіс	Speaker(s)
		Number			
1	22-04-2017 (Sat)	C-203	III -B.Tech.	Nanoscience and	Dr. P. Raghavendra Rao
	2.10 to 3.30 pm		EIE-1&2	Technology- A	Assoc. Professor, H&S.
				perspective	
2	24-04-2017 (Mon)	B-312	I-B.Tech.	Introduction to	Dr. C. Kiran
	2.10 to 3.30 pm		EIE-1&2	Nanotechnology	Assoc. Professor, EIE.
					Mr. Goutham
					Asst. Professor, EIE.
3	26-04-2017 (Wed)	B-305	I-B.Tech.	Basics of	Mr. K. Rammohan Reddy
	2.10 to 3.30 pm		EEE-1&2	Nanoelectronics	Asst. Professor, ECE.

The objectives of the lectures:

- To initiate, introduce and create interest in the students about fast developing field of Nanoscience and Technology.
- > To encourage the students for choose an elective subject in this area.
- ➢ To give awareness regarding the R&D activities such as internships and short term projects at IISc, IITH, UOH, ARCI and some other national institutes.

Impact of the lectures is as follows:

The first lecture was organized for III. B.Tech EIE-I and EIE-II students on 22/04/2017. A total of 90 were present along with 4 faculty members. *Nearly 40 students have shown their interest in opting for the elective in IV B.Tech I semester and also 10 students have shown interest in pursuing internship and project work in this specialization.*

The second lecture was organized for I. B.Tech EIE-I and EIE-II students on 24/04/2017. A total of 80 were present along with 4 faculty members. The speakers presented a basic introduction to world of nanoelectronics, by emphasizing the size and scale electronic elements. *The students were realized the daily life applications of Nanoscience and Technology*.

The third lecture was organized for I. B.Tech EEE-I and EEE-II students on 26/04/2017. A total of 85 were present along with 3 faculty members. The speaker explained the basic techniques involved in fabrication of electrical and electronic circuits in nanoscale. *The students understood the potential applications and opportunities in the field of Nanoscience and Technology. Some students have enquired about the certificate courses in this field.*



Photographs: Special lectures on "Basics of Nanoscience and Technology"

Elective course work

The center for Nanoscience and technology (CNST) is an interdisciplinary platform to engage the academic activities too.

The faculty members of Center for Nanoscience and Technology started the course work of two elective papers (interdisciplinary courses)

i) Basics of Nanoscience and Technology (BNST) and

ii) Micro-Electro-Mechanical Systems (MEMS).

The number students pursued the courses are as follows:

BRANCH	YEAR/SEM	AY	AY
		(2016-17)	(2017-18)
ECE	IV / II	83	166
EIE	III / I	72	120
EEE	IV / I	55	72

In view of the above table, we can observe that the number of students pursued the elective paper in this specialization is increased significantly.

Research Proposals

A) Research proposals sanctioned:

S No	Name of the faculty	Area of research	Budget (Rs. Lakh)	Agency	Status
1	Dr. Suchi Tiwari	Synthesis, Characterization and Potential Applications of Nano- dithiocarbamate complexes.	150000/-	UGC-DAE	Sanctioned

B) Research proposals for applied for funding to the agencies:

S No	Name of the faculty	Area of research	Budget (Rs. Lakh)	Agency	Status
1	Dr. L. Srinivasa Rao	Bi ₂ O ₃ glasses doped with NiO nanoparticles for Optical fiber amplifiers	6.85	Nanomission	Technical Review is completed
2	Dr. C. Thirmal	Nanoferroelectrics	10	Nanomission	Technical Review is completed
3	Dr. Suchi Tiwari	Nanobiology	10	Nanomission	Technical Review is completed

Research Papers

S.No.	YEAR	Author	Title of paper	Journal
1	2016	M. Sumithra,	Morphological change of	Materials Today:
		Y. Aparna,	silver nanoparticles by the	Proceedings,
		P. Raghavendra Rao,	effect of synthesis parameters	Volume 3, Issue 6, 2016,
		K. Srinivasa Reddy,		Pages 2278-2283.
		P. Ranjith Reddy		
2	2017	L. Srinivasa Rao,	J-O parameters versus	Optik - International Journal
		P. Venkateswara Rao	photoluminescence	for Light and Electron
		, M.V.N. Vasu Deva	characteristics of 40Li2O-	Optics,
		Sharma,	4MO (MONb2O5, MoO3 and	(Elsevier publication)
		N. Veeraiah	WO3)-55B2O3:1Nd2O3 glass	Volume 142, August 2017,
			systems	Pages 674-681.
3	2017	Rajani I,	Studies on conducting	J. Nanomaterials,
		V B Rao,	nanocomposite with gallium	Nanoengineering and
		C Udaya Kiran	nitride-doped ferrite, Part-II	Nanosystems., 2017.
4	2018	L. Srinivasa Rao,	Structural and optical	Materials Chemistry and
		T. Venkatappa Rao, Sd.	properties of zinc magnesium	Physics,
		Naheed,	oxide nanoparticles	(Elsevier publication)
		P. Venkateswara Rao	synthesized by chemical co-	Volume 203, 1 January 2018,
			precipitation	Pages 133-140.
5	2018	T. Anil Babu,	Structural and dielectric	Materials Science and
		K.V. Ramesh,	studies of excessive Bi3+	Engineering: B,
		V. Raghavendra Reddy,	containing perovskite PZT and	(Elsevier publication)
		D.L. Sastry	pyrochlore biphasic ceramics	Volume 228, February 2018,
				Pages 175-182.
6	2018	P. P. Biswas,	Dipole pinning effect on	J. Applied Physics
		C. Thirmal ,	Photovoltaic characteristics of	(AIP Publications)
		S. Pal,	ferroelectric BiFeO3 films	Vol. 123, 024101, (2018).
		P. Muragavel.		
