

Information Technology and Computing Programs in the Universities of West Bengal: *An Analytical Case Study*

P.K. Paul

Executive Director, MCIS and Asst. Professor, IST, Department of CIS, Information Scientist (Offg.), Raiganj University (RGU), West Bengal, India

Corresponding author: pkpaul.infotech@gmail.com

ABSTRACT

Information and Computing is the core for development of different kind. Computing and Information Technology tools are responsible for information related activities. There are different subjects fall under the computing and IT and among these few important are include Computer Science, Computer Engineering, Computer Applications, Information Science, Information Technology, Informatics, Information Systems etc. However only few are popular among these branch and among these Computer Science, Computer Applications and Information Technology are important one. India is a large country and there are different stakeholders of various means. As far as West Bengal is concerned it is one of the important and active state having good fame in heritage, population and education. There are different educational institutes around the state and many of them offering different level of programs and different nomenclatures in IT and Computing. Conventionally in the universities of West Bengal, one university department offers a specific subject or field. But this study is undertaken to show the differences or changes of thought in this regard. Moreover, the study highlights the degrees offered by the newer and old university as well.

Keywords: Universities, Higher Education, Computing, Systems, IT, Academic Degrees, Information Sciences, India, West Bengal

Initially only Computer treated as a field of study with the popular nomenclature of Computer Science. The basic aim of the program was to undertake study and research in the areas of theoretical computation, mathematical sciences; moreover it deals with the core of hardware, design and development of the architecture etc.^{[1],[5],[7]}. However, gradually other subjects have been developed which are more applied and industrial in nature and among these important are—

- Computer Application
- Computer Engineering
- Information Technology etc.

The computing and allied branches are available in two tracks namely Science and Engineering^{[2],[3],[4],[10]}. The Science degrees are offered as BSc and MSc whereas Engineering Degrees are comes with BE & BTech / ME & MTech. Two important branches which are available both as Science and Engineering Degrees are include—

- ❑ Computer Science and Engineering
- ❑ Computer Engineering
- ❑ Information Technology.

Whereas, Computer Application branch is available as specific MCA Degree (i.e. Computer Application as a full-fledged degree instead of Science concentration—MSc). Though, MCA in academic community treated as a Science degree. In West Bengal there are 40 around universities and many of them are offered IT and Computing Degrees. The degrees are offered in both the university campus and also in the affiliated colleges^{[8],[9],[15]}.

Objective

This paper is theoretical in nature and mainly a case study on Computing and IT related education in the state of West Bengal in India and having following aim and agenda—

- ❑ To learn about the basics of Computing and IT related nomenclature in basic sense; which are available internationally, in India and specifically in India.
- ❑ To know about the degrees available in IT and Computing with special reference to the West Bengal.
- ❑ To know the Universities of West Bengal and also basics on Higher Education in India in general sense.
- ❑ To learn about the IT related degrees, nomenclature and subjects offered in different universities of West Bengal.
- ❑ To know about the departments which are offered multiple subjects in the State of West Bengal in the field of IT and Computing.

IT and Allied Education

In Computing and IT field, there are diverse subjects and all are concentrated with the tools, technologies related to the computers. And as a result there are different subjects developed and started and among these few important are include as follows—

Computer Science—This is the theoretical concentrated field and mainly mathematical in nature; it is also normally engages in internal affairs of computing. The core aim of the field is design and development of the Computational Systems. Among the core areas of Computer Science important are—Computer Architecture, Operating Systems, Theory of Computation, Compiler Design, AI, Machine Learning, Computational linguistics, Automata Theory etc.^{[11],[12],[18]}.

Computer Application—It is a field and area responsible for the applications and systems design and development using software. This is also a field that concentrates on software technology as well. Hence different kind of high level languages are part of the field^{[14],[15]}.

Information Technology—This is the field which is applied in nature and there are difference areas which deals with information related activities ranging from collection to dissemination of information in different format^{[16],[17],[21]}. The field is mainly concentrated with different IT Components viz.—

- Software Technology
- Web Technology
- Multimedia Technology
- Network Technology
- Database Technology etc.

The field is broad enough and applicable in different areas as well.

Information Science— Information Science is an applied science which is depends on IT components due to its several applications. Information Science is an interdisciplinary science; there are different areas where Information Technology may be applied viz. Healthcare, Society, Business, Tourism and Transportation, Media, Government and Administration etc. As a result various areas have become popular in Information Science viz.—

- E Commerce
- E Governance
- E Healthcare
- Digital Society
- Digital Business
- E Business
- Digital Transformation
- E Administration etc.

Moreover there are different branches have created from the Information Science which are concentrated on Healthcare, Business and Commerce, Transportation, Education and Training etc.^{[22],[23]}.

Universities in West Bengal

There are different universities in West Bengal which are categorized into various categories viz. State University, State Private University, Central University, Deemed University apart from the degree awarding bodies viz. Institute of National Importance. However autonomous and centrally funded institutes are another example of higher educational institutes^{[13],[17]}.

The following list (Table 1) represents the names of the universities in West Bengal along with the type and category as well herewith.

Table 1: List of Universities in the state of West Bengal

Sl. No.	Universities	Category
1	Adamas University, Barasat, Kolkata, WB, India	Private University
2	Aliah University, Saltlake, Kolkata, WB, India	State University
3	Amity University, New Town, Kolkata, WB, India	Private University
4	Bankura University, Bankura, Kolkata, WB, India	State University
5	Bidhan Chandra Krishi Vishwavidyalaya, Kalyani, WB, India	State University
6	Brainware University, Barasat, Kolkata, WB, India	Private University
7	Cooch Behar Panchanan Barma University, Cooch Behar, WB, India	State University
8	Diamond Harbour Women's University, Diamond Harbour, WB, India	State University
9	Indian Association for the Cultivation of Science (IACS), Jadavpur, WB, India	Deemed University
10	Jadavpur University, Jadavpur, WB, India	State University
11	JIS University, Kolkata, WB, India	Private University
12	Kazi Nazrul University, Asansol, WB, India	State University
13	Maulana Abul Kalam Azad University of Technology, Saltlake, Kolkata, WB, India	State University
14	Netaji Subhash Open University, Saltlake, Kolkata, WB, India	State University
15	Presidency University, College Street, Kolkata, WB, India	State University
16	Rabindra Bharati University, Kolkata, WB, India	State University
17	Raiganj University, Raiganj, WB, India	State University
18	Ramakrishna Mission Vivekananda Educational and Research Institute, Howrah, WB, India	Deemed University
19	Seacom Skills University, Bolpur, WB, India	Private University
20	Sidho-Kanho-Birsha University, Purulia, WB, India	State University
21	Sister Nivedita University, New Town, Kolkata, WB, India	Private University
22	St. Xavier's University, New Town, Kolkata, WB, India	Private University
23	Techno India University, Saltlake, Kolkata, WB, India	Private University
24	The Neotia University, Sarisa, WB, India	Private University
25	The Sanskrit College and University, Kolkata, WB, India	State University
26	The West Bengal National University of Juridical Science, Saltlake, Kolkata, WB, India	State University
27	The West Bengal University of Health Sciences, Saltlake, Kolkata, WB, India	State University
28	The West Bengal University of Teachers' Training, Education Planning and Administration, Kolkata, WB, India	State University
29	University of Burdwan, Burdwan, WB, India	State University
30	University of Calcutta, Kolkata, WB, India	State University
31	University of Engineering and Management, New Town, Kolkata, WB, India	Private University
32	University of Gour Banga, Malda, WB, India	State University
33	University of Kalyani, Kalyani, WB, India	State University
34	University of North Bengal, Siliguri, WB, India	State University
35	Uttar Banga Krishi Vishwavidyalaya, Cooch Behar, WB, India	State University
36	Vidyasagar University, West Midnapore, WB, India	State University
37	Vishwa Bharati University, Bolpur, WB, India	Central University
38	West Bengal State University, Barasat, Kolkata, WB, India	State University
39	West Bengal University of Animal and Fishery Sciences, Kolkata, WB, India	State University

According to the study it has been noted that there are 39 universities in the state and among these 10 are private universities. As far as new universities are concerned it has been noted that 17 universities have been established after 2011 with the category of 'private' and 'state'. Fig. 1 showing the categories of universities in this regard.

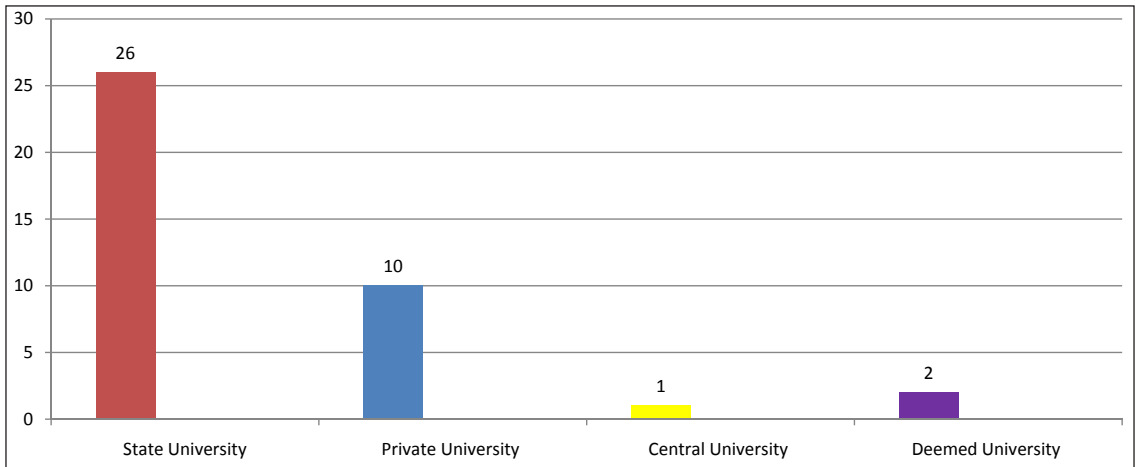


Fig. 1: Categories of Universities in the State of West Bengal

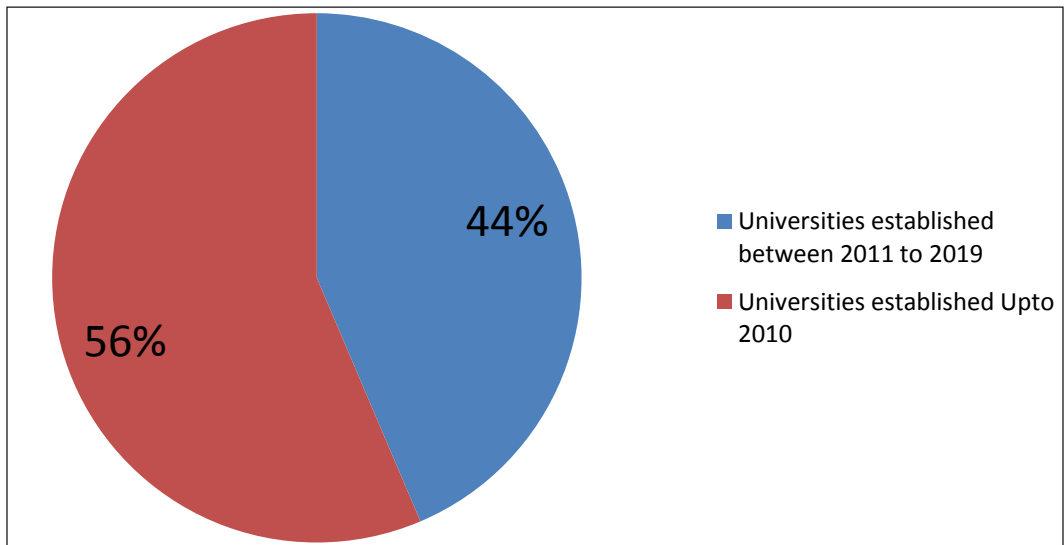


Fig. 2: Sharing of Universities: Recent and Old

Whereas the study also reveals (Refer Fig. 2) that 44 percent of the universities have been came up after 2010 (i.e. since 2011) to till date. However apart from these, there are number of Institute of National Importance in the state namely Indian Institute of Technology, *Kharagpur*, National Institute of Technology, *Durgapur*, Indian Statistical Institutes (ISI), *Kolkata*. Few other centrally funded institutes are also located in the state.

IT Education in West Bengal: An Analysis

In the State of West Bengal there are different universities offering computing and IT programs from various departments and among the nomenclature few important are includes the following—

- Computer Science
- Computer Science and Engineering
- Computer Science and Applications
- Computer and Information Science
- Computer Applications
- Information Technology
- Software Engineering

And these universities are offered both Science and Engineering degrees with BTech/ MTech/ MSc degrees from their in-campus; however no university offers BSc degree from the campus (instead of BCA program of Aliah University).

Table 2: List of Universities in the state of West Bengal with IT and Computing oriented departments

University	Department Subject	Programs/ Courses Offered	Number of Nomenclature/ Subject Offered in a Dept.
The University of Calcutta	Dept. of Computer Science and Engineering	<ul style="list-style-type: none"> ❖ B.Tech- Computer Science and Engineering ❖ MTech- Computer Science and Engineering ❖ MSc-Computer and Information Science ❖ PhD-CSE ❖ PhD-CS 	<ol style="list-style-type: none"> 1. Computer Science and Engineering 2. Computer Science 3. Computer and Information Science
The University of Calcutta	AK Chowdhury School of Information Technology	<ul style="list-style-type: none"> ❖ BTech-Information Technology ❖ MTech-Information Technology ❖ MTech-Computer Science and Applications ❖ MCA (Computer Applications) 	<ol style="list-style-type: none"> 1. Information Technology 2. Computer Applications
Jadavpur University	Dept. of Computer Science and Engineering	<ul style="list-style-type: none"> ❖ B.Tech- Computer Science and Engineering ❖ MTech- Computer Science and Engineering ❖ MTech- Computer Technology ❖ MCA (Computer Applications) 	<ol style="list-style-type: none"> 1. Computer Science and Engineering 2. Computer Technology 3. Computer Application
Jadavpur University	Dept. of Information Technology	<ul style="list-style-type: none"> ❖ B.Tech- Information Technology ❖ MTech- Software Engineering 	<ol style="list-style-type: none"> 1. Information Technology 2. Software Engineering

Maulana Abul Kalan Azad University of Technology	Dept. of Computer Science and Engineering	<ul style="list-style-type: none"> ❖ BTech- Computer Science and Engineering ❖ MTech- Computer Science and Engineering ❖ MTech- Information Technology 	1. Computer Science and Engineering
Maulana Abul Kalan Azad University of Technology	Dept. of Information Technology	<ul style="list-style-type: none"> ❖ BTech-Information Technology ❖ MTech-Information Technology ❖ MTech-Information Technology (Information Security) ❖ MTech-Information Technology (Artificial Intelligence) ❖ MTech-Information Technology (Data Science) ❖ MTech-Information Technology (Internet of Things) 	1. Information Technology
The University of Kalyani	Dept. of Computer Science and Engineering	<ul style="list-style-type: none"> ❖ MTech- Computer Science and Engineering ❖ MCA (Computer Applications) 	1. Computer Science and Engineering 2. Computer Applications
Vidyasagar University	Dept. of Computer Science	<ul style="list-style-type: none"> ❖ MSc-Computer Science ❖ MCA (Computer Applications) 	1. Computer Science 2. Computer Applications
The University of North Bengal	Dept. of Computer Science and Applications	<ul style="list-style-type: none"> ❖ MSc-Computer Science ❖ MCA (Computer Applications) 	1. Computer Science 2. Computer Applications
Aliah University	Dept. of Computer Science and Engineering	<ul style="list-style-type: none"> ❖ BCA (Computer Applications) ❖ BTech- Computer Science and Engineering ❖ MCA (Computer Applications) ❖ MTech- Computer Science and Engineering 	1. Computer Science and Engineering 2. Computer Applications
Raiganj University	Dept. of Computer and Information Science	<ul style="list-style-type: none"> ❖ BCA (Computer Applications) ❖ BSc-Computer Science ❖ MSc-Computer Science ❖ MSc Computer and Information Science ❖ MPhil- Computer and Information Science ❖ PhD- Computer and Information Science 	1. Computer Science 2. Computer Applications 3. Computer and Information Science
The University of Burdwan	Dept. of Computer Science	<ul style="list-style-type: none"> ❖ MSc-Computer Science and Applications 	1. Computer Science and Applications
West Bengal State University	Dept. of Computer Science	<ul style="list-style-type: none"> ❖ MSc-Computer Science 	1. Computer Science
Diamond Harbour Women's University	No Department yet Named/ Open	<ul style="list-style-type: none"> ❖ MSc-Computer Science and Applications 	1. Computer Science and Applications

It is worthy to note that among these Departments, The Department of Computer Science and Engineering, The University of Calcutta, WB, India offers three subjects as programs namely—

- Computer Science and Engineering
- Computer Science
- Computer and Information Science

Whereas Department of Computer Science and Engineering, Jadavpur University also offers the three subjects as program leading to degrees in—

- Computer Science and Engineering
- Computer Technology
- Computer Application

Apart from Jadavpur and Calcutta University another university i.e. Raiganj University, West Bengal, India also offers another three programs namely—

- Computer Science
- Computer Applications
- Computer and Information Science

Among these branches, Computer and Information Science noted as broad area incorporating IT and Computing related fields. It is worthy to note that, in this study affiliated colleges and programs under these universities are not included. The number of universities with different categories are depicted in Fig. 3.

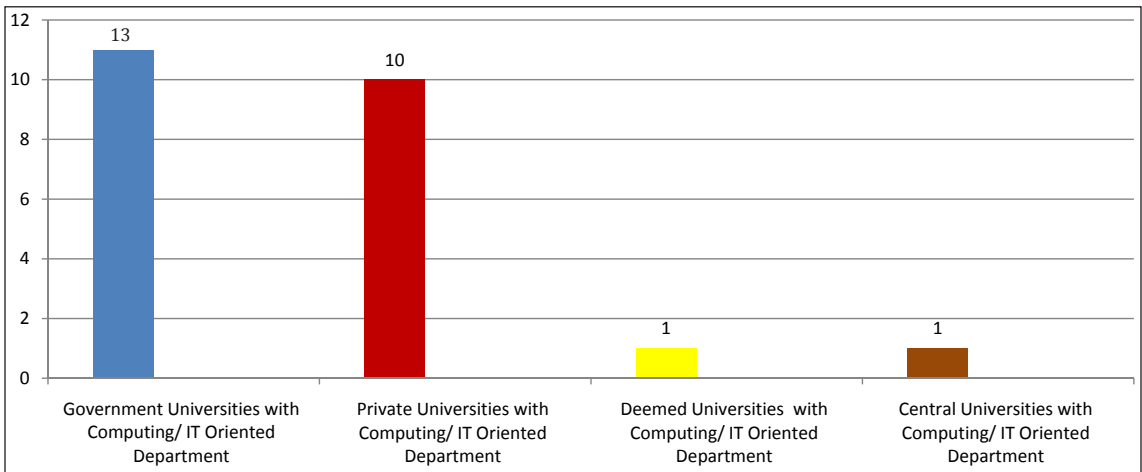


Fig. 3: IT and Computing related departments in Universities

CONCLUSION

The field of Computing and Information Sciences is changing rapidly different universities are offering various programs on different levels and subjects^{[19],[20]}. And even many emerging and super specialty

areas have been added into this like international and national universities. With this study, it has been noted that within ‘Computer’ and ‘Information’ track, the ‘Computer’ track is most popular and within Information track most common are Information Technology. Among the broad areas, Computer and Information Science is noted at Raiganj University. Whereas the emerging areas are available at MAKAUT viz. Data Science, Information Security, Cyber Security etc. It is important that in future The Departments having more programs or subjects may be converted into the College/ Schools for better functioning, autonomy and infrastructure make available.

REFERENCES

1. Agarwal, P. 2007. Higher education in India: Growth, concerns and change agenda. *Higher Education Quarterly*, **61**(2): 197-207.
2. Altbach, P.G. 1993. The dilemma of change in Indian higher education. *Higher Education*, **26**(1): 3-20.
3. Basak, S.C. and Sathyanarayana, D. 2010. Pharmacy education in India. *American Journal of Pharmaceutical Education*, **74**(4): 68.
4. Dayal, I. 2002. Developing management education in India. *Journal of management Research*, **2**(2): 98.
5. Desai, S. and Kulkarni, V. 2008. Changing educational inequalities in India in the context of affirmative action. *Demography*, **45**(2): 245-270.
6. Gereffi, G., Wadhwa, V., Rissing, B. and Ong, R. 2008. Getting the numbers right: International engineering education in the United States, China, and India. *Journal of Engineering Education*, **97**(1): 13-25.
7. Gupta, D. and Gupta, N. 2012. Higher education in India: structure, statistics and challenges. *Journal of Education and Practice*, **3**(2).
8. Kapur, D. and Mehta, P.B. 2004. Indian higher education reform: From half-baked socialism to half-baked capitalism. *Center for International Development Working Paper*, **103**.
9. Nambissan, G.B. and Rao, S. (Eds.). 2013. *Sociology of education in India: Changing contours and emerging concerns*. New Delhi: Oxford University Press.
10. Paul, P.K., Kumar, A., Poovammal, E. and Dangwal, K.L. 2014. Information Science: A Potential interdisciplinary field with Historical Perspectives and Future Potentials. *Educational Quest*, **5**(3): 211.
11. Paul, P.K. and Ghose, M.K. 2018. Why Green Computing and Green Information Sciences Have Potentialities in Academics and iSchools: Practice and Educational Perspectives. In *Advances in Smart Grid and Renewable Energy*, **435**: pp. 103-112, Springer, Singapore.
12. Paul, P.K. and Ghose, M.K. 2018. A Novel Educational Proposal and Strategies Toward Promoting Cloud Computing, Big Data, and Human–Computer Interaction in Engineering Colleges and Universities. In *Advances in Smart Grid and Renewable Energy*, **435**: 93-102, Springer, Singapore.
13. Sharma, Jagdish. 2006. “Diaspora: History of and Global Distribution”, *Encyclopedia of India (vol. 1)* edited by Stanley Wolpert, pp. 331–336, Thomson Gale, ISBN 0-684-31350-2.

14. Sharma, Shalendra D. 2006. "Globalization", *Encyclopedia of India (vol. 2)* edited by Stanley Wolpert, pp. 146–149, Thomson Gale, ISBN 0-684-31351-0.
15. Singal, N. 2006. Inclusive education in India: International concept, national interpretation. *International Journal of Disability, Development and Education*, **53**(3): 351-369.
16. Sood, R. and Adkoli, B.V. 2000. Medical education in India—problems and prospects. *J. Indian Acad. Clin. Med.*, **1**(3): 210-212.
17. Sohani, N. and Sohani, N. 2012. Developing interpretive structural model for quality framework in higher education: Indian context. *Journal of Engineering, Science & Management Education*, **5**(2): 495-501.
18. Supe, A. and Burdick, W.P. 2006. Challenges and issues in medical education in India. *Academic Medicine*, **81**(12): 1076-1080.
19. Tate, D.S. and Schwartz, C.L. 1993. Increasing the retention of American Indian students in professional programs in higher education. *Journal of American Indian Education*, 21-31.
20. Tayade, M.C. and Kulkarni, N.B. 2011. The Interface of technology and medical education in india: current trends and scope. *Indian Journal of Basic & Applied Medical Research*, **1**(1): 8-12.
21. Tijerina, K.H. and Biemer, P.P. 1988. The Dance of Indian Higher Education: One Step forward, Two Steps back. *Educational Record*, **68**(4): 86-91.
22. Tilak, J.B. and Varghese, N.V. 1991. Financing higher education in India. *Higher Education*, **21**(1): 83-101.
23. Tilak, J.B. 2008. Transition from higher education as a public good to higher education as a private good: The saga of Indian experience. *Journal of Asian Public Policy*, **1**(2): 220-234.
24. Umashankar, V. and Dutta, K. 2007. Balanced scorecards in managing higher education institutions: an Indian perspective. *International Journal of Educational Management*, **21**(1): 54-67.