

Computer Science Education in Nepal

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Abstract

In this article, I have reviewed a number of issues related to computer science education in Nepal. At first, I have introduced the country itself and then presented educational figures by introducing all the five universities in the Kingdom. This is supported by an example of evaluation system in each university because, in my opinion, evaluation systems play important role in educating students. It's a compelling factor against temporary laziness of even highly motivated students. This is followed by school level computer science education which is the basis for higher education in this field. Here, I have tried to present the course summary rather than content of the course because including all the course content would make the article very long. Subsequently, I have presented university- level computer science education where I have tried to distinguish one program from another without naming all the courses of an individual program. I have presented facts rather than conclusions wherever possible, I would like to invite readers to draw their own conclusion. Of course, at the end, there is my conclusion. I strongly encourage the readers to compare their conclusion with my conclusion. If you need complete information then references listed in this article should serve to some extent. As the programs, courses, policies, etc. of the universities are upgraded time to time, I strongly advise you to contact the respective university.

1. Introduction to Nepal

Nepal is a Himalayan Kingdom. Being land-locked, it is about 500 km from the nearest sea. It is located between 26° 22' and 30° 27' north latitude and 80° 4' and 88° 12' east longitude. The total area of the country is 1,47,181 km and shaped like a distorted rectangle. It extends for 885 km. in its east-west direction and breadth is about 193 km in north-south direction. The kingdom is located between two vast countries China in the north and India in other directions. The country is also known as the country of diversity. It has land (Kachana Kalana) as low as 60 metres above sea level and the highest peak of the world, Mount Everest (8848 metres) is also located here. It is the one and only one Hindu country in the world. Being the birth place of Lord Buddha, people from different part of the world visit the country and it has become like a "melting-pot" for cultures and languages. It occupies 0.03% land of the world and 0.3% of Asia. It is also known as the country of "third-pole" [3]. Climate varies from cool summers and severe winters in north to subtropical summers and mild winters in south. Main natural resources are quartz, water, timber, hydropower, scenic beauty, small deposits of lignite, copper, cobalt, iron ore etc. It has total a population of 25,284,463 (July 2001 est.) with yearly population growth 2.32% (2001 est.) [2]. Having a literacy rate 39.6% (1992 est.) [3], 81.3% of total population are

engaged in the farming profession and rest of the people are engaged in industries, businesses, education etc. Of the total population, approximately 86.5% are Hindu, 7.8% are Buddhist, 3.5% are Muslim and 2.2% others (est. 1992) [3]. Being officially Hindu Kingdom, it equally respects other religions and people from other religion are free to organise religious activities.

Geographically the country can be divided into three parts: (1) Himalayan Region, (2) Mountainous Region and (3) Terai Region. In the Himalayan region, it snows almost all around the year. One can take a mountain flight to see these beautiful mountains from Tribhuvan International Airport. Many people all around the world visit Nepal to see these mountains, and some of them also enjoy climbing. Mountainous region occupies most of the land and it is a little cold in the winter and a bit hot in summer. But the overall climate is found to be easily accepted by people all around the world during their visit. This region is further beautified by its component valleys. The Kathmandu valley is famous for its cultural richness and beauty whereas Pokhara valley is famous for its beauty and friendly people. The author had opportunity to talk with many Japanese people travelling to Pokhara. For most of them it was the best place in Nepal and they found it similar to Japan. There is certain degree of similarity in terms of their culture. Terai region, plain land, containing many national parks has been found homely by the people coming from hot and plain land all around the world.

2. Introduction to the Universities

At present, there are 25,522 primary, 77,276 lower secondary and 4,082 secondary schools and five universities in the country [1]. About 5 million students are studying in different schools in Nepal. Schools in 35 districts offer computer studies as an optional subject and about 9000 students appearing in the School Leaving Certificate Examination choose computer studies as an elective subject. About 200 high schools all over the kingdom offer computer studies as an optional subject or an extra-curricular activity. Likewise, about 45 higher secondary schools offer computer courses as an optional subject [4].

The universities are:

- I. Tribhuvan University
- II. Mahendra Sanskrit University
- III. Kathmandu University
- IV. Purbanchal University
- V. Pokhara University

2.1 Tribhuvan University (TU)

Tribhuvan University (<http://www.tribhuvan-university.edu.np>) was organised in 1956 and incorporated in 1960. Its central campus is located in the capital city, Kathmandu, and constituent campuses are spread all around the country. It's just half an hour drive from the Tribhuvan International Airport. It has five institutes (e.g. Institute of Engineering, Institute of Medicine, Institute of Science & Technology etc.) containing 61 constituent campuses. It has 177 affiliated colleges. In 2000/2001 the student admission record was: Engineering – 3610, Agriculture and Animal Sciences – 745, Medicine – 1,605, Forestry – 405, Institute of Science & Technology – 12,619. So the total number of student admitted was 18,984. In the Faculty of Law – 3,836, Faculty of Management – 39,273, Faculty of Education – 21,872 and Faculty of Arts – 62,784, altogether 127,765. So the grand total no. of student admitted in 2000/2001 was

146,749. For Ph. D.: 7 in Science & Technology, 2 in Law, 30 in Management, 64 in Arts, 1 in Education and 1 in Engineering were admitted. It is the *largest and oldest* university of Nepal [5]. At present, it offers following computer related programs:

- a. B. Sc. Computer Science (3 yrs.)
- b. B. E. Computer (4 yrs.)
- c. M. Sc. Computer Science & Information Technology (2 yrs.)
- d. M. Sc. Information and Communication Engineering (2 yrs.)

There is great scope for the foreign researchers to do collaborative work in the field of education. It has good link with many universities all around the world. The media of instruction are English and Nepali depending upon the nature of courses. Specially, medicine engineering and science & technology courses are offered in English medium.

General Evaluation System for Practical Oriented Courses in Tribhuvan University:

More emphasis is on final examination than on internal examinations. It has marking system. Computer related courses are generally offered on a semester basis rather than on a yearly basis. The final examination is generally conducted by the Tribhuvan University Examinations' Controller Board. There is a definite guideline for internal examination but it may differ from instructor to instructor and college to college so far as the minor details are concerned. The weight is as shown below:

Final Examination:	80% (subjective: short and long answer, final practical) [6]
Internal Examination:	20% (practicals; college and instructor specific)
<u>Marks</u>	<u>Division</u>
75% and above	Distinction
60 – 74%	First Division
45 – 59%	Second Division
33 – 44%	Third Division

Table 2.1.1: Tribhuvan University General Evaluation System for Intermediate Programs

Table 2.1.1 may differ in value for different levels and different programs. It can be taken as a basis to understand other specific tables. It is valid for some programs only.

2.2 Mahendra Sanskrit University (MU)

Mahendra Sanskrit University is the second oldest university of the country and was established in 1986. It does not offer any technological courses at present. It is dedicated with Sanskrit teaching and research. Sanskrit is a root language for many other languages like Nepali, Hindi, Bengali etc.

2.3 Kathmandu University (KU)

Kathmandu University (<http://www.ku.edu.np>), the third oldest university and the first university established with the effort of private sector, in 1991, is known as the best university in Nepal in terms of quality. It is located in a scenic place known as Dhulikhel which is 28 km away from the capital city Kathmandu and the Tribhuvan International Airport. Its building are spread

around small hills resulting a university village. This place is also famous for film shooting in the kingdom. If you are travelling from the city to the University you can enjoy a road through small mountains with breathtaking scenery. It has six different schools (School of Engineering, School of Science, School of Management, School of Education, School of Arts and School of Medicine) offering wide range of courses. It has visiting faculties from USA, UK, Norway, Australia, India etc to provide quality education. Its medical school is also supported by Harvard Medical School, USA. Faculties and research students from Harvard visit the medical school to implement the “Problem Based Learning (PBL)” method in medical education. It has collaboration with leading universities of Austria, Australia, Bangladesh, Canada, India, Japan, Norway, Russia, Switzerland, Thailand, United Kingdom, United States etc. I would like to list a few of them: (1) University of Waterloo, Canada; (2) Indian Institute of Management, India; (3) Indian Institute of Technology Madras, Chennai, India; (4) Indian Institute of Science, Bangalore, India; (5) Birla Institute of Technology and Science, Pilani, India; (6) Norwegian University of Science and Technology, Norway; (7) People’s Friendship University of Russia, Russia; (8) University of Berne, Switzerland; (9) Asian Institute of Technology, Thailand; (10) London University, UK; (11) Lancaster University, UK; (12) Pennsylvania State University, State College, USA; (13) The University of Michigan, USA, etc. The total number of students in all the five schools in 2000/2001 was 1497 [5]. It learnt from the oldest and largest university that when the number of students is very high quality goes down, so by keeping the number of students low it is maintaining quality. Affiliation expands to five medical colleges, 3 management colleges, 1 environmental college and 2 arts colleges. The total no. of students in affiliated colleges was 2491 in 2000/2001 [5]. It offers following computer related programs:

- a. Intermediate of Science (2 yrs., computer course included)
- b. B. E. Computer (4 yrs.)
- c. B. Sc. Computer Science – Honours degree (4 yrs.)
- d. M. E. Information Technology (1.5 yrs.)

Computer courses are also given to Bachelor of Business Administration (BBA), Bachelor of Business and Information System (BBIS) and Master of Business Administration (MBA). It is a pioneer for B. E. computer and B. Sc. Honours Computer Science. Many people in the kingdom claim that it is the best university in establishing international links, best for international researchers to approach if they are seeking geo-specific or hydrology research. Schools of Management and School of Education are located in the capital city, Kathmandu. There is a university school called “Kathmandu University High School” at the medical complex, Dhulikhel, specially meant for the children of University staff. The medium of instruction starting from grade 1 to Ph. D. is English unless specially demanded by the nature of a subject. In that case, the course may be offered in suitable language.

General Evaluation System for Undergraduate Computer Related Programs:

All the courses in these programs are offered on a semester basis. There are three internal written tests whose weight is determined by the instructor depending upon the number of assignments and mini-projects given in that subject. There can be numerous lab. exams and viva-voce to measure the student’s ability. Sometimes, quizzes can take the form of exam. The general trend is to give at most 60% weight to internal exams and at most 40% weight to a final exam. Final examination is generally of three hours duration, first 30 minutes for objective type of questions and the remaining time for short and long answer subjective type of questions. There is definite guideline to the question paper setter and answer sheet examiner. The number of questions and time period of examinations may vary.

<u>Grade</u>	<u>Grade-point</u>	<u>Marks</u>	<u>Grade-point Description</u>
A	4	80 & above	Excellent
B	3	65-79	Good
C	2	50-64	Fair
D	1	40-49	Poor
F	0	Below 40	Fail

Table 2.3.1: Undergraduate Grading System of Kathmandu University [7]

<u>CGPA</u>	<u>Performance</u>
3.5 to 4.0	Distinction
3.0 to less than 3.5	First Division
2.0 to less than 3.0	Second Division
Less than 2.0	Fail

Table 2.3.2: Undergraduate Cumulative Grade Point Average (CGPA) and Performance [7]

2.4 Purbanchal University (PUU)

Purbanchal University (<http://www.puniv.edu.np>) is located in Eastern Developmental Region of Nepal and is the second youngest university. This university was incorporated in 1994. It has Management, Science & Technology, Arts, Law & Education. With two constituent campuses and 34 affiliated colleges it offers following computer related programs:

- a. B. E. Computer (4 yrs)
- b. BIT (Bachelor of Information Technology – 4 yrs.)
- c. BCA (Bachelor of Computer Application -3 yrs.)
- d. MCA (Master of Computer Application – 2 yrs.)

Purbanchal is a pioneer for BCA and MCA. From the Tribhuvan International Airport, you can take a domestic flight of approximately 30 minutes to reach the beautiful city called Biratnagar where the university is located. This is the fastest growing university in terms of courses and students. It has a contact office at Kathmandu as well. The medium of instruction in this university is generally English.

(The evaluation system is similar to that of Kathmandu University)

2.5 Pokhara University (PU)

Pokhara University is the youngest university in Nepal and was established in 1997. It also has Arts and Social Sciences, Management, Science and Technology, offering these through three constituent campuses and 19 affiliated colleges in 2000/2001. There are 128 students in the constituent campuses and 1500 students in the affiliated colleges [5]. Following are the computer related programs offered by Pokhara University:

- a. B. E. Computer (4 yrs.)
- b. B. E. Information Technology (4 yrs.)
- c. B. E. Software Engineering (4 yrs.)
- d. BCA (Bachelor of Computer Application -3 yrs.)
- e. B. Sc. Computer Science (3 yrs.)
- f. BCIS (Bachelor of Computer Information System -4 yrs.)
- g. M. Sc. Computer Science & Data Processing (2yrs.)

Pokhara University is situated in Pokhara valley, one of the beautiful cities of Nepal. There are three lakes called Phewa, Rupa and Begnas. Rupa is the lake of beauty. From Phewa you can see Himalayas. Phewa is also known as the mirror for those Himalayas. From the Tribhuvan International Airport, you can reach Pokhara by taking a domestic flight of approximately 30 minutes of flight. Its contact office is also located in Kathmandu. The medium of instruction is generally English.

Undergraduate Evaluation Scheme of Pokhara University for Computer Related Programs

The students' academic performance during a semester is evaluated using the system of continuous assessment (evaluation of sessional work plus the final examination). The college and the University conduct the sessional works and the final examinations, respectively. Each course has sessional marks of 50% evaluated by the assigned teacher. Generally, each course will have a written semester examination of 50% marks at the end of each semester. In the Practical courses, no final examination is conducted and the sessional marks are awarded on the basis of continual assessment. Normally, final examinations are not conducted in elective courses and in courses, which are offered as intensive courses, conducted by reputed international scholars [8].

<u>Letter</u>	<u>Grade</u>	<u>Grade Point Description</u>
A	4.0	Excellent
A-	3.7	
B+	3.3	
B	3.0	Good
B-	2.7	
C+	2.3	
C	2.0	Satisfactory
C-	1.7	
D+	1.3	
D	1.0	Work Satisfying Minimum Requirement for Credit
F	0	Failing

Table 2.5.1: Pokhara University Undergraduate Grading System [8]

I would like to categorize Computer Science Education in Nepal in the following way:

- I. School Level
- II. Undergraduate Level
- III. Master's Level
- IV. Postgraduate Level

Among these, computer science in first two is well established. Third one is still in testing phase in many universities. Not much work has been done on the fourth one.

3 School-Level Computer Science Education

3.1 Secondary

The Ministry of Education and Sports is responsible for this level of education. The computer science course has been designed for grade 9 and 10 level of students who after completing these two years of study appear in the School Leaving Certificate (SLC) Examination of His Majesty's Government of Nepal. There is only one SLC board in Nepal where the comparison of all the

students of the Kingdom can be made. About one decade back, only universities used to offer 11 & 12th grade level of education and used to be named as “Proficiency Certificate in” e. g. Proficiency Certificate in Science, Proficiency Certificate in Law etc. At present, KU and TU have intermediate level as well. Otherwise, students are suppose to enrol in Higher Secondary Schools for which the direct governing body is Ministry of Education and Sports.

In grade 9, the following major topics are covered: (1) Background, (2) Introduction to Computer, (3) History of Computer, (4) Generation of Computer, (5) Computer System, (6) Types of Computer, (7) Number System, (8) Computer Media, (9) Computer Devices, (10) Hardware & Software, (11) Software Development Cycle, (12) Data Processing, (13) Computer Network, (14) Computer Virus, (15) Computer Security, (16) Computer Professionals and (17) Computer & Society

For 10th grade, the following is the outline: (1) Operating System (MS-DOS), (2) Logo Programming, (3) Word Processing (e. g. MS-Word), (4) Database Management (e.g. dBase), (5) Spreadsheet (e.g. Excel) and (6) Elementary Basic Programming.

Though this is the SLC level course, many private and boarding schools offer computer courses from grade 6. There is no definite course design from the government’s side. The general scheme followed is to break the topics offered in grades 9 & 10 into smaller and simpler forms for lower secondary students [The Education System of Nepal can be divided into: (1) Primary (pre & basic – Lower Kindergarten (LKG), Upper Kindergarten (UKG), Nursery, 1-5), (2) Lower Secondary (6-7), (3) Secondary (8-10), (4) Higher Secondary (11-12), (5) Tertiary level (Bachelor’s, Master’s & Ph. D.)]. Please note that government schools start from grade 1 directly.

The objective of the school level course is to prepare students to follow higher level courses, to be able to use word processor & spreadsheet, to write simple programs, understand the computer system and spread the knowledge in society.

The full marks allocated for computer science in grade 9 & 10 and SLC is 100 for each. Out of 100, 75 is a practical oriented exam (internal) and 25 is theoretical exam (final). Total full marks for the students appearing in SLC exam is 700.

3.2 Higher Secondary

The course name is “Computer Science I” in 11th grade and “Computer Science II” in 12th grade, both with 100 full marks each. Total teaching hours for both the courses is 150 each. It should be noted that total full marks for the students (11 and 12) is 1000.

3.2.1 Computer Science I [9]

3.2.1.1 Objective

After completing the course the student is expected to be able

1. to understand the fundamental working principle of computer systems
2. to identify computer resources for any specific micro-computer based application in the real life situation
3. to solve computing, word processing and documentation problems by using computers.

4. to provide computing knowledge and skill to individuals or organizations
5. to establish their own computer services and skill centres
6. to engage in higher study of computer science and technological courses in the country and abroad.
7. to provide services as instructor of computer science course in schools and
8. to understand the state of the art of computer technology and work as change agent for spreading computer culture in their societies.

3.2.1.2 Course Content

The course is designed to impart theoretical as well as hands-on practical knowledge and skill of computer science to the students. The course for grade 11 aims at providing the students with the concept of computer science and technology with specific emphasis on the fundamental aspects of software & hardware. The weight for theoretical knowledge and practical exercises for the grade 11 is at the ratio of 70:30 respectively. The outline is: (1) Evolution of Computers, (2) Types of Computer, (3) Number Systems, (4) Boolean Algebra, (5) Computer Systems, (6) Operating Systems, (7) programming Concepts, (8) Introduction to DBMS, (9) Software Packages, (10) Software Installation and (11) Project Work (individual basis)

3.2.2 Computer Science II [9]

3.2.2.1 Objectives

As it is a part of same course offered in grade 11, the objectives remain same.

3.2.2.2 Course Content

In grade 12 of their studies, the students are given a more advanced level of skill with specific emphasis on system design, database design and program development. The weight for theoretical knowledge and practical exercises for the grade 12 is in the ratio of 70:30 respectively. The outline is: (1) System Development Concept, (2) Database Management System, (3) Networking Concepts, (4) Programming Languages, (5) Computers and Society, (6) State-of-the-art and Future Trends in Computer Technology and (7) Project Work

3.2.3 Evaluation Scheme

Students are evaluated on the basis of the prescribed course, study material, books and lecture notes along with hands on practical exercises on computer system. The concept of the evaluation system is that the scheme should test students on the following aspects of the course – (1) Fundamentals of Computer Science, (2) Architecture and Functioning of a Digital Computer System, (3) Operating Systems and Computer Operation, (4) Logic Function and Algorithms of Programming, (5) System Design and Development Concept, (6) Software Development and Implementation, (7) Skill of Installing and using Package Programs, (7) Hardware Sizing and Installation of micro-computer system and (8) Knowledge of RDBMS etc. The evaluation scheme is expected to test and determine the ability of students for further study in the field of computer science and related technologies and also to test their capability of using computer in real life situation.

The level and quality of theoretical knowledge and practical skill of the students is examined through the use of various testing methods like written examinations, practical exercises, theoretical class tests and home assignments. Project work based on practical and theoretical exercises is assigned to each student of grade 11 and 12 at the end of each academic year. Students should submit standard documents of the assigned project in the prescribed manner within stipulated time; this is evaluated and marked by project supervisor.

Division of Marks:

Long answer questions	40%
Short answer questions	30%
Practical (Project work)	30%

In addition to higher secondary, Kathmandu University offers computer science courses with full marks 50 out of total full marks 1150 (two academic years). The course includes: Introduction to Computers, History of Computer Development, Generation of Computer and Classification of Computers, Computer Architecture, Input/Output Devices and Media, Concepts of Logical Circuits, Computer Arithmetic (Number System) and Data Representation, Concept of Low Level Language, Operating System, Types of Software, Steps in Program Design, Flow-charting and Algorithms, one of the High Level Languages.

Evaluation scheme:

Full Marks: 50

Theory Exam. (final) 30 (10 marks objective and 20 marks subjective)

Lab. Exam. (final) 20 (Viva – 5, Algorithm & Flow-chart 5, Program 10)

PUU and PU don't offer Intermediate Programs whereas TU does not offer computer science to intermediate students.

4 University Level Computer Education

4.1 Undergraduate Programs

4.1.1 Bachelor of Engineering in Computer – BE in Computer [4 yrs.]

TU, KU, PU & PUU are offering these courses regularly at present. The admission is generally open in the month of July/August every year and the classes start from August/September. After analysing the course structure of these universities one can infer that KU's syllabus is concentrated toward computer science, i. e., including few hardware courses, whereas the other three universities have a few more hardware courses. In general, there is no significant variation in the structure of core courses. The syllabi match with many universities of USA, UK, Canada, Japan, India, China etc. so far as the individual courses are concerned. This is a program which has been created by combining the courses of Electrical Engineering and Computer Science and many universities claim that it is a more concentrated and specialised program in the field of computer studies.

4.1.2 Bachelor of Computer Science - B. Sc. Honours in Computer [4 yrs.]

This course is only offered in KU and resembles the Computer Science Syllabus of US universities. One of the course designers was Dr. David Bellin, a Fulbright professor from North

Carolina State University, USA. The courses that are only present in the Computer Science syllabus are: (1) Assembly Language Programming, (2) Linear Algebra, (3) Automata Theory, Languages and Computation, (4) Combinatorics, (5) Linear Programming, (6) Graph Theory etc. The course structure has been designed in such a way that the students will be ready to work in the market with recent tools as well as can carry out theoretical computer science research work with little guidance.

4.1.3 Bachelor of Engineering in Information Technology - BE (IT) [4 yrs.]

Only PU offers this course. The distinguishing computer courses present are: (1) Probability and Queuing Theory, (2) Applied Operating System, (3) Principles of Communication, (4) Web Technology, (5) Computer Network and Internet, (6) Telecommunication System, (7) ATM Networks, (8) IP Telephony, (9) Fibre Optics Fundamental, (10) Data Mining and Warehousing, (11) Data and File Structure, etc. This program has adopted courses which have direct practical applications in the computer and electrical fields. Also, the program aims to give collective power of knowledge in both the fields.

4.1.4 Bachelor of Engineering in Software -BE(SE) [4 yrs]

This is also offered only by PU. The distinguishing computer courses are: (1) Probability and Queuing Theory, (2) Distributed Operating System, (3) Unified Software Development Process, (4) Data Mining, (5) Electronic Commerce, (6) IT Telephony, (7) ATM Networks, (8) Wireless Communications, etc. Obviously, the program concentrates on Software Engineering and aims to produce highly skilled manpower in this area.

4.1.5 Bachelor of Computer Information System - BCIS [4 yrs]

It is the first program of its kind in the country. At present, this program is only offered by PU. It can be defined as “computer courses given to management students”. Distinct computer courses are: (1) Computer Systems & Applications, (2) System Analysis & Design, (3) DBMS, (4) Computer Architecture & Microprocessor, (5) Operating System, (6) Network and Data Communication, (7) Computer Graphics, (8) Web Technology (9) E-Commerce etc. The program aims to prepare students to take up entry-level managerial positions and to start a professional career in computer information systems. Obviously, it develops the necessary foundation for Master’s level studies in Computer Information Systems, Management Information Systems or Computer Science.

4.1.6 Bachelor of Information Technology –BIT (4 yrs.)

This course is offered only by PUU. The computer courses that make this program distinct are: (1) Object Oriented Programming in C++, (2) Microprocessor & Assembly Language Programming, (3) Principles of Electronic Commerce, (4) Visual Programming II, (5) Organization and Technology, (6) Society & Ethics in Information Technology, (7) Embedded System Programming, (8) Data Mining and Warehousing, (9) Knowledge Organization and Information Access, (10) Network Programming, (11) Web Technology and Programming etc. This program clearly shows that IT field is mostly contributed by computer studies. This is

another approach taken by PUU to reach the same destination to that aimed at by PU with its BE (IT) program.

4.1.7 Bachelor of Computer Application –BCA [3 yrs.]

It is offered only of PUU. The students doing BCA are not eligible for Master of Engineering Programs. They are suppose to go with Master of Computer Application (MCA). The Computer courses making this program distinct are: (1) Digital Lab., (2) Hardware & System Installation, (3) Database Systems, (4) Script Programming, (5) Object Oriented Programming, (6) Numerical Methods of Computation, (7) Visual & Windows Programming, (8) Technology & Operations Management, (9) Internet Technology, (10) E-Commerce, (11) IT Presentation etc. By its name and course structure it can easily be inferred that this program is more application-oriented rather than science.

4.2 Master's Programs

4.2.1 Master of Engineering in Information Technology - ME (IT) [1.5 yrs]

This program is offered only by Kathmandu University. The core courses are: (1) Mathematical Foundation for Computer Sciences, (2) Data Structures and Algorithms, (3) DBMS, (4) Computer Network Architecture. One has to take 4 core courses and 6 elective courses in order to complete the program. Total credit for the courses is $10 \times 3 = 30$ and total credit for thesis work (one semester) is 15, resulting in 45 credit points for the students completing the degree. Among optional courses are Software Architecture, Distributed Systems, Cryptography, Knowledge Engineering, Network Programming, E-Commerce etc. are popular.

4.2.1.1 Evaluation Scheme [10]

For taught courses, the academic performance of the students is judged through (1) Continuous In-semester Assessment and (2) End – semester Examination. The continuous In-semester assessment of the student will be made by the concerned faculty member in any or a combination of the following: (1) Written tests, (2) Assignments, (3) Seminars, (4) Term Papers and (5) any other deemed suitable by the concerned faculty member. The End-semester examination is normally conducted according to the examination schedule notified by the concerned office.

A dissertation in a topic connected with a student's special discipline is a necessary requirement for the successful completion of the Master of Engineering degree. The candidates must indicate an ability to express themselves in a satisfactory style. Normally, the dissertation should be submitted at the end of the third semester. However, upon the recommendation of the supervisor, and subject to the approval of the Research Committee of the School, only one term extension of six months can be granted to a student if he/she desires so. The student receives a satisfactory or unsatisfactory grade and must have a satisfactory to qualify. In each course, a student is evaluated on a 4-point scale as follows:

<u>Grade Letter</u>	<u>Grade Value</u>	<u>Grade Meaning</u>
A	4	Outstanding
A ⁻	3.7	Excellent
B ⁺	3.3	Very good
B	3	Good

B ⁻	2.7	Fair
C ⁺	2.3	Poor
C	2	Very poor
F	0	Fail

Table 4.2.1.1.1: Grading System in Graduate Engineering Program of Kathmandu University

The student should get a minimum grade point average (GPA) of 2.5 in every semester and a cumulative grade point average (CGPA) of at least 3.0 and complete an oral defence of the dissertation at satisfactory level. Intake: Undergraduate in any engineering discipline, Master of Science in Mathematics, Physics or related area, with a score of over 50%, or CGPA of 2.5.

4.2.2 M. Sc. Computer Science & Data Processing - M. Sc. CSDP [2 yrs.]

This is only offered by PU. The evaluation system is same to that of PU undergraduate with small modification, i. e., there are no C-, D+ and D grades. (Detail information is not available.)

4.2.3 Master of Science in Information & Communications Engineering [2 yrs]

This course is offered only by Tribhuvan University – Institute of Engineering. Intake to the course is open to B. E. Computer, Electrical & Electronics. Core courses are: (1) Information Theory and Coding, (2) Digital System Design, (3) Information System Analysis and Design, (4) Communication Theory and (5) Telecommunication and Computer Networks each of 4 credit points. There are many elective courses from Electrical Engineering and Computer Science. The program comprises 20 credit core courses, 16 credit elective courses, 4 credit project work and 20 credit of thesis. So the total credit points to complete the course are 60.

4.2.3.1 Evaluation System [11]

The evaluation is based on the continuous assessment by the course teacher and the final examination. The students have to pass individually in the assessment as well as the final examination. The minimum pass marks for the assessments and final examination is 50%.

Depending upon the total percentage of marks determined by the following formula:

$$\text{Total percentage} = \frac{\bullet \text{ (Credit * Marks Obtained)}}{\bullet \text{ Credits}}$$

the following percentage is awarded:

<u>Percentage</u>	<u>Division</u>
80 or higher	Distinction
65 to <80	I
50 to <65	II

Table 4.2.3.1.1: Award of division for Graduate Engineering Program of Tribhuvan University

4.2.4 M. Sc. in Computer Science & Information Technology - M. Sc. CSIT [2 yrs.]

This program is offered only by Tribhuvan University's Central Department of Computer Science & Information Technology at present. Intake is open to B.E/B. Tech Computer, B. Sc. Computer Science and B.E. Electrical & Electronics. Also, students having M. Sc. (Phy., Stat., Math.) degree with the background of Computer System & Programming, Information System Design, Data Structure and Practical associated with these courses are also eligible to apply. The courses are: (1) Foundation Courses: Principle of Programming Languages, Computational Geometry, Data Structures and Algorithms, Operating System, Database, Computer Networking, Discrete Structures, Automata Theory, Compiler Construction and Computer Architecture. (2) Technology courses: Software Engineering, Project Work, Cryptography, Advanced Operating System, Internet Programming, Programming in Advanced Java, Graphics, Genetic Algorithms and Randomized algorithms. (3) Application courses: Artificial Intelligence, Dynamics of IT Industry, E-commerce, IT Infrastructure Management and Multimedia. The admission is open for the first batch.

4.2.4.1 Evaluation System

Continuous evaluation is carried out through quizzes, assignment including two mid-term examinations and an external final examination. The weight for each course carrying 100 full marks is divided as follows:

Assignments + two Mid-Term Examinations	- 20%
Final Examination	- 80%

4.2.5 Master of Computer Application –MCA [2 yrs]

This course is offered only by PUU. Admission for the first batch is open now. Intake is from (a) BCA, B.E. Computer/Electrical & Electronics, (b) Undergraduate degree in any field but they have to do an one year pre-requisite course. Total credit points of the program are 60. Course listing: in the first semester students have to study usual computer science courses like Operating System, Data Communications & Networks, Web Programming & Advanced DBMS. In the second and third semester students study OOAD, Software Engineering, Software Project Management as compulsory courses and there are 4 other electives which can be completely computer courses or can be computer & management courses. The availability of elective courses also depends upon availability of subject expert in that particular semester. A few elective courses are Geographical Information System (GIS), Remote Sensing and Photogrammetry, Image Processing, Advanced Web Technology, Network Management & Applications, AI & Applications, Multimedia & Applications

4.2.5.1 Evaluation Scheme

Generally the evaluation scheme of PUU resembles with the evaluation scheme of KU. There was no official document coming out for evaluation at the time the author left for Australia. Even the curriculum was framed just a few days before. If you have any special inquiry about this program please send mail to purbuniv@ccsl.com.np

5 Conclusion

Formal Computer Science Education started in 1994 when Kathmandu University started its B. E. program in Computer. This pioneer university had courage to start the course with the support of many international organizations/universities like United Mission to Nepal (UMN); Birla Institute of Technology and Science, Pilani, India; Norwegian University of Science & Technology, Norway etc. Before that, in around 1992, there were less than five institutes offering informal (training) in computer education. One of them, The National Computer Centre, was initiated by the government in mid 70's and was located in Singhdurbar (in the centre of the capital city) which offered different levels of training courses, and from there, the people having basic degree in Maths and science used to be sent outside the country for training. Those people came back and trained other people in the capital and it started multiplying.

In between 1994 and 2002 strong progress has been made in computer science education. At around 1998, Tribhuvan University started offering Computer Engineering courses. Another two universities, Pokhara and Purbanchal, started offering computer related programs since their establishment. So, at present there are over twenty engineering colleges and formal educational institutions offering different degrees (mentioned in this article) all around the country. The concentration of the educational institutions is high in the capital city, Kathmandu. There are a few colleges in other cities like Pokhara, Biratnagar, Dharan, Butwal, Bhairahawa etc. In addition to this the Ministry of Science & Technology is offering Semi-Skilled, Skilled and Highly-Skilled computer training in collaboration with the universities.

In the field of computer science education, the major problem is that none of the universities are able to carry out *world class research*. But this is the easiest field now to offer quality education in a country like Nepal because of the internet. The reality at present is that good multinational companies are not ready to place their research projects here because of the lack of qualified faculty. The usual reply is "You don't have real researchers!". They require people who have systematic-research-experience i. e. a Ph. D. degree. The possible solution lies in having collaboration with few best universities of developed countries where Nepalese universities should educate their faculty. Once the faculty get their Ph. D. in those developed countries it is possible for faculty to bring in international projects and start real research. Even those top international universities will be in a position to trust the universities in Nepal when they have their own graduates here.

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