Summary Report

About the School:

Named after Prof. G. S. Sanyal, one of the most distinguished teachers and a former director of Indian Institute of Technology Kharagpur, G. S. Sanyal School of Telecommunications started its journey on 8th of November,1996. Mr. Arjun Malhotra, a renowned alumnus of the institute and a successful entrepreneur had the vision for the future need of telecommunications in the country. It was his vision and an invaluable endowment from him and his wife Mrs. Kiran Malhotra which led to the inception of the school that was to function as a centre of excellence in the field of Telecommunication Engineering. It was conceived to fulfill the needs of education, research, technology development and training. The school has been assigned a role to collaborate with industry, academia, professional bodies etc. and function through various innovative means.

1. Academic Programs (Range of Degrees and Disciplines):

MS and PhD programs have been started from the Academic Session 2004-2005 and these are running successfully.

The School also successfully offered a one-year PG Diploma program (PGDTNM) on Telecommunications Network Planning and Management for two academic sessions between 2006 and 2008.

A proposal for a high-end M.Tech program on 'Wireless Communications & Networks' has been submitted to the office of Dean (PGS&R) and is presently under consideration for starting from the Academic Session 2015-16.

2. **Major 4-5 Thrust Areas of Research:**

- *Wireless Communication Systems*
- *Cognitive Radio*
- *Large Data Analysis*
- *Sensor Networks*
- *Optical Communication and Networking*

3. Curriculum and Courses & Teaching Environment

Items	**Ratio/ Number**	**Items**	**Number/%**
Teacher-student Ratio	1:9	Average No. of students motivated (%) to opt of careers in Eng/ Tech. Sectors UG/PG/PhD	100%
No. of Faculty members as on today	05	Average No. of students motivated (%) to opt of careers in Science sectors UG/PG/PhD	0%
Average No. of Tutorial Assistants per subject	01	No. of teaching labs	04
No. of UG/DD students	NA	Average No. of students per experiments in core courses	NA
No. of PG students/PhD students	20/27	No. of Students' workshops/ 'Tinkering' Labs	01
Average no. of tutors with more than 100 students	Nil	No. of new subjects introduced	09
Average Students placements (%) (UG/DD/PG)	0/0/100%	No. of New program introduced / proposed	01 M.Tech program proposed

No of major curriculum review in both UG & PG level	01 M.Tech program proposed	Undergraduate Vs PhD strength expressed as Percentage	NA
No of UG lab (teaching labs) developed/set-ups	NA	No of PG/research labs developed/new set up	04
No of E class rooms	Nil	No. of lab classes per week	NA
Average No. of Course done per student for B. Tech/DD/M. Tech/Ph.D	0/0/04/04	No. of core/elective/seminar/projects subjects taken for 1.B. Tech 2. DD 3. M. Tech respectively	2/9/0/0 2/9/0/0 3/9/0/0

4. Research and Development & its Environment (2008-13)

Items	**Number**	**Items**	**Number**	**Items**	**No.**
Total No. of Publications in Journals (2008-13)	46	Average no. of citation per paper	10	No of large interdisciplinary research projects	One (VDA)
Total No. of Publications in Conference & Symposium	100	Average Journal publication per year	10	Number of Int. conf./workshops attended by students	06
Total No of Books & e-books published	02	h-Index of the department since 2008/overall h-index in Scopus	35	No. of PDF hired in the Institute	Nil
Total No of Edited Conference Proceedings/book chapters	02	Number of papers with citation more that the average no. of citation of the Journals	10	No. of international Students as PhDs/PDFs	Nil
Total No. of Technology Developed/transferred	04	No. of recognitions & Awards, fellows etc to faculty/students (provide break up if necessary)	Faculties: 12	No. of International visiting researchers/adjunct faculty stayed here for at least a week	01
Total No. of Patents Filed/Obtained	13/1	Average Retention(%) of Young faculty for at least 10 years	80%	No. of short courses/workshops /conf. organized with international participations	Nil
Total No. of Copyright Filed/Obtained	Nil	No. of Sponsored research Project /fund(lakh) generated from non-internal source	05/ 7.00 Crores (approx.)	Average No. of PhD granted per year	02
(i) No. of Publications per Faculty (ii) No. of Publications per Masters student (iii) No. of Publications per PhD student	9.2 0.0 2.5	No. of Consultancy /fund (lakh) generated from non-internal source	Nil	Average No. of PhD Granted per year per faculty	0.4

No. of Publications per Faculty/Masters/PhD students in Top Ten Journals as Identified by the department	3/0/2	No of Internal and external Collaborations research papers/research projects/PhD students	39/1/8	Patent granted per faculty	0.2
Average No. of Citation per faculty per year	15	No of M. Tech students motivated into pursuing PhD/PhD graduates motivated to pursue career in Academics(abroad or IIT etc)	25/16	Number of articles in collaborations with Ten countries*	15
Ranking of the department in terms of average citations per paper within the Institute		Ranking of the department in terms of total number of Journal publications within the Institute/publications per faculty		No of articles of the dept. contributing towards h-index of the Institute since 2008	

5. External Stakeholder Engagement and others

Items	**Number**	**Amount Lakh**
No. of PhD/Master students' thesis funded by Industries	02/06	55.0
Total number of Industry sponsored projects and its income (Lakh)	05	500
No. of Curriculum Development Initiative for Industries	03	10.0
No of Technology transfer/adopted by Industry/Labs	Nil	Nil
No. of Nationally relevant research projects	05	500
No of Policy inputs/consultancies provided	01	5.00
No. of Research grant and seed money from internal savings of the Institute per young faculty of the department and its total fund	02	2.5 Crore (SGDRI) 5 Lakhs (ISIRD)
No. of Community Relevant projects	Nil	Nil

6. Vision for the Future (in brief):

(a) Departments/centers/schools should spell out its Mission and Vision Statements, (b) Plans for future to achieve the projected goals and (c) measures adopted towards above.

A) ***ACADEMIC VISION****: The School has been conceived to fulfil the needs of education, research, technology development and training in the field of telecommunication technology. It has been assigned a role to collaborate with industry, academia, professional bodies etc. and function through various innovative means.*

Following are the specific objectives of the School:

- *To take up manpower development activities through post-graduate, doctoral and post-doctoral research programmes in order to keep pace with the advances in telecommunications engineering*
- *To take up sponsored and consultancy projects from industries / government agencies*
- *To offer general and specific tailor made training programmes on current topics to*
- *industry professionals and teachers of other engineering institutes.*

***MISSION**: To provide post graduate level training in the area of Telecommunications Engineering to contribute to national growth and to create intellectual property in Telecommunications Engineering through cutting edge research and development.*

B) FUTURE PLANS:

- *To start an M.Tech program on 'Wireless Communications & Networks' from the Academic Session 2015-16.*
- *The School will continue to grow as a centre of excellence in the field of Telecommunications Engineering by setting up international class laboratory facilities to supplement the academic programs*
- *The School will also come up with need-based short-term course modules covering emerging aspects of Telecommunications Engineering in future.*

C) Measures Adopted Towards above:

1. *The School (GSSST) has already submitted a proposal to the Institute for starting a new and state-of-the-art M.Tech program in 'Communication Signal Processing and Networks'.*
2. *Nine new subjects have been approved by the Senate, IIT Kharagpur.*
3. *Received seed grant (SGDRI) of 2.5 Crores to set up a National Level Wireless Test Bed Facility.*
4. *Discussion in progress with several Industry collaborators and Govt. research labs like Vodafone India, TI-Bangalore, Polaris-Kolkata, Airtel, Samsung-Bangalore, SAMEER-Kolkata.*

7. External peer review of the Dept./centre/schools (in brief):

(a) Date of the peer review: January 3, 2014

(b) Name of the Experts involved and their affiliations in short:

1. Prof. A. K. Chaturvedi, Professor, IIT Kanpur
2. Prof. Ganapati Panda, Deputy Director, IIT Bhubaneswar

(d) Measures adopted/action taken at the department level to address the recommendations of the peer review report:

Please Refer to 6 (C).

8. **Strengths, Weaknesses, Opportunities & Threats (SWOT) Analysis of the Department**

STRENGTHS	**OPPORTUNITIES**
1. Young and energetic faculty members with expertise in Communication, Signal Processing and Networking. 2. Very good understanding among the members. 3. Good collaboration initiatives with leading industries and research labs. 4. Participation in Standardization Board for state of the art technologies. **WEAKNESSES** 1. Small size of faculty 2. Lack of space for creating new research facilities	1. Requirements of relevant research in Telecommunications Engineering for Indian manufacturers. 2. Good collaboration option with Indian Industries. 3. International research collaboration through faculty networking. **THREATS** 1. Failure to create a critical mass of faculty who can help the GS Sanyal School of Telecommunications grow to an international level.

9. Additional Information, if any

May be provided on request.

***Note: Ten countries: US, UK, Germany, Japan, Canada, France, Italy, Australia, Singapore, South Korea (optional :China may be replaced with anyone if department wants)**

Important Highlights

G. S. Sanyal School of Telecommunications
Indian Institute of technology Kharagpur

Visit us at: http://www.gssst.iitkgp.ernet.in

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- **Research Areas**

The following areas are the major research focus of current GSSST activities:

- Cellular communications: 4G and Beyond (Physical & MAC Layers)
- VLSI for Telecommunication Systems
- Short Range Communications
- Optical Communications & Networks
- Hybrid Optical Wireless Access Networks
- Data Networking and Modelling
- Cognitive Radio Networks
- Digital Communications
- Signal Processing and Processor Architectures
- Biomedical Signal Processing
- Green Communications
- Coherent Optical Communication
- Temporal Network Modelling
- Radio over Fibre Networks

No. of Journal Papers: 46
No. of Conference papers: 150

- **Current Research Collaborations**

Academia:
We are in the process of building credible research collaboration with several internationally acclaimed academic institutes such as Syracuse University, Duke University, Lingkoping University Sweden, University of Ghent Belgium, University of Washington Pullman, Technical University Munich Germany and Trinity College Ireland.

Industry
Vodafone India Ltd, Bharat Electronics Ltd, ISRO

- **Editorial Board Membership of Journals:**
- Springer Photonic Network Comm. (Dr. G. Das)
- Elsevier Optical Switching & Networking Special Issue for IEEE ANTS 2012 (Dr. G. Das)
- Inderscience Int. J. on UWB Comm. and Systems (Dr. D. Sen)


(c) Ongoing Projects

Project title	Sponsor	Principle Investigator
• Development of Interference Mitigation methods through Base Station Cooperation in Next Generation Wireless Broadband Mobile Communications Networks.	DIT, MCIT, Govt. of India	Dr. S. S. Das
• Standardization Activity in 4G & Beyond IN RAN.	Vodfone	Dr. S. S. Das, Prof. S.S. Pathk
• Studies on Fade Mitigation Control for Microwave Satellite Signal Propagation	ISRO	Dr. S. S. Das, Prof. K. Bandyopadhyay
• Virtual Laboratory Fading Channel & Mobile Communications	MHRD	Dr. S. S. Das
• Self Configuring Networks: Flexible Spectrum Sharing for Home Base Station in Next Generation Mobile Telecomm. Systems	Vodafone	Dr. S. S. Das, Prof. S. Chakrabarti, Prof. R.V. Rajakumar
• Energy Efficient Radio for Next Generation Cellular	Vodafone	Prof. R.V. Rajakumar, Dr. S. S. Das.
• Facility for Design, Development and Testing of Next Generation Telecom Gears	SGDRI, IIT Kharagpur	Dr. S. S. Das, Dr. G. Das, Dr. P. Ray, Dr. D. Sen , Dr. S. Chakrabarti
• Bayesian Multi-user detection in on-off random access channels	ISIRD, IIT Kharagpur	Dr. P. Ray

Conferences Served as TPC Chair/member

- TPC Member: IEEE ANTS, 2012, 2013 (Dr. P. Ray), DRCN 2014, IEEE CONECCT 2014 (Dr. G. Das), IEEE ICC 2013, 2014, IEEE Globecom 2013, 2014, SPCOM 2014 (Dr. D. Sen).
- TPC Chair : IEEE ANTS 2012, 2013 (Dr. G. Das)

Research Activities (PhD & MS Programmes)

(d) No. of Scholars completed PhD: 19
(e) No. of Scholars working towards PhD: 26
(f) No. of students completed MS - 13
(g) No. of students working towards MS - 04
(h) No. of students (E&ECE enrolment) completed M Tech projects - 46
(i) No. of students (E&ECE enrolment) working on M Tech projects - 16

Collaboration with other departments/centres in R&D Activities

- Dept. of Electrical & Electronics Communication Engineering
- Dept. of Computer Science & Engineering
- School of Information & Technology
- Det. of Electrical Engineering
- Dept. of Mechanical Engineering
- Dept. of Reliability Engineering