

**B3-IX**

**School of Technology and  
Computer Science**

**(STCS)**





## School of Technology and Computer Science

1. Name of the Department:

School of Technology and Computer Science (STCS)

2. Year of establishment:

1998

3. Is the Department part of a School/Faculty of the university?

The department is itself the School of Technology and Computer Sciences.

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

1. Ph.D.
2. Integrated M.Sc.-Ph.D. (I-Ph.D.)

Students may avail of an M.Phil. degree as an early exit option provided they have finished a specified set of requirements. However, there is no separate M.Phil programme.

5. Interdisciplinary programmes and departments involved

STCS does not offer interdisciplinary programmes.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

Institution	Course Name	Faculty member	Year
IISER Pune	Algorithms	Jaikumar Radhakrishnan	2013
CBS Mumbai	Financial Mathematics	Sandeep Juneja	2015
IMSc Chennai	Communication Complexity	Prahladh Harsha	2011
IMSc Chennai	Limits of approximation	Prahladh Harsha	2010
IIT Bombay	Advanced Information Theory	Vinod Prabhakaran	2014
IIT Bombay	Advanced Information Theory	Vinod Prabhakaran	2015
IIT Bombay	Network Information Theory	Vinod Prabhakaran	2015

7. Details of programmes discontinued, if any, with reasons

No programmes have been discontinued since the inception of the TIFR University.

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Students of the STCS are offered a course work programme based on a mixture of compulsory core courses, choice-based elective courses and compulsory project work, on topics of their choice. The detailed structure is given in the table below.

Programme	Duration (years)		Basic & Core Credits	Elective Credits	Project Credits	Total Credits
	Overall	Coursework				
Ph.D.	5	1.5	24	16	20	60
I-Ph.D.	6	2.0	32	16	32	80

The Academic Session is divided into two semesters: the Autumn Semester (August – November) and the Spring Semester (January – May).

In each semester, students are evaluated by a continuous evaluation process which includes assignments, quizzes, mid- and end-semester examinations and research paper presentations.

9. Participation of the department in the courses offered by other departments

STCS has an intensive doctoral level course work for students to prepare them for doctoral work. In addition, STCS students are free to choose electives in other Departments, in consultation with the Subject Board of STCS. Faculty members occasionally teach courses floated in other departments (or jointly with other departments) on topics of mutual interest.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

Faculty Designation with DAE Grade	Abbreviation (Item 11)	Number
Distinguished Professor (J)	Ds. Professor (J)	0
Senior Professor (I)	Sr. Professor (I)	0
Professor (H)	-	3
Associate Professor (G)	As. Professor (G)	4
Reader (F)	-	7
Fellow (E)	-	0
	Total	14

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

	Name	Deg*	Designation	Specialisation	Exp <sup>†</sup>	Stu <sup>‡</sup>
1.	P.K. Pandya	Ph.D.	Professor	Formal Methods, Logic, Realtime and Embedded Systems	27	1
2	J. Radhakrishnan	Ph.D.	Professor	Algorithms, Combinatorics, Complexity, Randomness	24	4
3	S.K. Juneja	Ph.D.	Professor	Applied Probability, Monte Carlo Methods, Financial Mathematics	19	4
4	T. Kavitha	Ph.D.	Assoc. Professor	Graph Algorithms, Computational Complexity	11	1
5	P.G.D. Sen	Ph.D.	Assoc. Professor	Quantum Computation	9	2
6	N. Sharma	Ph.D.	Assoc. Professor	Communications and Quantum Information Theory	9	
7	P. Harsha	Ph.D.	Assoc. Professor	Computational Complexity, Coding Theory, Algorithms	6	3
8	U. Bhaskar	Ph.D.	Reader	Algorithmic Game Theory, Online and Approximation Algorithms	1	1
9	A. Chattopadhyay	Ph.D.	Reader	Computational Complexity, Algorithms and Discrete Maths, Algebraic Automata Theory	3	3
10.	M. Gopalakrishnan	Ph.D.	Reader	Self-assembly, Systems Biology	7	1
11	A. Gupta	Ph.D.	Reader	Formal Verification, Modelling, Constraint solving	1	1
12	V. M. Prabhakaran	Ph.D.	Reader	Information Theory, Communication, Signal	4	2

				Processing, Cryptography		
13	N. Raja	Ph.D.	Reader	Models of Concurrent Interaction	17	1
14	R. Vaze	Ph.D.	Reader	Information Theory, Multi-Antenna Communication, Stochastic Geometry, Statistical Learning	6	1

\* Highest degree

† Years of Experience as a regular Faculty Member (TIFR and elsewhere)

‡ Ph.D. students guided within the last 4 years (including those joined and those graduated)

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors
- Professor V Anantharam, University of California, Berkeley, USA
  - Professor D Kapur, University of New Mexico, USA
  - Professor V S Borkar, IIT Bombay
13. Percentage of classes taken by temporary faculty – programme-wise information

STCS does not employ temporary faculty.

14. Programme-wise Student Teacher Ratio

	Programme	Students (S)	Faculty (F)	Ratio S/F
1.	PH.D.	12	14	0.86
2.	INTEGRATED M.SC.-PH.D.	6	14	0.43
3.	M.SC.	–	–	–

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

Scientific and Technical Staff	Administrative and Auxilliary Staff
6	2

16. Research thrust areas as recognized by major funding agencies

- Computer Science
- Systems Science
- Communication and Information Theory
- Applied Probability

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

#### National

	Agency	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	DRDO	Design and implementation of DIFC security architecture for securing linux like operating systems.	45	16/1/2015 - 16/3/2016	P. K. Pandya (PI), R.K.Shyamasundar

#### International

	Agency	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	DST and Max Planck Society	Indo-Max Planck Centre for Computer Science (IMPECS)	47	Nov 2010 - Nov 2015	T. Kavitha
2.	India-Israel UGC-ISF	Two Player Games: Hardness of Approximation and Communication Complexity.	55	October 2015 - October 2018	Prahladh Harsha

## 18. Inter-institutional collaborative projects and associated grants received

## a) National collaboration

**National**

	<b>Collaborating Institutions</b>	<b>Project Title</b>	<b>Total Grant (Rs. lakhs)</b>	<b>Duration</b>	<b>Faculty</b>
1.	DIT	Speech-based Access for Agricultural Commodity Prices and Weather Information in 12 Indian Languages	6	July 2014- July 2016	K.Samudravijaya and N. Bondale
2.	DIT	Development of Pronunciation Lexicon Based on Experimental Study of Phonetics and Phonemics of Indian Languages (Marathi Vertical)	38	Completed in Sep 2015	N. Bondale
3.	Information Technology Research Academy (ITRA) TIFR, IIT Bombay, NIT Surathkal, NIT Dugrapur	Uncoordinated, Secure and Energy Aware Access in Distributed Wireless Networks	182	Jan 2014 – Dec. 2016	V.Prabhakaran & R. Vaze
4.	IIT Bombay, TIFR, BARC	Center for Formal Design and Verification of Software (CFDVS)	310	April 2011 – April 2017	R.K.Shyamasundar, P.K. Pandya, N. Raja



19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

	Agency	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	DAE	XII Plan Project – Maths and Computer Science	390	2012-2017	All STCS faculty

20. Research facility / centre with

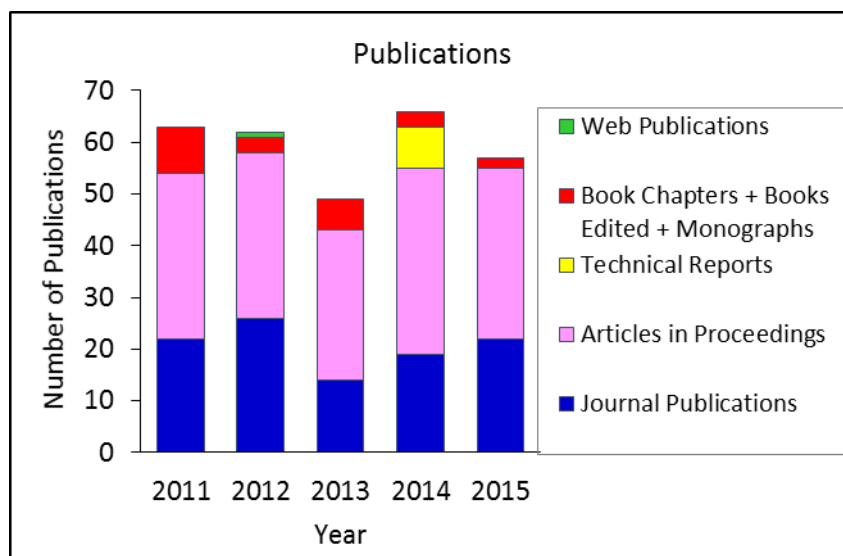
- state recognition                      None
- national recognition                    None
- international recognition              None

21. Special research laboratories sponsored by / created by industry or corporate bodies:

None

22. Publications:

	Journal Publications	Articles in Proceedings	Technical Reports	Web Publications	Book Chapters	Books Edited	Mono-graphs	Books
2010-11	22	32	-	-	7	2	-	1
2011-12	26	32	-	1	2	1	-	
2012-13	14	29	-	-	5	1	-	
2013-14	19	36	8	-	2	1	-	
2014-15	22	33	-	-	1	1	-	1
<b>Total</b>	<b>103</b>	<b>162</b>	<b>8</b>	<b>1</b>	<b>17</b>	<b>6</b>	<b>-</b>	<b>2</b>



\* Books with ISBN with details of publishers

1. R. K Shyamsunar and M. A. Pai (Editor), "Homi Bhabha and the Computer Revolution", Oxford University Press, February 2011. ISBN-13: 978-0-19-807246-1, ISBN-10: 0-19-807246-5.
2. R. Vaze, "Random Wireless Networks", Cambridge University Press, March 2015. ISBN: 9781107102323.

\* Citations -

- Total number of citations: 22387 (Source: Google scholar)
- Number of citations per faculty: 1599

\* h-index :

- Range 11—24

23. Details of patents and income generated:

None

## 24. Areas of consultancy and income generated

	Faculty Member	Project Name	Company Name	Duration	Income
1.	S Juneja	Designing Portfolio Risk Measurement Tool	Capital Metrics and Risk Solutions	1 year (2012-13)	Rs. 10 lakhs

## 25. Faculty selected nationally / internationally to visit other laboratories / institutions / industries in India and abroad

**National**

	Name of Faculty member	Place visited	Date (MM/YYYY)
1.	S.K. Ghosh	Indian Statistical Institute, Kolkata Indian Statistical Institute, Kolkata Indian Statistical Institute, Kolkata	Nov.5-Dec.4 2012 Oct. 21-Dec. 02, 2013 Oct. 13-Nov. 12, 2014
2.	M. Gopalkrishnan	Indian Institute of Science, Bangalore Indian Institute of Technology, Kanpur Indian Institute of Technology, New Delhi Institute of Mathematical Sciences, Chennai NCBS, Bangalore	Jan. 02-08, 2011 June 28, 2012 June 29, 2012 Feb. 06, 2013 June 10-21, 2013
3.	S.K. Juneja	Indian Institute of Technology, New Delhi Indian Institute of Technology, Guwahati	Nov. 25-26, 2012 March 24-27, 2014
4.	V.Prabhakaran	Indian Institute of Technology, Madras	Oct. 21-30, 2012
5.	N. Raja	Indian Statistical Institute, Kolkata	Dec.27-Jan. 04, 2013
6.	P.G.D. Sen	Infosys Mysore Park, Mysore Indian Statistical Institute, Kolkata Institute of Mathematical Sciences, Chennai	Aug. 14-19, 2013 Sept. 02, 2013 Jan. 29-31, 2014
7.	N. Sharma	Indian Institute of Technology, Kanpur	Mar. 29-31, 2012
8.	R. Vaze	Indian Institute of Science, Bangalore Indian Institute of Technology, Madras	July 16-23, 2012 Jan. 26-31, 2013

**International**

	<b>Name of Faculty member</b>	<b>Place visited</b>	<b>Date (MM/YYYY)</b>
1.	A.Chattopadhyay	State University of New Jersey, Rutgers, USA University of Edinburgh, United Kingdom University of Toronto, Canada Universitat Politecnica De Catalunya, Barcelona, Spain	1 week in Oct. 2012 Feb-Mar 2014 Aug 17-23, 2014 Sept 01-06, 2014
2.	S.K. Ghosh	Ben-Gurion University of the Negev, Israel Institute fur Informatik, ETH Zurich, Switzerland Institute of Theoretical Computer Science, ETH Zurich, Switzerland	Dec. 16-Jan. 04, 2011 June 01-30, 2012 Sept. 01-30, 2013
3.	M. Gopalkrishnan	University of Southern California, USA Massachusetts Institute of Technology, USA Duke University, USA University of Southern California and California Institute of Technology, USA Imperial College, London, United Kingdom American Institute of Mathematics, Palo Alto, USA IBM Yorktown Heights, USA University of Portsmouth, United Kingdom Imperial College, London, United Kingdom	Sept. 15-30, 2011 Oct. 02-04, 2011 Oct. 5-14, 2011 Aug. 07-17, 2012 Nov. 19-Dec. 01, 2012 Mar.25-29, 2013 Apr. 01-02, 2013 June 23-25, 2014 June 26-July 05, 2014
4.	P. Harsha	IBM Research, Watson, USA University of Toronto, Canada Weizmann Institute of Science, Israel Institute for Advanced Studies, Princeton, USA Simons Institute for the Theory of Computing, USA Univ. of Texas at Austin, USA KTH, Royal Institute of Technology, Sweden Center for Quantum Technologies, Singapore	May 18-19, 2011 June 03-04, 2011 June 15-July 20, 2011 Dec. 3-16, 2011 Aug. – Dec. 2013 Nov. 94-08, 2013 March 21-28, 2013 Nov. 06-Dec.06, 2014 Jan.25-Feb.08, 2015

		Weizmann Institute of Science, Israel Simons Institute for the Theory of Computing, USA	Mar. 24-Apr. 24, 2015
5.	S.K. Juneja	Heriot Watt University, United Kingdom University of Amsterdam, The Netherlands Brown University, USA Princeton University, USA University of Southern California, USA Ecole Polytechnique, Palaiseau Cedex, France KTH, Stockholm, Sweden CWI, Amsterdam, The Netherlands Univ. of Tokyo, Japan Stanford University, USA	May 2011 Nov. 2011 Oct. 28-Dec.01, 2012 Nov. 25-26, 2012 Oct. 09-11, 2013 Nov. 10-16, 2013  May 12-16, 2014 June 23-27, 2014 Sept. 25-26, 2014 Nov. 09-15, 2014
6.	T. Kavitha	Max-Planck Institute, Germany University of Sydney, Australia ICTP, Trieste, Italy University of Lugano, Switzerland Max-Planck Institute, Germany Max-Planck Institute, Germany Max-Planck Institute, Germany	May 01-28, 2011 Aug. 21-Sept. 4, 2011 Feb. 22-Mar 08, 2012 May 01-31, 2012 Jun 01-July 05, 2012 May 15-June 11, 2013 July 01-25, 2014
7.	V.Prabhakaran	University of California, Los Angeles, USA University of California, Los Angeles, USA University of Illinois at Urbana-Champaign, USA University of California, Los Angeles, USA	Feb. 11-18, 2011 Feb. 17-23, 2013 Sept.27-Oct. 12, 2013  Feb. 15-17, 2014
8.	N. Raja	Lorentz Center, Leiden, The Netherlands Centre International de Rencontres Mathematiques, Marseille, France Isaac Newton Institute, Cambridge University, United Kingdom Technische Universitat Dresden, Germany Mathematisches Forschungsinstitut, Oberwolfach, Germany Institute Henri Poincare, Paris, France Lorentz Center, Leiden, The	Nov. 2011 Feb. 2012  Apr.30-June 01, 2012  Aug. 17-Sept.04, 2013 Nov. 24-Dec. 01, 2013  June 01-30, 2014 November 2014

		Netherlands	
9.	P.G.D. Sen	McGill University, Canada	Sept. 2011-Mar. 2012
10.	N. Sharma	University of Waterloo, Canada Isaac Newton Institute for Mathematical Sciences, United Kingdom	Dec. 04-10, 2011 Nov. 01-Dec. 20, 2013
11.	R.K. Shyamasundar	National University of Singapore, Singapore	Aug.-Sept. 2013
12.	R. Vaze	Bell Labs, USA National Institute of Informatics, Tokyo, Japan University of Cambridge, United Kingdom	May 02-10, 2011 May 14-16, 2012 Jan. 27-12, 2013

## 26. Faculty serving in

- a) National committees b) International committees c) Editorial Boards d) any other (please specify)

## (a) National Committees:

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
1.	P. Harsha	2nd Annual Mysore Park Workshop in Theoretical Computer Science: Algorithms and Complexity 3rd Annual Mysore Park Workshop in Theoretical Computer Science: Algorithms and Complexity 4th Annual Mysore Park Workshop in Theoretical Computer Science: Algorithms and Complexity	Organizer	May 2011 Aug. 2012 Aug. 2013
2.	V. Prabhakaran	National Communications Conference National Communications Conference National Communications Conference	Member Member Member	2014 2015 2016
3.	J.Radhakrishnan	Indian Academy of Science Indian National Science Academy	Fellow Fellow	
4.	R. Vaze	IEEE NCC 2011 IEEE NCC 2012 IEEE SPCOM 2012 IEEE NCC 2013 IEEE SPCOM 2014	Member Member Member Member Member	2011 2012 2012 2013 2014

**(b) International Committees:**

	<b>Name of the Faculty Member</b>	<b>Name of the Committee</b>	<b>Role in the Committee</b>	<b>Term of Service</b>
1.	P. Harsha	RANDOM 2009 APPROX 2011 FSTTCS 2011 RANDOM 2013 FSTTCS 2013 CALDAM 2015 FSTTCS 2015 CCC 2016 FOCS 2016	Member Member Member Member Member Member Chair Member Member	2009 2011 2011 2013 2013 2015 2015 2016 2016
2.	S.K. Juneja	Performance INFORMS Applied Probability Conference 2015	Member Member	2015 2015
3.	T. Kavitha	FSTTCS 2010 COCOON 2011 SWAT 2012 COCOON 2012 FSTTCS 2012 SODA 2013 ALENEX 2013 ESA 2013 WAOA 2013 APPROX 2014 FSTTCS 2014	Member Member Member Member Chair Member Member Member Member Member Member Member	2010 2011 2012 2012 2012 2013 2013 2013 2013 2014 2014
4.	P.K. Pandya	POPL 2015 ICLA 2015, SETTA 2015, TASE 2015, RP 2014, SETTA 2014, TASE 2014, ICTAC 2014, ICTAC 2013, ICDCN 2013,	OC Chair Member	2015

5.	V.Prabhakaran	International Conference on Signal Processing and Communications	Member	2012
		International Conference on Distributed Computing and Networking (ICDCN)	Member	2013
		ACM International Symposium on Mobile Ad Hoc Networking and Computing (Mobihoc)	Member	2013
		International Conference on Signal Processing and Communications	Member	2014
		IEEE International Conference on Computer Communications (INFOCOM)	Member	2014
		IEEE Conference on Communications and Network Security (CNS)	Member	2015
		IEEE International Symposium on Information Theory (ISIT)	Member	2015
		IEEE Information Theory Workshop (ITW)	Member	2016
		International Conference on Signal Processing and Communications		
		6.	J.Radhakrishnan	STOC 2010
		FSTTCS 2012	Chair	2012
		Nevanlinna Prize Committee	Member	2014
7.	R. Vaze	IEEE International Conference on Communications 2011		2011
		IEEE VTC 2011		2011
		IEEE VTC 2012		2012
		IEEE International Conference on Communications 2012		2012
		IEEE Globecom 2012	TPC Member	2012
		IEEE Globecom 2013		2013
		IEEE VTC 2013		2013
		IEEE International Conference on Communications 2013		2013
		WiOpt 2013		2014
		WiOpt 2014		2014
		IEEE Globecom 2014		



**(c) Editorial Boards :**

	<b>Name of the Faculty Member</b>	<b>Name of the Journal</b>	<b>Impact Factor</b>	<b>Term of Service</b>
1.	S.K. Juneja	Mathematics of Operations Research ACM TOMACS Annals of Operations Research	0.924 1.090 1.217	2008-present 2009-2011 2011
2.	P.K. Pandya	Formal Aspects of Computing Journal, Springer	0.806	1996-2011
3.	V.Prabhakaran	Sadhana (Indian Academy of Sciences)	0476	2013-present
4.	J.Radhakrishnan	SIAM Journal on Discrete Mathematics Discrete Mathematics Theoretical Computer Science	0.668  0.465	2009-2011  2008-2011
5.	R. Vaze	IEEE Journal of Selected Areas of Communications	3.453	2015-present

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs).

As all TIFR faculty members regularly participate in national and international research-oriented symposia, conferences, workshops and schools, often as the organizers or principal lecturers, they are always in touch with the state of the art in their areas of expertise. Therefore, no separate recharging/refresher programmes are needed, nor are any conducted. In fact, TIFR faculty are in great demand as lecturers in such programme in other institutions, both inside and outside India.

28. Student projects

- percentage of students who have done in-house projects including inter-departmental projects

All (100%) students are required to do projects as a part of their Ph.D..

- percentage of students doing projects in collaboration with other universities / industry / institute

None

29. Awards / recognitions received at the national and international level by

- Faculty
- Doctoral / post doctoral fellows
- Students

### National Awards

	Year	Name of the Awardee	Name of the Award
1.	2007	J. Radhakrishnan	Indian Academy of Science Fellowship
2.	2008	T. Kavitha	INAE Young Engineers Award
3.	2008	T. Kavitha	INSA Young Scientist Medal
4.	2008	J. Radhakrishnan	S.S. Bhatnagar Award
5.	2010	M. Gopalkrishnan	Ramanujan Fellowship
6.	2011	P. Harsha	NASI-SCOPUS Young Scientist Award for Mathematics
7.	2011	P. Harsha	Associate of the Indian Academy of Sciences
8.	2011	V. Prabhakaran	Ramanujan Fellowship
9.	2013	A.Chattopadhyay	Ramanujan Fellowship
10.	2013	R. Vaze	Indian National Science Academy's Young Scientist Award
11.	2013	R. Vaze	Indian National Academy of Engineering's Young Engineer Award
12.	2014	J. Radhakrishnan	Indian National Science Academy Fellowship
13.	2014	R. Vaze	Best paper award, Networks track, National Conference on Communications at IIT-Kanpur
14.	2014	R. Vaze	Ramanath Cowsik Medal from TIFR for best paper in last 5 years for people under the age of 35 from TIFR
15.	2015	U. Bhaskar	Ramanujan Fellowship
16.	2015	R. Vaze	National Academy of Science India's Young Scientist Award

### International Awards

	Year	Name of the Awardee	Name of the Award
1.	2009	S.K. Juneja	Best paper award at the ICST Fourth International Conference on Performance Evaluation
2.	2010	R. Vaze	Eurasip Best Paper Award for the best journal paper published in Eurasip Journal on Wireless Communication and Networking
3.	2012	S.K. Juneja	Best paper award at the ICST Sixth International Conference on Performance Evaluation

4.	2015	A.Gupta	Best paper award at the 18th European Joint Conference on Theory and Practice of Software
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• **Students, Postdocs, Scientific Staff and Others:**

**National Awards**

	Year	Name of the Awardee	Name of the Award
1	2012	Ankush Agrawal	TCS Research Fellowship
2	2012	Girish Varma	Google Fellowship
3	2013	Gugan Thoppe	IBM Fellowship
4	2013	Karthyek A Murthy	IBM Fellowship
5	2014	Sagnik Mukhopadhyay	TCS Research Fellowship
6	2014	Deepesh Data	Microsoft Research Fellowship

30. Seminars/Conferences/Workshops organized and the source of funding (national / international) with details of outstanding participants, if any.

	Year	Name	Funding Agency	Faculty members
1.	2011	Workshop on Recent Trends in Social Networks: Algorithms, Models and Learning	TIFR	S.K. Juneja
2.	2011	Workshop on Computing for Science Discovery and Innovations: A Roadmap	-	R.K. Shyamasundar
3.	2011	STCS Annual Symposium	TIFR	
4.	2012	Workshop on Mathematical Finance	ICTS (??)	S.K. Juneja
5.	2012	Introduction to Graph and Geometric Algorithms	NBHM	S.K. Ghosh
6.	2013	Introduction to Graph and Geometric Algorithms	NBHM	S.K. Ghosh
7.	2013	International Conference on Distributed Computing and Networking		R.K. Shyamasundar
8.	2013	Pre-Workshop School of WALCOM 2013 on Graph and Geometric Algorithms	NBHM	S.K. Ghosh
9.	2013	STCS Annual Symposium	TIFR	
10.	2013	Introduction to Graph and Geometric Algorithms	NBHM	S.K. Ghosh
11.	2013	Workshop on Applications of Game Theory	TIFR	S.K. Juneja

	Year	Name	Funding Agency	Faculty members
12.	2013	Introduction to Computational Geometry, Research Promotion Workshop on Introduction to Graph and Geometric Algorithms	NBHM	S.K. Ghosh
13.	2014	Workshop on Energy Efficiency in Wireless Networks	TIFR	R. Vaze
14.	2014	Recent Progress in Arithmetic Complexity	TIFR	A.Chattopadhyay, P. Harsha and J.
15.	2014	Introduction to Approximation Algorithms, Research Promotion Workshop on Introduction to Graph and Geometric Algorithms	NBHM	S.K. Ghosh
16.	2014	STCS Annual Symposium	TIFR	R. Vaze and P. Harsha
17.	2014	Research Promotion Workshop on Introduction to Graph and Geometric Algorithms	NBHM	S.K. Ghosh
18.	2015	Principles of Programming Languages (POPL 2015)		P.K. Pandya
19.	2015	Research Promotion Workshop on Introduction to Graph and Geometric Algorithms	NBHM	S.K. Ghosh
20.	2015	Tutorial and Workshop on Learning and Related Probabilistic Applications	TIFR	S.K. Juneja and R. Vaze
21.	2016	Workshop on Bombay Information Theory Seminar (BITS 2016)		V.M. Prabhakaran, P. Harsha and J. Radhakrishnan

31. Code of ethics for research followed by the departments

STCS follows the TIFR Guidelines on Academic Ethics

32. Student profile programme-wise:

Name of the Programme	Applications received%	Selected%		Joined		Pass percentage*	
		Male	Female	Male	Female	Male	Female
Ph.D.	8110	29	1	16	-	69	-
Integrated M.Sc.- Ph.D.				05	-	100	-

## 33. Diversity of students

According to geographical location:

Students	Ph.D.		Integrated-Ph.D.		M.Phil.		Total
	*M	*F	*M	*F	*M	*F	
From the state where the university is located	0	0	1	0	0	0	1
From other states of India	8	0	9	0	0	0	17
NRI students	0	0	0	0	0	0	0
Foreign students	0	0	0	0	0	0	0
<b>Total</b>	<b>8</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>18</b>

According to the undergraduate institutions students come from:

† Science institutions, e.g. CBS, NISER, etc.# IITs, NITs, etc.

Students from	Ph.D.		I-Ph.D.		Total
	Male	Female	Male	Female	
Indian Universities	3	0	4	0	7
Premier science institutions †	3	0	0	0	3
Premier professional institutions #	5	0	2	0	7
Others*	0	0	1	0	1
Foreign Universities	0	0	0	0	0
<b>Total</b>	<b>11</b>	<b>0</b>	<b>07</b>	<b>0</b>	<b>18</b>

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

	Examination	No of students who cleared
1.	GATE	11
2.	NET	01
3.	JEST	04
4.	Others	01

## 35. Student progression

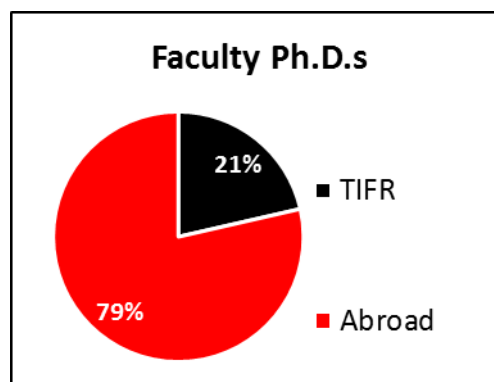
Ph.D. programme : Most of the students admitted to the STCS go on to complete the course work and get their Ph.D.s. Occasionally, a student may opt out of the programme, for various reasons. Normally, after completing their Ph.D., students have to leave TIFR. The vast majority go elsewhere for postdoctoral research. A small number go for other employment, such as teaching positions or the industry.

Integrated M.Sc.-Ph.D. programme : Most of the students admitted to the STCS go on to complete the course work and get their M.Sc.'s and Ph.D.s. Occasionally, a student may opt out of the programme, for various reasons. Normally, after completing their Ph.D., students have to leave TIFR. The vast majority go elsewhere for postdoctoral research. A small number go for other employment, such as teaching positions or the industry.

## 36. Diversity of staff

**Number of faculty who are Ph.D.'s**

from <b>TIFR</b> :	3
from other institutions in <b>India</b> :	0
from institutions <b>Abroad</b> :	11
<b>Total No</b>	<b>14</b>



## 37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period

The minimum eligibility criteria for selection as a member of the TIFR faculty is a Ph.D. degree. Thus, this number is not relevant.

38. Present details of departmental infrastructural facilities with regard to

a) Library

STCS, like other Departments of TIFR in the Colaba campus, makes use of the TIFR Library and Scientific Information Resource Centre (SIRC) ([see Section B2, Item no 4.2](#))

b) Internet facilities for staff and students

STCS, like other Departments of TIFR in the Colaba campus, makes use of the TIFR Computer Centre and Communication Facility ([see Section B2, Item no 4.3](#))

c) Total number of class rooms

STCS, like other Departments of TIFR in the Colaba campus, makes use of the common class rooms and lecture theatres of TIFR ([see Section B1, Item no 12](#))

d) Class rooms with ICT facility

All the classrooms above have ICT facilities like overhead projectors, Wi-Fi, etc. Video-conferencing possibilities are also available in most lecture rooms.

e) Students' laboratories:

i. STCS has a common laboratory with 25 workstations and 8 servers.

ii. Each student has individual desktop computer with internet connection.

f) Research laboratories

- Laboratory for Embedded Systems and Formal Methods equipped with 2 Servers, 6 workstations, Software for embedded system programming and analysis, and 6 Firebird Robots.
- Laboratory for financial mathematics.
- Laboratory for speech analysis and synthesis.

## 39. List of doctoral, post-doctoral students and Research Associates

## a. from the host institution/university

	Doctoral students	Post-doctoral fellows
1.	Mohit Garg	Sameer Kamal
2.	Sagnik Mukhopadhyay	N. V. Narendra Kumar
3.	Sarat B. Moka	Bodhayan Roy
4.	Deepesh Kumar Datta	
5.	Suneel Saraswat	
6.	Kshitij Gajjar	
7.	Abhishek Kumar Singh	
8.	Gowtham Raghunath Kurri	
9.	Aditya Nema	
10.	Suhail Sherif	
11.	Nikhil S. Mande	
12.	Phani Raj Lolakapuri	
13.	Tulasi Mohan Molli	
14.	Anamay Gununath Tengse	
15.	Anand Avinash Deo	
16.	Gunjan Kumar	
17.	Rahul Jain	
18.	Varun Narayanan	

## b. from other institutions/universities

1. Smarajit Das, Indian Institute of Science, Bangalore (Visiting Fellow from 2009-2012).
2. Ratnik Gandhi, Dirubhai Ambani Institute of Information and Communication Technology, Gandhinagar, Gujarat (Visiting Fellow from 2010-2012).
3. Ashish Tendulkar, Indian Institute of Technology, Madras (Visiting Fellow from 2011-2012).
4. A.V. Sreejith, Institute of Mathematical Sciences, Chennai (Visiting Fellow from 2013-)
5. Mukul Agarwal, University of Waterloo (Visiting Fellow from 2014-15).
6. M. Sharayu, University of Texas at Austin, USA (Visiting Fellow from 2014-15).



40. Number of post graduate students getting financial assistance from the university.

ALL the students of STCS are in doctoral programmes, and hence they are all given TIFR fellowships.

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

The institute had undertaken a comprehensive review of all its activities in 1995-96. Based on the recommendations of the committee, it was decided to establish the School of Technology and Computer Science in the institute to further nurture and focus attention on these important areas. The graduate programme under the Computer and Systems Science subject board grew out of these efforts.

42. Does the department obtain feedback from

a. faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

The Subject Board convener stays in touch with the Instructors and collects their feedback at regular intervals. This is used to (a) advise the Instructors, (b) update the Syllabus, and (c) fine-tune the curriculum.

b. students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

From time to time anonymous feedback is obtained from the students. The relevant portions in this are communicated to the Instructors.

c. alumni and employers on the programmes offered and how does the department utilize the feedback?

Currently no such feedback is collected on a formal basis.

43. List the distinguished alumni of the department (maximum 10)

	Name of the Alumnus	Reason for Distinction
1.	Prof. V. S. Borkar	Distinguished Professor, IIT Bombay
2.	Prof. R. K. Shyamasundar	Distinguished Professor, IIT Bombay
3.	Prof. Mathai Joseph	Executive Director, TRDDC, Pune
4.	Dr. S. Ramani	IIIT, Bangalore, Internet Hall of Fame
5.	Dr. N. Karmarkar	Tata Consultancy Services, Fulkerson Prize, Paris Kenallakis Award
6.	Prof. S.P. Mudur	Computer Science Department Head, Concordia University, Canada, Director, CDAC
7.	Prof. Rahul Jain	National University of Singapore, Leading expert in the area of quantum communication and computation
8.	Prof. P.V.S. Rao	Padma Shree (retired)
9.	Prof. M.V. Pitke	Director (CDOT), Director (CDAC)

44. Give details of student enrichment programmes (special lectures / workshops / seminar) involving external experts.

As Item No 30 shows, STCS regularly conducts conferences etc. which are attended by all the doctoral students, and these provide the required introduction to the state of the art in the subjects of their research. Students are encouraged to attend schools and workshops conducted by external experts organized at other academic institutions in the country. In addition, TIFR has a vibrant programme of seminars, colloquia and public lectures which the students are encouraged to attend.

45. List the teaching methods adopted by the faculty for different programmes.

STCS generally adopts conventional blackboard teaching methods. Research presentations are typically made using an overhead projector facility.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

The STCS subject board constantly monitors the progress of the students and obtains feedback from faculty and students alike.

47. Highlight the participation of students and faculty in extension activities.

STCS faculty, postdocs and students regularly participate in the Outreach Activities of TIFR. The institute hosts the Indian Association for Research in Computing Sciences, the leading body that supports students and faculty members country wide by conducting teacher training courses and providing travel and other support. It also organizes the training for the Indian Informatics Olympiad efforts and organizes the country's leading Computer Science Conference, namely, Foundations of Software Technology and Theoretical Computer Science (FSTTCS)

48. Give details of "beyond syllabus scholarly activities" of the department.

The school has regular seminars by faculty members and visitors, covering a variety of subjects, from individual research to recent breakthroughs in the field. In addition, faculty members take on undergraduate and graduate interns, providing them first-hand research experience on advanced topics.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

STCS, as a part of TIFR, was reviewed by a UGC Review Committee in 2010.

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

TIFR pioneered research in computing in India. Thus, India's first digital computer, TIFRAC, was designed and constructed at TIFR in 1961. First digital computer networking experiments were also carried out by Dr. S. Ramani at TIFR and these eventually led to the university network ERNET. Researchers at TIFR designed computing and digital communication systems for Indian Defense through nationally funded projects such as ADGES and AREN. National Center for Software Technology and Computing Science (NCSICT) was established at TIFR in 1974.

Currently, the department has active research in foundational areas such as algorithms and complexity theory, formal methods and program analysis, wireless communication and sensor networks, classical and quantum information theory,

applied probability, computational finance and mathematical modeling of risk. Several significant research results have been obtained in these areas.

Department members have published over 1100 papers. Members regularly publish in top international journals and conferences. Moreover, members have served on programme committees of leading international conferences. Also, TIFR has hosted several international conferences including POPL 2015, ICDCN 2013 and ICLP.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

### **Strengths**

1. Strong theoretical and conceptual focus in contemporary areas of Computer and Information Sciences. Given our diverse faculty interests, the school is well placed to exploit the emerging convergence world wide in the quantitative sciences.
2. Strong recent faculty hires with Ph.D.s and postdoctoral experience from top universities world wide. Most of the recent hires have Ramanujan Fellowships.
3. High quality graduate programme with intense doctoral level coursework that equips our Ph.D.s with diverse modern tools and techniques.
4. Strong Industrial Research Lab scholarship support for our graduate programme.
5. Overlap of interests with TIFR's other theoretical groups in the areas of Mathematics, Theoretical Physics and Theoretical Biology.

### **Weakness**

1. The relatively small size of the school limits our abilities for bold initiatives in new areas.
2. Limited number of international and visiting faculty.
3. The undergraduate curriculum/training in Indian universities does not provide sufficient analytical background to entering graduate students.

4. Difficult to compete with industrial research labs in hiring faculty given their much higher salary scales.
5. Many bright B. Tech. students are hesitant to commit to a Ph.D. which could require over five years to complete, and would prefer an option to complete a masters and then decide whether to continue for a Ph.D. We currently do not explicitly provide this option.

### **Opportunities**

1. Substantial number of talented Indian students do their Ph.D.s at internationally top research universities in areas of our interest. Increasing proportion of them are choosing to return to academic jobs in India. This is an opportunity to further strengthen our faculty.
2. As computer science and related areas become pervasive in real life, the theoretical expertise developed in the school has the opportunity to make impactful contributions in the Indian context.
3. The growing strength and confidence in the Indian theoretical computer science research community offers an opportunity for us to evolve as world leaders in research in niche theoretical areas.
4. Increasing interest among the international universities for collaborative presence in India; this can be leveraged to strengthen our research.
5. Many international industrial research labs are locating to India; the school has the opportunity to develop relationships that enhance our resources and provide useful inputs to our research.

### **Challenges**

1. Our focus areas have substantial overlap with the industry, forcing us to compete with them for best talent.
2. Increased competition for high quality students with international top universities as well as with the industry.

3. Although the quality of faculty applicants returning to India in areas related to computer and informational sciences has increased, increasingly many research institutions in India provide a nurturing research environment comparable to TIFR, adding to the competition for recruiting the best talent.
  4. Making our programme more visible to the undergraduate population across India to attract students from a much bigger pool.
  5. Minimizing interference in day to day administration by extended bureaucracy so that our focus remains on effective research and providing effective training to student researchers.
52. Future plans of the department.

Algorithms, Complexity, Formal Verification Methods have been our traditional areas of focus. Our future plans are to continue to gain strength in these. Over the last few years, we have gained faculty strength in areas including Information Theory, Quantum Information Processing, Applied Probability, Machine Learning, Financial Mathematics and Sensor Networks. Our aim is to further expand in these directions as well. All of the above areas are highly quantitative, and there are substantial synergies in quantitative tools and techniques used in these as well as in other important areas including Big Data, Control Theory, Information Theoretic Privacy, where we also hope to recruit in future.

To enhance the quality of incoming students and to increase our impact, we are considering modifying our current programme into an integrated Masters and Ph.D. programme that focuses on common quantitative tools used in varied emerging applications in computers and information sciences as well as physical and social sciences and engineering. This would be a unique programme in the country. An important flexibility of this programme would be to allow an explicit option to students to leave after a Master's degree; thus encouraging talented students to join without making an initial long term commitment.

To prepare students for high quality research our school conducts intense doctoral level courses. Through videos etc. we plan to generate knowledge resources and make them accessible to the general public.

Our plan is to further develop synergistic relationships with top international research universities as well as with top industrial research labs that have recently come up in the country, to add to our student programmes through scholarships and exchange programmes as well as to further strengthen our research.