

ACM Survey on PhD Production in India for Computer Science and Information Technology

2016 – 2017

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The purpose of this study is to collect reasonably reliable data on PhD production in CS in India, and then use it to identify useful trends. This exercise was motivated by the Taulbee report in the US, and Dr Gautam Shroff, Vice President and Head - TCS Research, Tata Consultancy Services has been leading this year's survey. Based on the inputs and experience from the survey conducted in last couple of years, the survey and report for academic year 2016-17 has been incorporated.

Institutes Included

Last year, the study attempted to include all institutions which have a PhD program in CS/IT. A list of 2507 institutes from all over India was obtained from AICTE. According to the data available on the websites, of these institutes, 73 institutes stated that they have a PhD in CS or IT. We added to these, other institutions (IITs, NITs, etc.) which are known to be granting PhDs in computer science, inputs for this were taken from various researchers and faculty and from the previous study. Additional institutes were obtained from the partner institutes to TCS Research Scholar Program. This gave a total of 145 institutes which claims to have a PhD program and which could be included in this study. This list of institutions is given in Appendix H.

Data Collection

An online form was created, and sent to the Head of Department (CSE/IT) and the Director of the institutes. The form asked for information on: the number of PhD faculty, number of non-PhD faculty, total number of PhD students enrolled and the total number of PhDs graduated last year who got their degree. The form also asked for the stipend that was paid to the PhD students and the major problems that the institutes face with regard to the PhD programme.

Reminders were sent, and the institutions were informed that if they failed to respond, the data of students pursuing PhD from those institutes cannot be captured.

We got responses from 18 institutes through online survey. We assume that the other institutions (i.e. which did not respond and for which we could not find relevant data) don't have an active PhD program, or if they do, it is too small to be of any significant impact.

For this year's report, we have grouped the institutions as follows:

- Group 1: Institutions which provided the data about number of faculty, PhDs enrolled, and PhDs awarded. (18)
- Group 2: Institutes which provided data last time but did not do so for this year's report. (5)
- Group 3: Institutions which did not submit the filled form, but the number of faculty, and the total number of PhDs enrolled was available on their website. (11)

- Group 4: Institutions which did not submit the form and we could not find information about the PhD students enrolled on their websites, but obtained information about the number of faculty. (18)

For group 2, we took the data from last year's study, assuming that it would not have changed significantly this year.

Analysis

PhD Production

The number of students who completed their PhD from August 2016 to July 2017:

Group 1 institutes: 75

Group 2 institutes (estimated): 45

Group 3 institutes (estimated): 71

Group 4 institutes (estimated): 81

To better understand where these PhDs are being produced, we divide the institutions in two categories: those that have 80% or more faculty with PhDs, and others. Presumably the first category represents the more research-focused institutions, while the second category is likely to be the more teaching-focused institutions. There are 32 institutions in the first category (List of these institutions and their data ids given in Appendix E), and 20 institutions in the second category (Appendix F). With this classification, we have the following for PhD production:

- ***Research-focused institutes produced a total of 176 PhDs and other institutes produced 96. The total number of PhDs produced last year from all institutions is 272.***

Based on the detailed data provided by Group 1 institutions, we can say:

- ***Of the total PhDs produced, 63% were male and 37% were females.***

Looking at the statistics, the number of students who are enrolled:

Group 1: 887

Group 2: 463

Group 3: 629

Group 4 Estimated: 800

For all the institutes, the total adds up to 2779. And for group 1 and group 2 is 1350. Out of which, the total number of part time students doing PhDs in institutes belonging to Group 1 is 259 and that of Group 2 is 41.

Using this total, we can estimate the number of PhDs likely to be produced in the country in the coming years. We assume that 90% of these students will graduate over the next five years. If we expect that these graduations will be spread across 5 years with approximately uniform distribution, the number of PhDs graduating will come to around 520 per year for the coming five years. Since we know that the enrolment in PhD programs has been increasing over the past few years, we can expect the increase to be gradual. We assume that the increase in first year is x , in 2nd year is $2x$... and in 5th year it is $5x$. With this, we can estimate that the number of PhDs graduating will gradually increase to about 550 per year in about 5 years among all institutions, and about 300 per year from institutions in group 1 and 2.

Overall, keeping in mind the likelihood of overestimation for institutions in group 2 and 3, we can say that the PhD production in the Academic Year 2016-17 was around 272, and that PhD production is likely to grow gradually to about 480 per year in about 5 years.

Areas of Research

In this section we analyse the areas of research chosen by the students who completed their thesis in 2016-2017.

As can be seen from fig 1, the most popular area of research is Artificial Intelligence, Theory and Algorithm and Robotics / Vision. Informatics: Biomedical and other sciences and Networks are fields which are also popular as a research interest among PhD students. (This data is only from institutes in group 1 who filled the online form.)

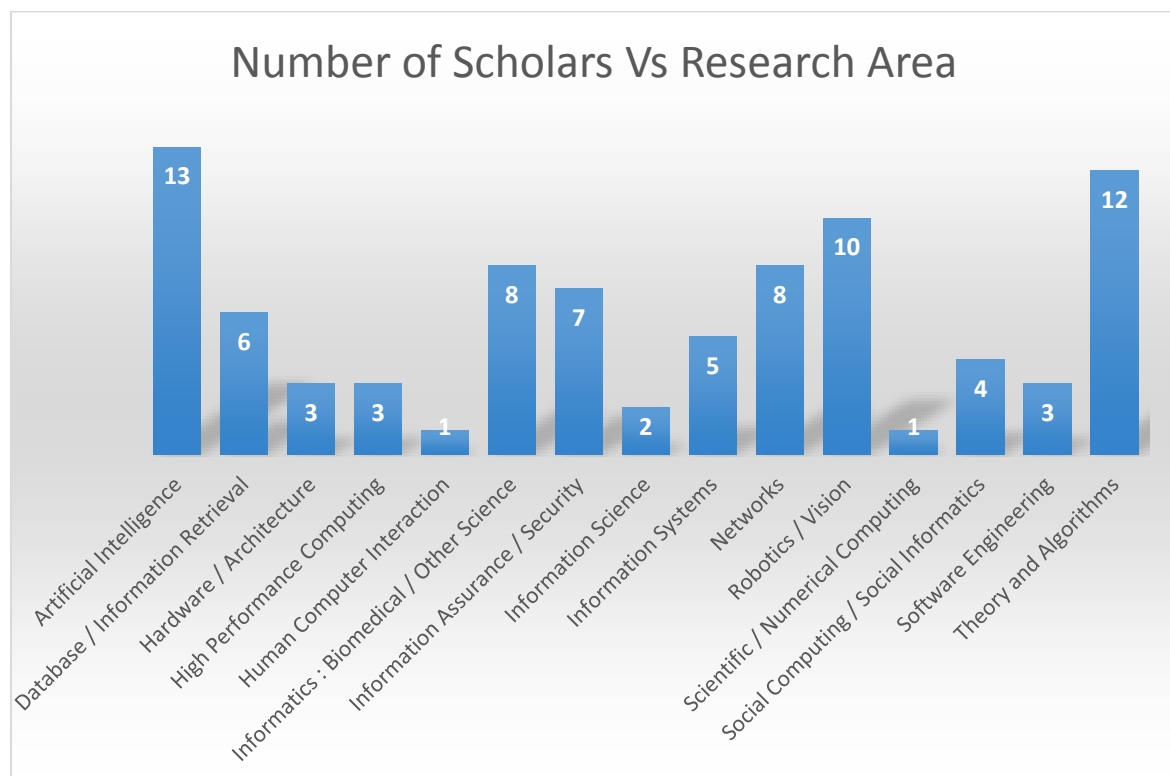


Fig 1: Area of research chosen by students who completed their PhD in 2016 – 2017

Comparing this with last year's response, we observe an increase in interest for Artificial Intelligence and Informatics: Biomedical and other sciences.

Employment Statistics

Based on the data provided by institutes of group 1, the most popular choice of employment after completing PhD is teaching in India.

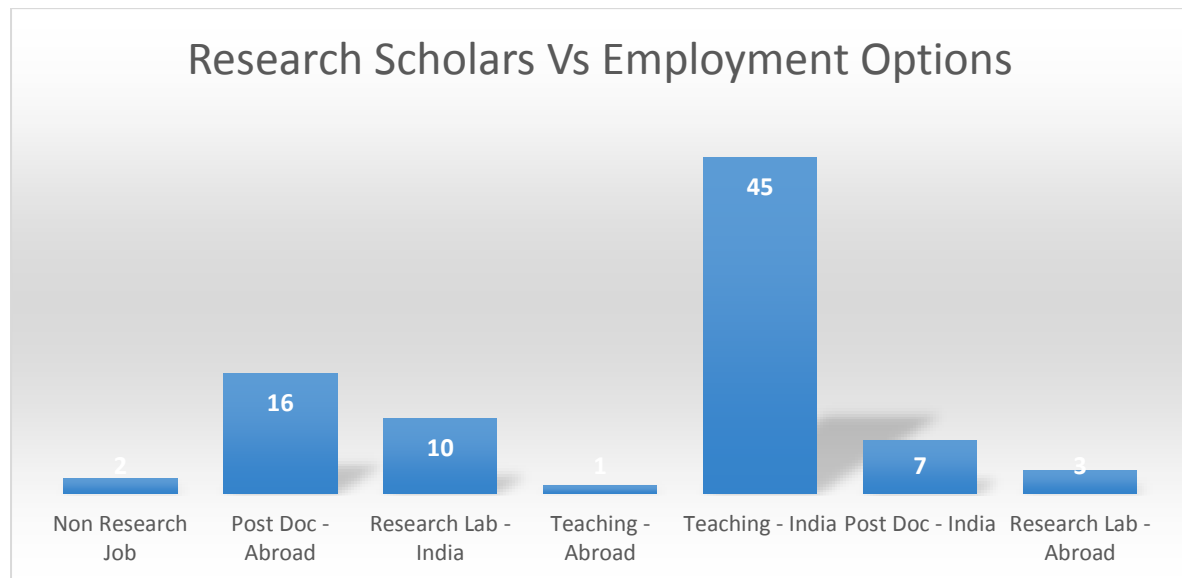


Fig 2: The employment options chosen by students who completed their PhD in 2016-2017

Stipend/Compensation given to PhD students

Based on the data provided by 18 institutes about the stipend paid to a PhD student, we can say:

The highest salary given: Rs. 34,500

The lowest salary given: Rs. 12,000

Average salary a student can expect is: Rs. 20,877

Issues/Challenges faced by the PhD program

The online form had an open question for institutes to list down the issues they face with the PhD program. The response that we got can be broadly categorized into the following:

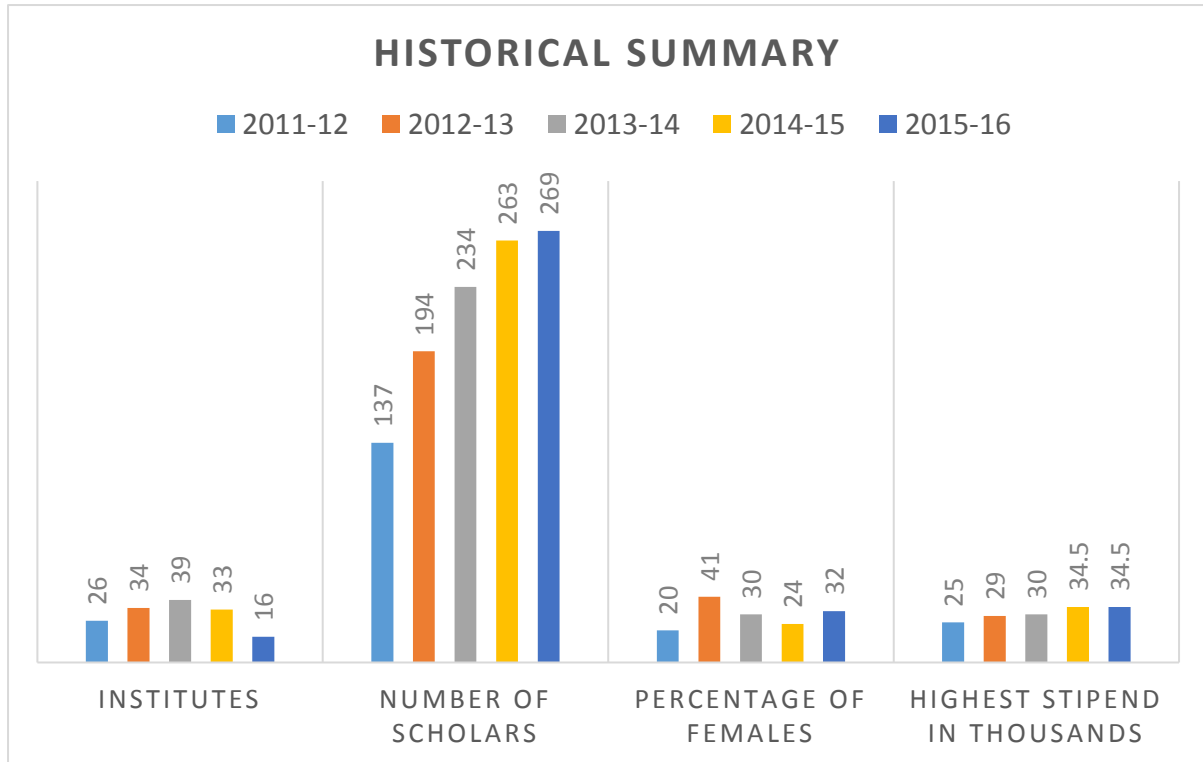
- Attracting good students to pursue PhD
- Support for Lesser Number of International Conferences
- Lack of tie ups in the industry and institutes

Faculty

For the 52 institutes covered in the study, the total number of faculty with PhD is 1116 and the average faculty with PhD in the CSE/IT department of an institute is 21.

Trend and Summary

Total number of PhDs in Computer Science in India is increasing over the years.



References

1. CRA Taulbee Survey. <http://cra.org/resources/taulbee/>

Acknowledgements

I would like to thank Sachin Parkhi for his help in conducting the study and preparing the report. I would also like to thank all the institutions who provided data by either filling the form or by sending data over email.

Appendix

A. Group 1 institutes: Provided Data

Institute	PhD Faculty	Non PhD Faculty	PhD Graduates Male	PhD Graduates Females	Ph D Graduates Total	Faculty from PhD Students	PhD Students Enrolled	Part Time PhD Students Enrolled
Indian Institute of Technology Ropar	14	0	1	0	1	0	26	0
ISI Kolkata	75	0	9	1	10	0	115	4
Chennai Mathematical Institute	12	0	1	0	1	0	19	3
IIIT Bangalore	17	0	2	2	4	0	66	34
National Institution of Technical Teachers' Training and Research	15	0	2	1	3	1	49	9
Delhi University (Main Campus)	5	1	0	2	2	0	27	0
IIIT Hyderabad	50	3	8	2	10	0	128	44
Ahmedabad University, Institute of Engineering and Technology (IET)	9	3	0	0	0	0	5	2
Amrita University	49	79	6	9	15	10	146	97
Visvesvaraya National Institute of Technology Nagpur	13	1	2	1	3	0	33	6
IIIT Delhi	26	0	2	0	2	0	74	0
JIIT Noida	94	34	0	3	3	1	72	55
National Institute of Technology Trichy	13	2	2	2	4	0	8	0
Indian Institute of Technology Patna	13	0	4	1	5	0	59	5
Don Bosco College of Engineering and Technology	6	17	0	3	3	2	23	0
Institute of Mathematical Sciences Chennai	8	0	6	1	7	0	17	0
Tata Institute of Fundamental Research	15	0	2	0	2	0	20	0
Walchand College of Engg. - Sangli	3	11	0	0	0	0	0	0

B. Group 2 institutes: Provided data for last year's report and did not provide this year

Institute	PhD Faculty	Non PhD Faculty	Total PhD Graduates	Total Number of PhD Scholars Enrolled
Calcutta University	12	0	8	107
Indian Institute of Technology Kanpur	33	0	6	51
Indian Institute of Technology Bombay	43	0	12	140
Indian Institute of Science Bangalore	32	0	9	103
University of Hyderabad	23	3	10	62
Total	143	3	45	463

C. Group 3 institutes: PhD faculty and students enrolled data found on website

Name of Institute	PhD Faculty	Non PhD Faculty	PhD Graduates (16-17) (Estimated)	Total Enrolled
IIT Allahabad	26	0	7	67
IIT Roorkee	12	0	4	51
IIT Jodhpur	6	0	3	12
IIT Mandi	35	0	10	71
IIT Madras	33	0	10	108
IIT Gandhinagar	8	0	3	11
IIT Hyderabad	19	0	6	57
IIT Guwahati	28	0	8	119
NIT Warangal	15	0	4	50
Thapar University	54	29	13	57
Punjab Engineering College	8	13	3	26
Total	244	42	71	629

D. Group 4 institutes: Only PhD faculty data available on website

Name of Institute	PhD Faculty	Non PhD Faculty	PhD Graduates (16-17) (Estimated)	Total Enrolled
ISM Dhanbad	14	1	4	40
JNU	20	0	5	50
Pune University	3	4	1	5
GITAM	17	9	5	50
BIT Mesra	27	27	7	70
COEP	13	27	4	40
NIT Agartala	7	19	2	20
NIT Durgapur	28	4	7	70
PSG College of Technology	14	17	4	40
Thiagarajar College of Engineering	13	15	4	40
MANIT	18	1	5	50
Jivaji University	2	0	1	5
Jadavpur University	29	23	8	80
SJB Institute of Technology	22	17	6	60
SNS College of Technology	23	23	6	60
Sri Jayachamarajendra College of Engineering	19	17	5	50
Sona College of Technology	17	7	5	50
Veer Surendra Sai University of Technology, Burla	6	5	2	20
Total	292	216	81	800

E. Research-focused institutes: 80% or more PhD faculty

Institute	PhD Faculty	Non PhD Faculty	Ph D Graduates Total	PhD Students Enrolled
Calcutta University	12	0	8	107
Chennai Mathematical Institute	12	0	1	19
Delhi University (Main Campus)	5	1	2	27
IIIT Allahabad	26	0	7	67
IIIT Bangalore	17	0	4	66
IIIT Delhi	26	0	2	74
IIIT Hyderabad	50	3	10	128
IIT Gandhinagar	8	0	3	11
IIT Guwahati	28	0	8	119

IIT Hyderabad	19	0	6	57
IIT Jodhpur	6	0	3	12
IIT Madras	33	0	10	108
IIT Mandi	35	0	10	71
IIT Roorkee	12	0	4	51
Indian Institute of Technology Patna	13	0	5	59
Indian Institute of Technology Ropar	14	0	1	26
Indian Institute of Science Bangalore	32	0	9	103
Indian Institute of Technology Bombay	43	0	12	140
Indian Institute of Technology Kanpur	33	0	6	51
Institute of Mathematical Sciences Chennai	8	0	7	17
ISI Kolkata	75		10	115
ISM Dhanbad	14	1	4	40
Jivaji University	2	0	1	5
JNU	20	0	5	50
MANIT	18	1	5	50
National Institute of Technology Trichy	13	2	4	8
National Institution of Technical Teachers' Training and Research	15	0	3	49
NIT Durgapur	28	4	7	70
NIT Warangal	15	0	4	50
Tata Institute of Fundamental Research	15	0	2	20
University of Hyderabad	23	3	10	62
Visvesvaraya National Institute of Technology Nagpur	13	1	3	33
Total	683	16	176	1865

F. Institutions with less than 80% PhD Faculty

Institute	PhD Faculty	Non PhD Faculty	Ph D Graduates Total	PhD Students Enrolled
Ahmedabad University, Institute of Engineering and Technology (IET)	9	3	0	5
Amrita University	49	79	15	146
BIT Mesra	27	27	7	70
COEP	13	27	4	40
Don Bosco College of Engineering and Technology	6	17	3	23
GITAM	17	9	5	50
Jadavpur University	29	23	8	80
JIIT Noida	94	34	3	72
NIT Agartala	7	19	2	20
PSG College of Technology	14	17	4	40
Pune University	3	4	1	5
Punjab Engineering College	8	13	3	26
SJB Institute of Technology	22	17	6	60
SNS College of Technology	23	23	6	60
Sona College of Technology	17	7	5	50
Sri Jayachamarajendra College of Engineering	19	17	5	50
Thapar University	54	29	13	57
Thiagarajar College of Engineering	13	15	4	40
Veer Surendra Sai University of Technology, Burla	6	5	2	20
Walchand College of Engg. - Sangli	3	11	0	0
Total	433	396	96	914

H. All institutes included in the study

Name of Institute
AIT Technical Campus
Akshaya College of Engineering and Technology
Aligarh Muslim University
Amity School of Engineering and Technology
Amrita University
Andhra University College of Engineering
Anna University
Asian School of Technology
Aurangabad College of Engineering
Avinashilingam Deemed University for Women
BHU IT
Bengal Science and Engineering University
BITS Pilani
BITS Mesra
Bapuji Institute of Engineering and Technology
Bengal Engineering and Science University, Shibpur
Chennai Mathematical Institute
College of Engineering
College of Technology and Engineering, Udaipur
D.E.I. Technical College
Delhi Technological University
Delhi University (Main Campus)
Department of Computer Science and Applications, Kurukshetra University
Department of Studies in Computer Science, Manasa Gangothri, University Of Mysore
Desh Bhagat Foundation Group of Institutions, Ferozpur Road Moga
Dhirubhai Ambani Institute of Information and Communication Technology
Don Bosco College of Engineering and Technology
Dr. Babasaheb Ambedkar Technological University Institute of Petrochemical Engineering
Dr. B.R Ambedkar National Institute of Technology, Jalandar
Dr C.V Raman Institute of Science and Technology
East West Institute of Technology
GITM Institute of Technology
Goduti Engineering College For Women
Government College of Technology, Coimabtoe
Guru Gobind Singh Indraprastha University
Guru Nanak Dev Engineering College
Guru Teg Bahadur Khalsa Institute of Engineering and Technology
IIIT Allahabad
IIIT Bangalore
IIIT Delhi
IIIT Hyderabad

IITB-Monash Research Academy
ISI Kolkata
Indian Institute of Science Bangalore
Indian Institute of Technology Bhubaneswar
Indian Institute of Technology Bombay
Indian Institute of Technology Delhi
Indian Institute of Technology Gandhinagar
Indian Institute of Technology Guwahati
Indian Institute of Technology Hyderabad
Indian Institute of Technology Indore
Indian Institute of Technology Kanpur
Indian Institute of Technology Kharagpur/ Scholl of IT
Indian Institute of Technology Kharagpur/CSE
Indian Institute of Technology Madras
Indian Institute of Technology Mandi
Indian Institute of Technology Patna
Indian Institute of Technology Rajasthan
Indian Institute of Technology Roorkee
Indian Institute of Technology Ropar
Indian School of Mines, Dhanbad
Institute Of Engineering Jiwaji University, Gwalior
Institute Of Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur
Institute of Mathematical Sciences Chennai
Invertis Institute of Engineering & Technology
ITM University, Gwalior
JNU
Jadhavpur University Kolkata
Jaipur National University
Jamia Hamdard
Jamia Millia Islamia
JIIT Noida
JNTUH College of Engineering Hyderabad
K S R Institute For Engineering And Technology
K S Rangasamy Institute of Technology
K. L. E. Society's College of Engineering And Technology, Belgaum
K.V.G. College of Engineering
LMNIIT
MNNIT Allahabad
Madan Mohan Malvia Engineering College
Madhav Institute of Technology & Science
Maharashtra Institute of Technology, Pune
Manonmaniam Sundaranar Uviversity
Mumbai University
National Institute of Technology Agartala
National Institute of Technology Bhopal

National Institute of Technology Calicut
National Institute of Technology Durgapur
National Institute of Technology Goa
National Institute of Technology Jamshedpur
National Institute of Technology Kurukshetra
National Institute of Technology Meghalaya
National Institute of Technology Raipur
National Institute of Technology Rourkela
National Institute of Technology Silchar
National Institute of Technology Surathkal
National Institute of Technology Trichy
National Institute of Technology Warangal
National Institution of Technical Teachers' Training and Research
Netaji Subhas Institute of Technology
Padmashree Dr. D. Y. Patil Institute of Engineering and Technology
PSG College of Technology
Rajeev Gandhi Proudhyogiki Mahavidyalaya
Ramrao Adik Institute of Technology
Sant Longowal Institute of Engineering and Technology
Sardar Patel College of Technology
School of Computer Science and IT
School of Computer Sciences, Mahatma Gandhi University
Shobhit Institute of Engineering and Technology
Shri G.S Institute of Tech. and Science
Shri Guru Gobind Singhji Institute of Engineering and Technology
Shridevi Institute of Engineering And Technology
Sir M.visvesvaraya Institute of Technology
SJB Institute of Technology
SNDT Womens University
SNS College of Technology
Sona College of Technology
Sri Jayachamarajendra College of Engineering
Ssbt's College of Engineering and Technology
Swami Vivekanand Institute of Technology, Sagar
Symbiosis Institute of Technology
Symbiosis Institute of Technology & Science
Thapar University
Thiagrajan College of Engineering
TIFR
University Institute of Engineering and Technology
University of Hyderabad
University of Pune
Veer Surendra Sai University of Technology, Burla
Vishwakarma Institute of Information Technology
Vishwakarma Institute of Technology

Visvesvaraya National Institute of Technology Nagpur
BMS, Bangalore
College of Engineering, Calcutta University, Kolkata
CUSAT, Kochi-kerala
Govt. College of Engg. (GCOEP), Pune
Heritage Institute of Technology
Institute of Technology, Nirma University - Ahbad
MIT, Manipal
National Inst of Technology (NIT), Jalandhar
Osmania University
Punjab Engg College, Chandigarh
SASTRA, Thanjavur
Veeramata Jeejabhai Technological Instt (VJTI), Mumbai
Walchand College of Engg. - Sangli