



MCA DEGREE BEYOND TRADITIONAL MATHEMATICAL & LOGICAL PREREQUISITE & CONCENTRATION: IS IT INTO A NEW DIRECTION?

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Cite This Article: P. K. Paul, A. Bhumali, P. S. Aithal & K. S. Shivraj, "MCA Degree Beyond Traditional Mathematical & Logical Prerequisite & Concentration: Is it into a New Direction?", International Journal of Applied and Advanced Scientific Research, Volume 3, Issue 1, Page Number 118-124, 2018.

Abstract:

In Indian academic segment, Computer Application is one of the important and popular programs of study. The term Computer Application in India treated as a domain rather conveying meaning-application of computing. Computer Application programs available with Bachelors and Masters degree program leading to BCA and MCA degree. The program applied in nature and mainly dedicated to prepare skilled manpower in the segment of the software industry. Further, Computer Application program is responsible for the creation of manpower for the industries, organizations, and institutions. The initial period of Computer Application program was restricted only to MCA program and gradually the undergraduate program has been offered by many Indian universities. The main aim of introducing MCA program over the existing Masters in Computer Sciences was to make students skilled in computing and information technology industry with diverse undergraduate/ bachelor degrees background. Although as an Applied Science program MCA opened up the door for the bachelors degree holders with the condition of having completed at least one paper/ course in Mathematics etc. However, in recent past, many universities have been taken initiative for offering MCA program without entrance eligibility on Mathematics. Such universities offer the MCA program to the holders of Computing/ Computer Sciences or allied subject as a paper and gradually many have started to offer the same with that prerequisite. This paper is first time exploring such academic affairs in the form of scientific research. The paper is of theoretical nature with mentioned current and future potentials as well beyond mathematical prerequisite and curricula and job potentialities with cases of Indian Private Universities.

Key Words: Information, MCA, Computing, Higher Education, Job Potentialities, Indian Universities, Computer Application & Private Universities

Introduction:

Computer Application and its definition is difficult to find out. As the nomenclature Computer Application has not yet popular internationally. Many universities have started the program in the eighties with the degree first MCA and gradually many universities have started the program for 10+2 with Bachelors Degree called BCA (i.e. Bachelor of Computer Application). The program MCA has been started with the eligibility of Bachelors Degree with Mathematics as a Paper/ course either at Bachelors degree or 10+2. Though, gradually universities have opened the door to other relevant papers viz. Statistics, Business Mathematics, Business Statistics etc. The program MCA has been started in long back 1980's and that time universities have admitted candidates with Mathematics as a paper as the Computing requires logical skills in different scales and areas [1], [6], [10]. Another reason for the non-availability of skilled graduates with Computer related papers, but in recent past, many universities have started to offer the MCA for Bachelors degree without Mathematics and they have started computing paper as an eligible applicant. In many private universities, even the norms are much flexible and open for the Bachelors degree only [2], [3], [7]. Further, it is important to note that most such universities not under the AICTE (All India Council for Technical Education), New Delhi as prior approval and requirement for the MCA program not mandatory. During the last decade the private universities have emerged and increased rapidly and thus there are various diversities to be noted in respect of MCA program in different context.

Objective:

- The core aim and objective of this conceptual paper is to include (but not limited to) the following
- ✓ To know about the basics of Computer Application as a program of study and job opportunities in the field.
 - ✓ To learn about the basics and nature of Computer Application as a field and domain in applied science area.
 - ✓ To dig out the program of study in the field of Computer Application in India with current trends.
 - ✓ To learn about the changing style and face of Computer Application programs especially MCA programs in respect of private universities.
 - ✓ To know about the private universities in India and also flexible and non-mathematical concentrated MCA program of study.

- ✓ To identify the future potentialities of MCA program in respect of job requirement as much as possible.

Methodology Undertaken:

It is a conceptual paper and also interdisciplinary in nature. The main and core aim and agenda of the paper is to find out the nature and characteristics of Computer Application as a program of study. Further to learn about this, review method has been adopted and undertaken.

Apart from the literature review, a majority of the concentration of the review is based on web review. As the work is dedicated to dig out the latest about Computer Application programs in India with reference to MCA; so that web review in the private universities has been undertaken. The study conducted during September-October, 2017.

Computer Application: Meaning to Application

Computer Application and its availability of right definition is very tough as there is no existing definition in this regard. Even academicians have not yet conducted research on this domain. In general, Computer Application may be defined as follows:

Definition 1: "Computer Application is an applied science concentrated on application of computing, software, and hardware for the information processing and management".

Definition 2: "Computer Application is an applied science domain restricted to the software technologies and mainly programming, systems, computer architecture".

Definition 3: "Computer Application is the field of study and practice with a due concentration of computation. It is a domain for high level programming language and restricted to design, develop, evaluate software systems with using core software engineering principles".

Hence whereas Computer Science is a domain of theoretical in nature with concentration on Computing as an inner 'Computer Application' is about application and practical but only Software Technologies (mainly the high level programming language viz. C, C++, VC, Visual Basic, VB.Net, Dot Net Technologies, Java, Python, R Programming, Perl etc). Computer Science is focused with mathematical in nature with due concentration on following

- ✓ Operating Systems
- ✓ Artificial Intelligence
- ✓ Computer Architecture
- ✓ Image Processing
- ✓ System analysis
- ✓ Probability and Mathematics
- ✓ Algorithm

Hence Computer Application is highly software centric and mainly deals with the attributes which help to become the job holders of following

- ✓ Computer Operator
- ✓ Computer Assistant
- ✓ Programmer
- ✓ Developer
- ✓ Software Developer
- ✓ Software Engineer
- ✓ Software Architect
- ✓ Software Analyst
- ✓ Computer Analyst
- ✓ Java Developer
- ✓ Software Testing Professionals
- ✓ Computer Networks
- ✓ Computer Database Administrator
- ✓ Application Developer

Though in contrast to Information Technology (which is broader in Computing and IT with a concentration of Network Technologies, Database Technologies, Web Technologies, and Multimedia Technologies apart from traditional Software Technologies) Computer Application is only restricted in Software Technologies [4], [5], [6], [12]. And the field is in a crisis of identification of areas and focus. But as far as the curriculum concentration of most of the universities it is about software and programming and development.

Development of Computer Application as a Branch of Study:

The gradual development of Information Technology requirement in organizations, business and industries, government and administration, health and medicine leads the increased number of Computer Application intake and offered institutions pan India basis. Initially, the program was not under the purview of AICTE (All India Council for Technical Education), New Delhi, India and later the increased number of institutions and intake led its expansion in other affiliated technical colleges with permission of the statutory

council. Initially, the program started with the Master of Computer Application (MCA). The core and focus of the program is software centric for the job and career in the software industry as well [8], [11], [13].

Later the development of Computer Application and its need in the different sector including the creation of skilled manpower results in its start with Bachelor program (nomenclature as Bachelor of Computer Application). During the last thirty years, Computer Application has become an important popular branch in India both at UG and PG level with applied nature though such Computer Application course in an international context is yet to be recognized. Even many international standard Indian universities namely INI (Institution of National Importance) viz. Indian Institute of Technology (IITs), Indian Institute of Science (IISc), Indian Institute of Science, Education and Research (IISERs) not yet offer the Master of Computer Application (MCA) program. Further, it is important to note that few have started the program but later on discontinued (such as IEST Shibpur).

BCA Vs MCA:

BCA program and MCA program both are more or less same only difference is its level; Bachelors and Masters. A major difference between BCA and MCA is that the Master of Computer Application (MCA) is under AICTE (All India Council for Technical Education), New Delhi, India while BCA doesn't under the purview of AICTE.

Both the degrees ask candidates from diverse background. Further the Bachelor program needs 10+2 in any stream with mathematics while Masters Program needs 10+2+3 in any stream (or more i.e. fifteen years of education) with mathematics. While few universities have been adopted allied field of study of mathematics (viz. Business Mathematics, Statistics etc) as an eligibility criterion [9], [12], [14].

It is important to note that in BCA program apart from Mathematics (or allied fields) in recent past few autonomous universities and affiliating universities were move to intake Computer Application (or allied fields) as the eligibility of the program. The number of institutions under AICTE is increasing day by day during the first twenty five years of the introduction of MCA program but in recent past, the numbers of intake and offered institutions significantly decreased due to several issues which are mentioned in suggestion section of this paper. For example, from 2016 to 2017 in past one year nationwide about 10000 (ten thousand) seats have been reduced. Table: 1 shows the number of intake in past 10 years.

Table 1: Variation of Intake in AICTE approved Institutions

Year	MCA
2007-08	70513
2008-09	73995
2009-10	78293
2010-11	87216
2011-12	92216
2012-13	100700
2013-14	119713
2014-15	109925
2015-16	103048
2016-17	94159
2017-18	85104

Whereas the number of institutions also been increased for example in 2010 total number of MCA offering institutions was 1198 while in the year 2017 the number of institutes stands on 1241. Table: 2 depicted a detailed account on this including other technical institutions in numbers (under AICTE, New Delhi, and Govt. of India)

Table 2: AICTE approved Institutions [6]

AICTE Approved Institutions and numbers							
Year	Engineering	Management	MCA	Pharmacy	Architecture	HMCT	Total
2010-11	3222	2262	1198	1114	108	100	8004
2011-12	3393	2385	1228	1137	116	102	8361
2012-13	3495	2450	1241	1145	126	105	8562
2013-14	3384	2450	1241	1031	105	81	8562
2014-15	3392	2450	1241	1025	114	77	8562
2015-16	3364	2450	1241	1027	117	77	8562
2016-17	3288	2450	1241	1034	115	74	8202

According to the expert academican and educationalist, the reason behind this is due to the production of a large number of unskilled graduates, less hands-on training, non-adequately qualified trainers, the gap between industry and academia etc.

MCA: Beyond Traditional

The Master of Computer Application (MCA) program in general context differs from traditional Computer Science (MSc) program. First, Computer Science program is theoretical in nature and also deals with following

- ✓ Less skilled contents
- ✓ Highly logical and core of computing
- ✓ Eligibility for the program is concentrated on Computer Science or Allied domains.
- ✓ Apart from Computer Science etc the eligibility also Mathematics full degree/ major/ concentration/ general paper.

Whereas Computer Application (MCA) is open for all bachelors degree holders with Mathematics at least one course/ paper. Even candidates without mathematics at 10+3+2 (or beyond) are also eligible if studied mathematics at 10+2 in any discipline. In traditional MCA program (which is offered in about 85000 seats under the AICTE) apart from the admission eligibility of Mathematics studied as one paper in Undergraduate or lower level, the coursework of the program is also deals with Mathematics related papers and importantly few are Management centric (which is not common in Computer Science). The details of Mathematics and Management centric papers have been listed in Table: 3 (derived from AICTE Model curriculum for the MCA program).

Table 3: Coursework in respect of Mathematics & Management in MCA [8]

Mathematics Papers [6 Papers]	Core Management Papers [5 Papers]	Elective Management Papers [Any 4 Paper]
1. Mathematical Foundations 2. Probability and Combinatorics 3. Statistical Computing 4. Optimization Technique 5. Statistical Lab 6. Probability Lab	1. Introduction of Management Functions 2. Oral and Written Communication 3. Accounting and Management Control 4. Management Support Systems 5. Organizational Behavior	1. Managerial Economics 2. Corporate Planning 3. Foundations of Decision Processes 4. Investment Technology 5. Business Finance 6. Taxation Practices 7. MIS Framework and Implementation 8. Management of Software Projects

Apart from this in traditional MCA program, few other papers such as Artificial Intelligence, Network Programming, Business Programming etc are also highly mathematical in nature. Evidently, these are suitable for the software development professions and for the scientific/ academic research etc. However, few new-age MCA programs are looking to be different in the context of eligibility criteria and coursework.

India is a leading education hub in the world with numerous educational institutions (40000+ Higher Educational Institute) comprising Universities, Colleges (general, professional and polytechnic), Research Centers, Autonomous Institutes etc. As far as Universities are concerned India holds three types of major universities are listed below (as on October, 2017)

- ✓ Central Universities (47 in numbers)
- ✓ State Funded Universities (370 in numbers)
- ✓ Private Universities (279 in numbers)
- ✓ Deemed to be Universities (123 in numbers)

It is important to note that in recent past private universities have increased rapidly and except few states viz. Tamilnadu, Goa, Kerala, Jammu & Kashmir. A majority of these universities offer MCA programs, and a detailed state wise list of universities of self finance nature is shown in Table: 4.

Table 4: Private Universities in India [6]

Serial No	States	No. of Universities
1	Arunachal Pradesh	7
2	Assam	5
3	Bihar	2
4	Chhattisgarh	9
5	Gujarat	30
6	Haryana	20
7	Himachal Pradesh	17
8	Jharkhand	7
9	Karnataka	14
10	Meghalaya	8
11	Mizoram	1
12	Madhya Pradesh	24
13	Maharashtra	9
14	Manipur	1

15	Nagaland	3
16	Odisha	4
17	Punjab	15
18	Rajasthan	46
19	Sikkim	5
20	Tripura	1
21	Uttar Pradesh	29
22	Uttrakhand	13
23	West Bengal	9
Grand Total		279

Among these private universities, a majority are offering MCA program with traditional eligibility criteria. However, these universities are not directly under the purview of AICTE so that many universities offer programs as per their interest with due credit to AICTE norms. Furthermore as per the latest survey following states are highest numbers of MCA program offering territories with Bachelors in any disciplines—

- ✓ Arunachal Pradesh
- ✓ Chhattisgarh
- ✓ Gujarat

These states each holds total 4 universities offering the flexible MCA program. Importantly few other states also have minimum three universities offering flexible MCA program and these include Punjab and West Bengal. States which have minimum two universities which offer MCA program include Meghalaya and Rajasthan.

Table 5: Private Universities in India offers MCA: Beyond Mathematical requirement

S.No	Universities with MCA Program at a Glance: Beyond Mathematics	
	Universities	Programs & Eligibility
Arunachal Pradesh		
1	Arunachal University of Studies	MCA (Any Bachelors Degree)
2	Arunodaya University	MCA (Any Bachelors Degree)
3	Himalayan University	MCA (Any Bachelors Degree)
4	North East Frontier Technical University	MCA (Any Bachelors Degree)
Assam		
5	Assam Don Bosco University	MCA (Any Bachelors Degree)
Chhattisgarh		
6	ICFAI University	MCA (Any Bachelors Degree)
7	ISBM University	MCA (Any Bachelors Degree)
8	Kalinga University	MCA (Any Bachelors Degree)
9	MATS University	MCA (Any Bachelors Degree)
Gujarat		
10	Ahmadabad University	MCA (Any Bachelors Degree)
11	Charotar University of Science & Technology	MCA (Any Bachelors Degree)
12	Indus University	MCA (Any Bachelors Degree)
13	R.K. University	MCA (Any Bachelors Degree)
Haryana		
14	Baba Mast Nath University	MCA (Any Bachelors Degree)
Jharkhand		
15	Sai Nath University	MCA (Any Bachelors Degree)
Meghalaya		
16	Mahatma Gandhi University	MCA (Any Bachelors Degree)
17	Martin Luther Christian University	MCA (Any Bachelors Degree)
Madhya Pradesh		
18	A.K.S. University	MCA (Any Bachelors Degree)
Maharashtra		
19	Vishwarkarma University	MCA (Any Bachelors Degree)
Manipur		
20	Sangai International University	MCA (Any Bachelors Degree)
Nagaland		
21	St. Joseph University	MCA (Any Bachelors Degree)
Punjab		
22	Lovely Professional University	MCA (Any Bachelors Degree)

23	Rayat Bahra University	MCA (Any Bachelors Degree)
24	Sri Guru Ram Das University of Health Sciences	MCA (Any Bachelors Degree)
Rajasthan		
25	Shridhar University	MCA (Any Bachelors Degree)
26	Sunrise University	MCA (Any Bachelors Degree)
Sikkim		
27	Vinayaka Missions Sikkim University	MCA (Any Bachelors Degree)
Uttar Pradesh		
28	J.S. University	MCA (Any Bachelors Degree)
Uttarkhand		
29	Himalayan Garhwal University	MCA (Any Bachelors Degree)
West Bengal		
30	Adamas University	MCA (Any Bachelors Degree)
31	Brainware University	MCA (Any Bachelors Degree)
32	Seacom Skills University	MCA (Any Bachelors Degree)

The following table illustrated sample syllabus of MCA which shows in this eligibility based program the focus is on applied and practical oriented and less theory-mathematical in nature. Here table: 6 depicted in detail.

Table 6: A Sample MCA syllabus with less Mathematical Concentration and Higher applied gradients

MCA Curriculum Assam Don Bosco University, Assam	
Semester I Digital Logic Design Programming and Problem solving using C Organizational Behavior Accounting and Financial Management Programming and Problem solving with C Logic Design Lab	Semester II Theory of Computation Data Structure using C++ Object Oriented Programming and Design Computer Graphics Computer Organization and Architecture Computer Graphics Probability Theory Data Structure using C++ OOP & Design Lab Computer Graphics Lab Computer Organization and Architecture Lab
Semester III DBMS Data Communication and Networks I Operating Systems Design and Analysis of Algorithm Programming through Java Lab OS Lab Design and Analysis of Algorithm Lab Programming through Java Lab DMBS Lab	Semester IV Software Engineering Data Communication and Networks II & Network Programming DBMS II Internet Technology and Application System Programming ERP Data Communication and Networks II & Network Programming Lab DBMS II Lab Internet Technology and Application Lab System Programming Lab
Semester V Artificial Intelligence Emerging Trends in IT Research Methodology Elective I Elective II Research Methodology Lab Major Project Communication Skills	Semester VI Major Project-Phase II

Suggestion and Future Direction:

Computing and Information Technology changing gradually the current tools, technologies and systems led the development of new educational model and curricula. Universities are moving towards better industry-academia interface and more are always preferable. Collaboration with industries for specific major or specialization based programs may be started viz.

- ✓ MCA (Cloud Computing)
- ✓ MCA (Big Data)
- ✓ MCA (Human Computer Interaction)
- ✓ MCA (Usability Engineering)
- ✓ MCA (Green Computing)
- ✓ MCA (Computer Networks)
- ✓ MCA (Information Systems Management)

Further universities may teach/ offer the required mathematics paper during the course of study as an additional credit or as no credit course/ papers. Skill based curricula may be offered in association with other training partners such as Microsoft, IBM, Cisco, Novel etc.

Conclusion:

Universities are increasing rapidly in their number. Mainly the private universities in recent past developed significantly and many other skill based initiatives as well. The eligibility criteria around the world are also changing. Flexibility, student oriented programs and courses are in demand in most of the advanced universities worldwide. India is not the exception, many universities are moving towards the advanced concept of corporate universities and here MCA program may be offered with such style. Importantly with flexible eligibility criteria, more students may be placed in Information Technology industry with the opportunity of education and lastly placement. However, universities may think a suitable model of education for other background students and also non mathematics students in teaching learning process in the initial phase. The specialization may also be offered to them based on their background, for example, commerce or economics students may switch to E-Commerce, E-Business, Digital Marketing. While Political Science, Sociology, Public Administration degree holders may go for E-Governance, Social Computing etc, Language degree holder may go for Language Technologies

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