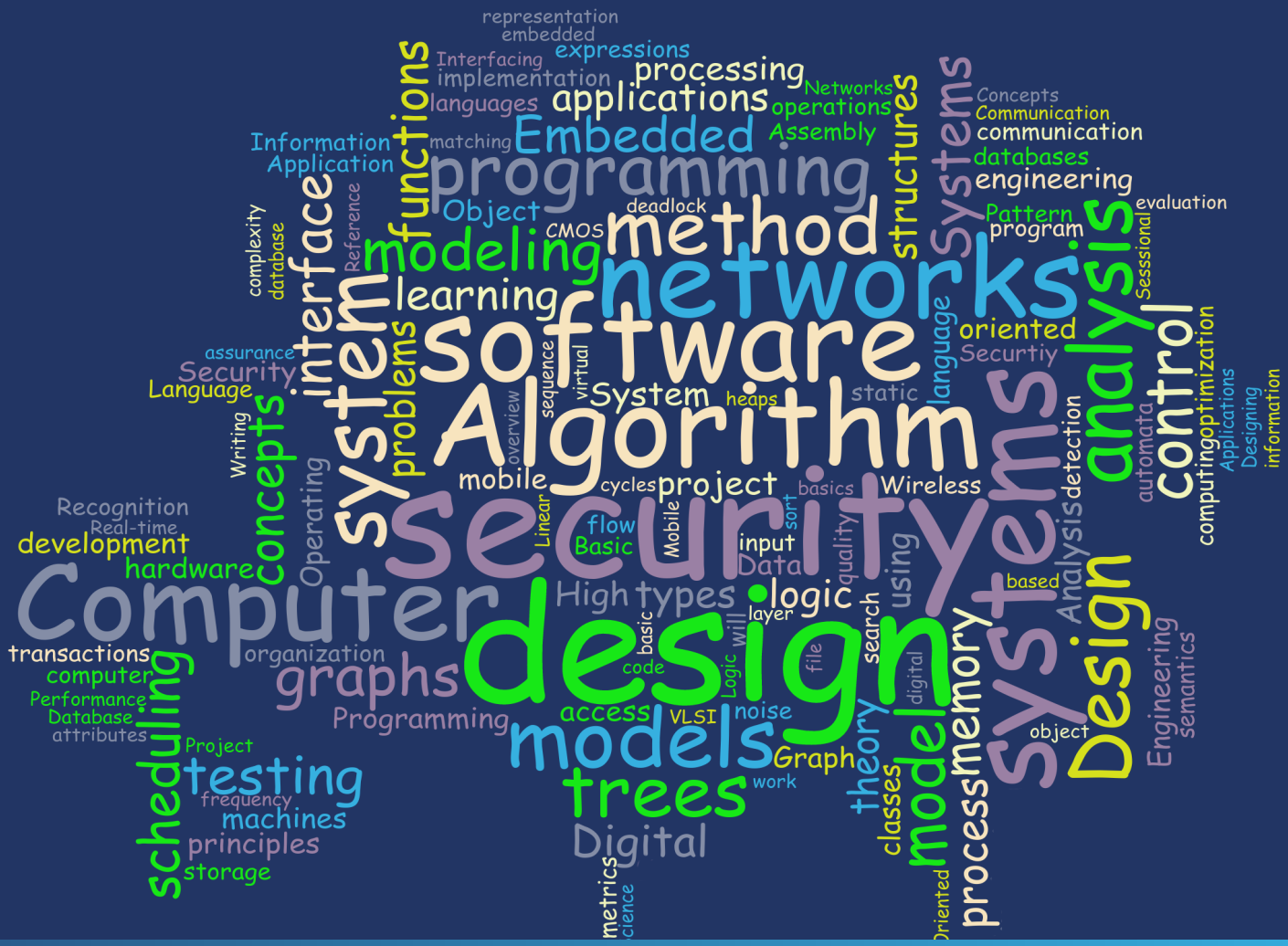
Undergraduate Course Calendar



February 2016

Department of Computer Science and Engineering
Bangladesh University of Engineering and Technology

Undergraduate Course Calendar

February 2016

Department of Computer Science and Engineering
Bangladesh University of Engineering and Technology
ECE Building, West Palasi
Dhaka 1205, Bangladesh

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Designed by: Dr. Muhammad Masroor Ali

Theme: Major areas/topics in Computer Science and Engineering (superimposed on a map of the world)

Preface

Bangladesh University of Engineering and Technology (BUET) offers both undergraduate and graduate programs. This calendar is for the undergraduate students in the Department of Computer Science and Engineering (CSE) of BUET. Although this calendar has been written mainly for the students, student advisers and teachers will find it valuable as a reference document. Also, anybody from any organization who wants to communicate for any kind of service including advisory service will find this book helpful.

This booklet provides general information about this university, its rich historical background, university administration, faculties and departments. Different aspects of the course system, such as rules and regulations relating to admission, grading system, performance evaluation, requirement for degrees have also been elaborated. It describes the course requirements, detailed course outline and courses offered in different terms.

The fields of Computer Science and Computer Engineering themselves are changing rapidly. So the departmental as well as the non-departmental courses for CSE students have been revised to cater to recent advancements in these fields. Some courses have been reorganized to accommodate better student needs. Moreover, students now have more freedom in subject selection to specialize in a certain direction in their final years.

The revised curriculum as incorporated in this calendar was approved by the academic council, BUET for the CSE undergraduate students from the 2015-2016 session. Some of the information recorded in this calendar is

likely to be modified from time to time. Everybody concerned is strongly advised to be in touch with the advisers or the undersigned regarding modifications to be introduced later by the university.

It is hoped that this information booklet will be of much use to everybody concerned.

Dhaka, Bangladesh
February, 2016

Dr. Mohammad Mahfuzul Islam
Professor and Head
Department of CSE, BUET

Contents

Chapter 1

General Information

1.1 History

Bangladesh University of Engineering and Technology, abbreviated as BUET, is the oldest institution for Engineering and Architecture in Bangladesh. The history of this institution dates back in 1876 when BUET originated as the Survey School at Nalgola to train Surveyors for the then Government of Bengal of British India. As the years passed, the Survey School became the Ahsanullah School of Engineering offering three-year diploma courses in Civil, Electrical and Technical Engineering. In 1948, the School was upgraded to Ahsanullah Engineering College (at BUET's present premises) as a Faculty of Engineering under the University of Dhaka, offering four year bachelor's degrees in Civil, Electrical, Mechanical, Chemical and Metallurgical Engineering. This action was taken with a view to meeting the increasing demand of engineers in the country and to expanding the facilities for quicker advancement of engineering education. In order to facilitate postgraduate studies and research, in particular, Ahsanullah Engineering College was upgraded to the status of a university and given a new name of "East Pakistan University of Engineering and Technology (EPUET)" in the year 1962. After the independence of Bangladesh in 1971, it was renamed as "Bangladesh University of Engineering and Technology (BUET)".

Till today, BUET has produced around 26,600[1] graduates in different branches of engineering and has established a good reputation all over the world for the quality of its graduates, many of whom have excelled in their respective fields in different parts of the globe. It was able to attract

[1] As on March 03 2016

students from countries like India, Iran, Jordan, Malaysia, Nepal, Pakistan, Palestine and Sri Lanka.

1.2 Location

The BUET campus is in the heart of the capital of Dhaka. It has a compact campus with halls of residences within walking distance of the academic buildings. At present the campus occupies 76.85 acres (31.1 hectares) of land. The main academic area is confined in and around the old campus occupying 30.24 acres (12.24 hectares) of land defined by Shahid Sharani, Bakshi Bazar Road and Asian Highway. This area accommodates four faculties, three institutes, the administrative building, the central library, main sports facilities, the auditorium complex, the BUET Club, eighty two units of residential accommodation of teachers, staff and employees and the Vice-Chancellor's bungalow. The new academic building named Electrical and Computer Engineering (ECE) Building has been built in the new academic area, situated on the west side of Palashi, to accommodate the Faculty of Electrical and Electronic Engineering and one other institute.

1.3 Undergraduate Studies

Undergraduate courses in the faculties of Engineering, Civil Engineering, Electrical and Electronic Engineering, Mechanical Engineering extend over a time span of four academic years and lead to B. Sc. Engineering degrees in Chemical Engineering, Materials and Metallurgical Engineering, Civil Engineering, Water Resources Engineering, Computer Science and Engineering, Electrical and Electronic Engineering, Biomedical Engineering, Mechanical Engineering, Industrial and Production Engineering, Naval Architecture and Marine Engineering. In the Faculty of Architecture and Planning, the degree of Bachelor of Architecture is obtained in five years and the degree of Bachelor of Urban and Regional Planning is obtained in four years.

1.4 Postgraduate Studies and Research

Post Graduate studies and research are now among the primary functions of the university. Most of the departments under the different faculties offer master's degrees and some of the departments have Ph.D. programs. Moreover, postgraduate degrees are also offered in the departments of Chemistry, Mathematics, Physics, Glass and Ceramic Engineering and,

Petroleum and Mineral Resources Engineering and by the institutes of this university. In addition to its own research programs, the university undertakes research programs sponsored by outside organizations like European Union, UNO, Commonwealth, UGC, etc. The expertise of the University teachers and the laboratory facilities of the University are also utilized to solve problems and to provide up-to- date engineering and technological knowledge to the various organizations of the country. The University is persistent in its effort to improve its research facilities, staff position, courses and curricula in order to meet the growing technological challenges confronting the country.

1.5 Administration

The University has the following Statutory Authorities:

1. Syndicate
2. Academic Council
3. Finance Committee
4. Faculties
5. Selection Boards
6. Committee for Advanced Studies and Research (CASR)
7. Planning and Development Committee
8. Boards of Postgraduate Studies (BPGS)
9. Boards of Undergraduate Studies (BUGS)

The Syndicate is the supreme authority in major policy-making matters and in approving recommendations. The Finance Committee, the Planning and Development Committee and other committees assist the Syndicate in matters important for proper functioning of the University. The Academic Council is the supreme body in formulating academic rules and regulations to which the Committee for Advanced Studies and Research (CASR), the faculties and Boards of Undergraduate (BUGS) and Postgraduate Studies (BPGS) recommend.

The University administration consists of the following members:

Vice Chancellor	: Prof. Khaleda Ekram
Deans of Faculties	
Faculty of Civil Engineering	: Prof. Dr. Md. Mazharul Hoque
Faculty of Architecture and Planning	: Prof. Dr. Zebun Nasreen Ahmed
Faculty of Electrical and Electronic Engineering	: Prof. Dr. M. Kaykobad
Faculty of Mechanical Engineering	: Prof. Dr. Maglub Al Nur
Faculty of Engineering	: Prof. Dr. Md. Abu Hashan Bhuiyan
Administrative Officers	
Registrar	: Prof. Dr. N. M. Golam Zakaria *(Additional Charge)*
Controller of Examinations	: Prof. Dr. Md. Abul Kashem Mia *(Additional Charge)*
Comptroller	: Md. Jasim Uddin Akanda
Director, Directorate of Students' Welfare (DSW)	: Prof. Dr. Md. Delwar Hossain
Director, Advisory, Extension and Research Services (DAERS)	: Prof. Dr. Sheikh Reaz Ahmed
Director, Bureau of: Research, Testing and Consultation (BRTC)	Prof. Dr. Sk. Sekender Ali
Librarian	: Suraiya Begum *(in charge)*
Chief Engineer	: M. M. Abdul Alim
Chief Medical Officer	: Dr. Md. Shahjahan Ali
Provosts of Residential Halls	
Ahsan Ullah Hall	: Prof. Dr. Satya Prasad Majumder
Kazi Nazrul Islam Hall	: Prof. Dr. Mir Tareque
Titumir Hall	: Prof. Dr. A. K. M. Akther Hossain
Sher-e-Bangla Hall	: Prof. Dr. Md. Mashud Karim
Suhrawardy Hall	: Prof. Dr. Syed Ishtiaque Ahmed
Shahid Smriti Hall	: Prof. Dr. Md. Wahab Khan
Chattri Hall	: Prof. Dr. Shakila Rahman
Dr. M. A. Rashid Hall	: Prof. Dr. Mohammad Elias

1.6 Faculties, Departments and Teachers

At present, the university has eighteen teaching departments under five faculties. There are over six hundred teachers in the university who are teaching in these faculties. There are additional teaching posts like Dr. Rashid Professor, Professor Emeritus and Supernumerary Professor.

Chapter 2

Department of Computer Science and Engineering

2.1 Historical Background

The Department of Computer Science and Engineering, the first department of its kind in Bangladesh, was established in 1984 under the Faculty of Electrical and Electronic Engineering. From the very initial days of its establishment, it has been able to attract the very best students of the country. Students securing topmost merit positions in the country's most competitive and prestigious admission test of BUET opt for studies in this department. At the very beginning, the Department offered only M. Sc. Engg. and M. Engg. degrees in Computer Science and Engineering. The undergraduate program started in 1986. At first, 30 students were admitted each year for pursuing the B. Sc. Engineering degree. Starting from the academic session 1994-1995, the number was increased to 45 and from the session 1997-1998 the number was further increased to 60. Considering the growing need of computer science graduates, the Department decided to enroll 120 students per session and started to do so from the academic session 2000-2001. So far, in 25 batches 1785 students have been awarded B. Sc. Engineering, more than 450 M.Sc. Engineering and 4 Ph.D. degrees from this Department. The Department has now active faculty strength of 46 with 23 having Ph.D. degree in different branches of Computer Science and Engineering. Currently 23 teachers are abroad for higher studies.

Over the years, this ever-flourishing department has been providing the technical foundation, scholarly guidance and leadership skills that have resulted in a number of highly qualified and skilled computer graduates, proving their potentiality at home and abroad. With educated, sincere

and enthusiastic faculties, a continuous enrollment of brilliant students and an amicable teacher-student interaction - the department has become a unique one in its field.

2.2 Location

The Department of Computer Science and Engineering is located in the Electrical and Computer Engineering Building (ECE) of BUET, previously known as New Academic Building, at Palashi. It is an eleven-storied building. The class rooms and laboratories occupy the first to sixth level. There are common examination rooms in the ninth and tenth level.

2.3 Study Program

The Department of Computer Science and Engineering offers the degrees of B. Sc. Engg., M. Engg., M. Sc. Engg. and PhD. The courses and syllabus followed by this Department for the above degrees are the most modern ones like that of advanced countries as well as appropriate to the local needs. The syllabus is so designed as to contain all the necessary study materials so that a graduate can face the engineering problems readily after graduation. The teachers of the Department meet periodically to review the courses and their contents; necessary changes are made to update the needs and trends from time to time.

2.4 Research Activities

The Department of CSE provides the highest quality of research at the international level from Bangladesh. Faculties and students of this department have strong research involvement. Major research areas include Algorithms (Parallel and Distributed), Graph Theory and Graph Drawing, Computational Biology and Bioinformatics, Networking and Wireless Communication, Multimedia and Distributed Systems, Advanced Database and Data Mining, Artificial Intelligence and Neural Network, Image Processing and Pattern Recognition etc. Government and private sectors prefer faculties of the Department for the solutions to their technical and innovative operations.

Here are some statistics of the total number of publications so far.

International Journals	More than 250
International Conferences	More than 670
Others	More than 500

The teachers and students of the Department have publications in various reputed international journals like Computational Geometry: Theory and Applications, IEICE Transactions on Information and Systems, Philosophical Transactions of the Royal Society, IEEE/ACM Transactions on Networking, IEEE Transactions on Knowledge and Data Engineering, IEEE Transactions on Neural Networks, IEEE Transactions on Systems, Man, and Cybernetics, Information Processing Letters, International Journal of Computer Mathematics, Computers & Graphics, International Journal of Control and Automation, International Journal of Foundations of Computer Science, International Journal of Multimedia and Ubiquitous Systems, Journal of Algorithms, Journal of Applied Mathematics and Computing, Journal of Computer Science, Journal of Computer Systems, Networks and Communications, Journal of Graph Algorithms and Applications, Journal of Heuristics, Journal of Supercomputing, Mathematics in Computer Science, Multimedia Tools and Applications, Neurocomputing, Studia Informatica Universalis, Telecommunication Systems, Theoretical Computer Science, Theory of Computing Systems, VLDB Journals, Applied Mathematics E-Notes, Swarm and Evolutionary Computation, International Journal of Foundations of Computer Science, Computational Biology and Chemistry, J. Discrete Algorithms, Discrete Applied Mathematics, International Journal of Genomics, International Journal of Data Mining and Bioinformatics, Mathematics in Computer Science, Fundam. Inform., Information Sciences, The Scientific World Journal, Transportation Research Part C: Emerging Technologies, BMC Bioinformatics, Algorithms for Molecular Biology, Discrete Mathematics, Algorithms and Applications, Journal of Computers, International Journal on Digital Libraries, Int. Journ. of Unconventional Computing, Natural Computing, Mathematics in Computer Science, Journal of Combinatorial Mathematics and Combinatorial Computing, Algorithmica, Int. J. Found. Comput. Sci., Computers & Operations Research etc.

Faculty members published their research works in reputed international conferences like ICDE (International Conference of Data Engineering), UbiComp (ACM International Joint Conference on Pervasive and Ubiquitous Computing), OOPSLA (ACM SIGPLAN Conference on Object Oriented Programming, Systems, Languages & Applications), WWW (World Wide Web Conference), IPSN (ACM/IEEE International Conference on Information Processing in Sensor Networks), ISAAC (International Symposium on Algorithms and Computation), PAKDD (Pacific-Asia Conference on Knowledge Discovery and Data Mining), COCOON (International Conference on Computing and Combinatorics), ICONIP (International Conference on Neural Information Processing),

GD (Symposium on Graph Drawing), WG (Workshop on Graph-Theoretic Concepts in Computer Science), IEEE International Performance Computing and Communications Conference, IEEE International Conference on Communications (ICC), IEEE International Symposium on Intelligent Signal Processing and Communications Systems, International Frontiers of Algorithmics Workshop (FAW), International Workshop on Combinatorial Algorithms (IWOCA), International Workshop on Algorithms and Computation (WALCOM) etc.

Faculty members and Alumni of this Department have been engaged in research with different reputed universities of the world. A number of faculty members have acted as international members, visiting researchers and research fellows in reputed research institution like University of Waterloo, King's College London, Curtin University of Technology and many more.

Faculty members and alumni of CSE Department have served as Program Committee members in different international conferences and workshops and have edited special issues in reputed international journals. A number of research students and faculty members of this Department have also served as reviewers in different conference and workshop series and reputed international journals.

The faculty members of this department have received a number of awards for their research contributions and academic excellence. Some of them are as follows:

1. Professor Dr. M. Kaykobad was awarded the gold medal of the Physical Sciences senior group of Bangladesh Academy of Sciences for the year 2004. He also received gold medal for his contribution to computer science education and programming contests. Dr. Kaykobad has received the Distinguished Alumnus award from his Alma Mater the Flinders University of South Australia. He has been nominated for prestigious Victory Day Award 2010 for his contribution in information technology.
2. Professor Dr. Md. Saidur Rahman received the prestigious FUNAI Information Technology Award for excellence in research. He also received UGC and BAS gold medals. Dr. Saidur Rahman initiated a Workshop series on Algorithms, namely WALCOM (Workshop on Algorithms and Computation), proceedings of which are being published by the famous Springer-Verlag publishers in the prestigious Lecture Notes in Computer Science (LNCS) series.
3. Professor Dr. Md. Monirul Islam has received 3 awards (including Best Paper) at SCIS and ISIS 2006.

4. Dr. Reaz Ahmed, Associate Professor, was awarded the 2008 Fred W. Ellersick Prize Paper Award by the IEEE Communications Society.
5. Professor Dr. M. Sohel Rahman has received the prestigious BAS-Gold Medal Award-2008 in Physical Sciences (Junior Group) by Bangladesh Academy of Sciences in recognition of his excellent contribution in research.
6. Professor Dr. Masud Hasan received TWAS-Bangladesh Academy of Sciences Young Scientist Award for Bangladeshi Scientists for 2011 (Gold Medal).
7. Professor Dr. Mohammed Eunus Ali received the prestigious UGC Award in the year 2012 for his outstanding research contribution.
8. Himel Dev (Former Lecturer, CSE, BUET) has been highly commended in the Computer Sciences & Information Technology category of The Undergraduate Awards 2014. His essay rates in the top 10% of total 4,792 submissions from undergraduate students around the world.
9. Mohammad Saifur Rahman (Assistant Professor, CSE, BUET) has two patents, Keep Alive Management (2014) and Cooperative client and server logging (2014).
10. Nashid Shahriar (Assistant Professor, CSE, BUET) with Reaz Ahmed (Former Associate Professor, CSE, BUET) and Shihabur Rahman Chowdhury (Former Lecturer, CSE, BUET) has two patents, Connectivity-Aware Virtual Network Embedding (2015) and Dedicated Protection for Virtual Network Embedding (2015).

2.4.1 International Workshop on Algorithms and Computation (WALCOM)

In 2007, CSE, BUET started a conference series named WALCOM, the first event of which was jointly hosted by Department of CSE, BUET and Bangladesh Academy of Sciences (BAS). This workshop covers the areas of approximation algorithms, combinatorial algorithms, parallel and distributed algorithms, combinatorial optimization, computational biology, computational geometry, data structures, graph algorithms, graph drawing, parameterized complexity, network optimization, online algorithms, randomized algorithms and string algorithms.

WALCOM has created a great opportunity for computer science students, academicians and researchers to exchange views, thoughts and ideas, and helps them keep abreast of the recent advancement of

the fast growing branch of science and technology. The Department of CSE is dedicated to promoting and encouraging research activities in Bangladesh, especially in science and engineering. To serve this purpose, the significance of WALCOM is unquestionable.

2.4.2 International Conference on Networking Systems and Security (NSysS)

In 2015, CSE, BUET started a conference series named NSysS, the first event of which was hosted by CSE, BUET. Scope of this conference includes recent advances in both theoretical and experimental research addressing the rich space of computer networks, networking systems, and security across academia and industry. NSysS 2015 was held during January 5-7, 2015 in Dhaka, the capital of Bangladesh. This conference was technically co-sponsored by ACM Chapter and IEEE Communications Society Bangladesh Chapter. Again NSysS 2016 was held during January 7-9, 2016 in Dhaka, Bangladesh. This conference was technically co-sponsored by ACM Chapter and IEEE Bangladesh Section.

NSysS solicits original technical papers articulating novel ideas, protocols, and algorithms with ground-breaking results and quantified experiences involving networking systems and security. The conference values papers, which will take a broad networking and/or security perspective(s) covering contemporary and future applications. Of particular interest are technical contributions that enable new and compelling networking and security paradigms.

2.5 Laboratory Facilities

The laboratory facilities of the Department have been increased significantly over the last few years. At present there are thirteen different laboratories in the Department premises. A brief description of each of the laboratories follows.

2.5.1 Microcomputer Laboratory

This laboratory was established in 1986. The PCs and servers of these laboratories have been upgraded continuously. At present these laboratories have about 35 high performance workstations and some servers. All the workstations provide Windows 7 and Linux platforms and have important software installed.

2.5.2 Software Engineering Laboratory

This laboratory facility has come into existence from 2001. This laboratory has a total number of 36 workstations with multimedia support. A multimedia projector belongs to this laboratory to facilitate presentation.

2.5.3 Networking Laboratory

The networking laboratory has also been established in 2001. The students can acquire knowledge of network management, establishment and maintenance by using the various networking devices present in this laboratory. There are Cisco routers (model no. 1700, 2501 and 2514), Cisco Switches (model no. 1600 and 1900), 35 high performance workstations. The workstations in this laboratory have been loaded with different networking software that allows the students to monitor and experiment with different aspects of computer networking.

2.5.4 Digital Laboratory, and Interfacing Laboratory

The Digital Laboratory was established in 1986 while the Interfacing Laboratory has been established in 2001. The digital laboratory is equipped with modern tools to design and implement digital circuits. On the other hand, the interfacing laboratory provides widespread opportunity to gain knowledge about interfacing peripheral devices and electronic circuits with PC. These laboratories have a vast number of ICs in stock, starting from simple 74 series chips up to different types of microprocessors and their peripheral chips. There are various Microprocessor Trainer Kits such as 8088 based MTS 88.C μkit and 8086 based μkit.

2.5.5 Multimedia Laboratory

The CSE Multimedia Laboratory is enriched with state-of-the-art machines and accessories. This laboratory has 35 high performance workstations with multimedia support. The laboratory has a Flatbed Scanner, a Digital Video Camera, a Multimedia Projector with Document Camera, a Video Capture Card, a PC-based Video Conferencing Kit. All the stations are connected with the Department LAN. In addition, three stations have 802.11g/2.4 GHz wireless PCI adapters. They communicate with an 802.11/2.4GHz wireless Access Point which is connected to the backbone LAN.

2.5.6 Computing Laboratory

This laboratory has 40 high performance workstations with multimedia support. All the workstations provide Windows 7 and Linux platforms and have important software installed.

2.5.7 Programming Laboratory

This laboratory is equipped with 35 high performance workstations.

2.5.8 Database and Data Warehouse Laboratory

This laboratory has 33 workstations and 2 database servers.

2.5.9 Wireless Networking Laboratory

This laboratory provides with various wireless networking devices which includes modern sensors, gateway, wireless access points, routers, radio controlled microcontrollers and so on.

2.5.10 VLSI Design and Automation Lab (VDAL)

This laboratory is equipped with modern tools to design and simulate VLSI circuits. It has a vast number of FPG boards in stock and some other modern tools to aid the study in this field.

2.5.11 Artificial Intelligence and Robotics Laboratory

The laboratory has programmable robot kit and humanoid robot kit along with 13 workstations.

2.5.12 Graph Drawing and Information Visualization Laboratory

This laboratory is supported by Ministry of Science and ICT (MoSICT), Government of Bangladesh, under the project "Facility upgradation for sustainable research on graph drawing and information visualization". This laboratory has 8 high performance workstations.

2.5.13 Tiger IT Biometric Lab

This laboratory has 35 high performance workstations with multimedia support. All the workstations provide Windows 7 and Linux platforms and have important software installed.

2.5.14 Samsung Innovation Lab

This laboratory has 25 high performance workstations with multimedia support. All the workstations provide Macintosh (Mac) platforms and have important software installed.

2.5.15 Graduate Complex

This complex consists of two Graduate Class Rooms, one Graduate Seminar Room and a Graduate Laboratory. Graduate Class Rooms are dedicated for M.Sc., M.Eng. and Ph.D. classes, where Graduate Laboratory has 25 desktops, 5 Laptops, 3 printers, 2 scanners and 1 photocopier for research purposes.

2.5.16 Graduate Seminar Room

Graduate Seminar Room is located in the Graduate Complex in the department at 5^{th} floor. This room is equipped with excellent sound system, online video streaming system and high speed internet connection for arranging seminars, conferences and meetings.

2.5.17 Bangladesh-Korea Information Access Center

One of the latest inclusions to CSE Department is Bangladesh-Korea Information Access Center (IAC). IAC has been funded by Korean government with an aim to remove the "digital divide" and promote the Information and Communication Technology. IAC is equipped with-

1. A seminar room with modern facilities (60 sitting capacity).
2. An Internet Browsing room (19 browsing workstations).
3. A training Center (35 training workstations).

2.6 Library Facilities

A small but rich library has been established in the Department. It has currently 1200 books and a lot of journals. The library is being enriched

day by day. Books related to the field of study can also be found at the central library and Faculty library. In addition to that there is a small computer software library which consists of original software, user's guide, programmer's guide and manuals.

2.7 Co-curricular Activities

Students of this Department have achieved remarkable success in co-curricular activities like programming contests, software and hardware project competitions, software fair etc.

2.7.1 Programming Contest

CSE Department programming teams have enormous success in various national and international programming contests. The Department team participated in the prestigious world final of ACM (Association for Computing Machinery) International Collegiate Programming Contest (ACM-ICPC) in consecutive seventeen times starting from 1998 to 2014.

In recognition of the extraordinary achievements of Bangladeshi students, the then Honorable Prime Minister Shaikh Hasina gave an award of Tk. One lac to each of the 9 students of which 8 were from the Department of Computer Science and Engineering. The then Honorable Prime Minister, Sheikh Hasina gave an award of Tk. One lac each to Mustaq Ahmed, Munirul Abedin and Mohammad Rubaiyat Ferdous Jewel for their extraordinary performance in the 24th world finals of the ACM-ICPC occupying 11th position among 60 teams and leaving behind famous institutions like MIT, Harvard, Stanford. CSE team became runners up in prestigious ICPC Challenge in the 2009 World Finals of ACM ICPC held at Stockholm.

Shahriar Manzoor, an alumnus of our department, is the only judge from Aisa in the prestigious World Finals of ACM ICPC since 2003. BUET has the honor to host one of the Asia regional ACM-ICPC held in 2001, 2002 and 2003. CSE graduates are also contributing in the hosting of programming contests in this region. There are many graduates of ours who are continuing with their praiseworthy activities by coaching teams of many US universities.

The following table summarizes the programming contest performance of Department team in different world finals of ACM-ICPC.

ACM	Date	Venue	Team	Place
22nd	28.02.1998	Georgia, USA	Bengal Tigers Suman Kumar Nath Rezaul Alam Chowdhury Tarique Mesbaul Islam	24th
23rd	12.04.1999	Eindhoven, Netherlands	The Baloon Counters Rezaul Alam Chowdhury Mojahedul H. A. Hasnat M. Mehedy Masud	H. M. [1]
24th	18.03.2000	Florida, USA	BUET Backtrackers Mustaq Ahmed Munirul Abedin Rubaiyat Ferdous Jewel	11th
25th	10.03.2001	Vancouver, Canada	BUET Loopers Mustaq Ahmed Munirul Abedin Abdullah Al Mahmood	29th
26th	23.03.2002	Hawaii, USA	BUET Ackermanns Abdullah Al Mahmood Md. Kamruzzaman Mushfiqur Rouf Nasa	H. M. [1]
27th	25.03.2003	California, USA	BUET Loopers Asif-ul Haque M Saifur Rahman Mehedi Bakht	H. M. [1]
28th	31.03.2004	Prague, Czech Republic	BUET Phoenix Asif-ul Haque M Saifur Rahman Mehedi Bakht	27th
29th	06.04.2005	Shanghai, China	BUET Explorer Mushfiqur Rouf Nasa Abdullah Al Mahmud Manzurur Rahman Khan	29th
30th	09.04.2006	San Antonio, Texas, USA	BUET Exceed Omar Haidar Istiaque Ahmed Manzurur Rahman Khan	39th

[1] Honorable Mention

ACM	Date	Venue	Team	Place
31st	15.03.2007	Tokyo, Japan	BUET xC33d Istiaque Ahmed Sabbir Yousuf Sanny Md. Mahmudur Rahman	H. M. [1]
32nd	09.04.2008	Alberta, Canada	BUET Sprinter Md. Mahbubul Hasan Shahriar Rouf Sabbir Yousuf Sanny	31st
33rd	21.04.2009	Stockholm, Sweden	BUET Falcon Md. Mahbubul Hasan Shahriar Rouf Tanaeem M Moosa	33rd
34th	05.02.2010	Harbin, China	BUET Rand Ecliptic Tanaeem M Moosa Muntasir Mashuq Tasnim Imran Sunny	34th
35th	30.05.2011	Florida, USA	BUET Annihilator Tanaeem M Moosa Tasnim Imran Sunny Muntasir Mashuq	H. M. [1]
36th	17.05.2012	Warsaw, Poland	BUET .oO Mir Wasi Ahmed Md. Enzam Hossain F. A. Rezaur Rahman Choudhury	97th
37th	03.07.2013	Saint Petersburg, Russia	BUET Choker Muhammad Nazmul Hasan Prasanjit Barua Mohammad Hafiz Uddin	66th
38th	27.06.2014	Sverdlovsk Oblast, Russia	BUET MAX+7 Prottoy Mozumder Mohammad Hafiz Uddin Prasanjit Barua	19th

2.7.2 Software and Hardware Project Competitions

Students of CSE Department participate regularly in different software and hardware project competitions. One such project is "Telephone Controlled Voting System". Imranul Hoque and Sonia Jahid, two students of this Department participated with this project in the "World Engineers Convention 2004 (WEC2004)" at Shanghai, China in November 2-6, 2004. More than three thousand engineers from different regions have participated in this convention. Their project secured third position in that convention and was highly praised in Chinese dailies in that time.

Another notable project is "Aktel Mayer Bhasha", a system for composing Bangla message in mobile phone. Few final year students

of this Department, developed this Bangla SMS system to write Bangla text in mobile messages. Then Aktel, now Robi Axiata Limited has commercially launched this system in their various Value Added Services.

Another notable project is "3SM System", another system for composing Bangla message in mobile phone. Hasan Shihab Uddin, Sujoy Kumar Chowdhury, Nahid Mahfuza Alam (Shapla) and Md. Mahbubur Rahman, four students of this Department, developed this Bangla SMS system to write Bangla text in mobile messages. The Pacific Bangladesh Telecom Ltd (CityCell) has commercially launched this system in their various Value Added Services and around 1 million subscribers are getting service from it.

BUET team consisting of 4 students from the Department of CSE and EEE has won the Microsoft Imagine Cup 2013 Bangladesh Round Grand Finale, arranged in American International University Bangladesh on 6th April, 2013.

A team of Department of CSE, BUET, representing Bangladesh in the International Robotics Challenge (IRC), Techfest, IIT, Mumbai, India, was the runners up after defeating all other teams except the three times defending champion Srilankan team.

2.7.3 CSE Festival

The Department of CSE arranges regular CSE Festival which includes programming contest, project show and various colorful and rich cultural programs. The Department arranges such programs to encourage the innovative ideas of CSE students and to excel their works. Some of the attractions of CSE Festivals in the past years was Inter-University Math Olympiad, National Collegiate Programming Contest (NCPC), Inter-University Project show and so on.

The purpose of CSE Festival is to promote good relations among the Department of CSE and other universities and industry. The students of this Department manifest their excellence in co-curricular activities besides their glorious academic background with the support from teachers, in this CSE Festival.

2.8 Training

The Department conducts a number of training programs for different organizations and individuals. With the mushroom like growth of computer centers in the country, where the quality of teaching is questionable, the Department of Computer Science and Engineering is

eager to play a vital role in producing quality computer professionals who can make positive contribution in the development of this country. The Department offers various short courses like computer networking, system administration using Linux, software development with Oracle9i, Visual Basic.NET and so on. The Department of Computer Science and Engineering acts as Regional Cisco Academy in Bangladesh and provides CCNA (Cisco Certified Networking Associates) training to both instructors and students. Bangladesh-Korea Information Access Center (IAC) also offers regular courses on Web Design and Application Development, Linux System Administration and Server Configuration and Database Management and Administration. Occasionally the Department offers training programs for specific professionals so that they can have better IT involvement in their profession. One such training is "e-Heath and Learning" program for doctors funded by European Union.

2.9 Consultation/Advisory Services

The Department offers several consultation/advisory services to different government and private organizations in their computerization and IT related activities. These services include, but not limited to, feasibility study (both technical and financial), machine and peripheral specification preparation and supervision of their proper installation, system analysis, software development, course curriculum development.

2.10 List of Active Faculty members and Their Research Areas

Professors

1. Dr. M. Kaykobad; M.S (Ons) in Engg., Automated Management of Merchant Marine, Odessa Marine Engg. Institute Netherlands; M.Engg., Computer Applications Technology, Asian Institute of Technology, Thailand; Ph.D, The Flinders University of South Australia, Australia (Algorithms, Computational Complexity, Optimization).
2. Dr. Muhammad Masroor Ali; B. Sc. Engg (EEE), BUET; M. Engg, Kyushu University, Japan; Ph.D, Kyushu University, Japan (Semantic Web).
3. Dr. Md. Abul Kashem Mia; B. Sc. Engg (EEE), BUET; M. Sc. Engg (CSE), BUET; M.S. (Information Science), Tohoku University, Japan; Ph.D, Tohoku University, Japan (Algorithms, Parallel Processing, Graph Theory, Graph Visualization, Computational Complexity).
4. Dr. Md. Saidur Rahman; B. Sc. Engg (EEE), BUET; M. Sc. Engg (CSE), BUET; M.S. (Information Science), Tohoku University, Japan; Ph.D, Tohoku University, Japan (Graph Drawing, Graph Partitioning, VLSI Layout Algorithms, Computational Geometry, Network Routing Protocols, Bioinformatics, Distributed Systems, Graph Data Mining).
5. Dr. Md. Monirul Islam; B. Sc. Engg (EEE), BIT, Khulna; M. Sc. Engg (CSE), BUET; Ph.D, Fukui University, Japan (Neural Networks, Evolutionary Algorithms, Data Mining, Robotics).
6. Dr. Md. Mostofa Akbar; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, University of Victoria, Canada (Multimedia Systems, Knapsack Problem, Distributed Systems, Computer Networks, VLSI (System on Chip, Network on Chip).
7. Dr. Abu Sayed Md. Latiful Hoque; B. Sc. Engg (EEE), BUET; M.Sc. Engg (CSE), BUET; Ph.D, University of Strathclyde, Glasgow,UK (Advanced Database System, Data Mining, Parallel and Distributed Data Warehouse, OLAP, Information Retrieval)
8. Dr. Md. Mahfuzul Islam; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, Monash University, Australia (Wireless Network Resource Management, Artificial Intelligence, Image Processing, Network Security)

9. Dr. Md. Sohel Rahman; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, King's College of London, UK (Stringology, Bioinformatics, Algorithms, Musicology, Graph Theory, Networks)
10. Dr. A. K. M. Ashikur Rahman; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D., University of Alberta, Canada (Architecture, Compilers and Parallel Computing, Artificial Intelligence and Machine Learning, Software Engineering, Systems and Networking)
11. Dr. Md. Eunus Ali; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D., University of Melbourne, Australia (Databases, Data Analytics, Machine Learning, Ubiquitous Computing)
12. Dr. Mahmuda Naznin; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; M.S. North Dakota State University, USA; Ph.D, North Dakota State University, USA (Sensor Network, Network Security, Combinatorial Optimization, Linear and Non-linear Optimization, Meta Heuristics)

Associate Professors

1. Md. Abdus Sattar; B. Sc. Engg (EEE), Engineering College, Rajshahi; M. Sc. Engg (CSE), BUET (Natural Language Processing, Computer Aided Design, Digital System Design, Computer Architecture)
2. Dr. Md. Monirul Islam; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, Monash University, Australia (Digital Image Processing, Image Retrieval, Computer Vision, Machine Learning, Multimedia Technology, Artificial Intelligence)
3. Dr. S. M. Farhad; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, University of Sydney, Australia (Architecture, Compilers and Parallel Computing, Bioinformatics and Computational Biology, Systems and Networking)
4. Dr. Md. Shohrab Hossain; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, University of Oklahoma, USA (Artificial Intelligence and Machine Learning, Bioinformatics and Computational Biology, Systems and Networking)
5. Dr. Md. Yusuf Sarwar Uddin; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, University of Illinois at Urbana-Champaign (UIUC), IL, USA (Participatory sensing, Wireless Sensor Networks, Disruption-tolerant networking (DTN), Wireless and mobile networks, Distributed Computing and Systems)

6. Dr. Tanzima Hashem; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, University of Melbourne, Australia (Spatial Databases, Ubiquitous Computing, Location Privacy, Big Data Application and Analysis)

Assistant Professors

1. Abu Wasif, B. Sc. Engg (CSE); BUET; M. Sc. Engg (CSE), BUET (Artificial Intelligence, Machine Learning)
2. Khaled Mahmud Shahriar; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET (Graph Drawing, Networks, Computer Security)
3. Dr. Muhammad Abdullah Adnan; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, University of California, San Diego, USA (Bioinformatics and Computational Biology, Systems and Networking, Cloud Computing, Smart Grid & Sustainable Computing)
4. Dr. Rifat Shahriyar; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, Australian National University, Australia (Managed Runtime and Garbage Collection, Programming Language Design and Implementation, Computer Architecture, High Performance Computing)
5. Sukarna Barua; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET (Machine Learning, Data Mining, Wireless Ad-hoc Networks, Artificial Intelligence)
6. Dr. A. B. M. Alim Al Islam; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, Purdue University, USA (Wireless Networks Embedded Systems, Modeling and Simulation, Computer Network Security, Reliability Analysis)
7. Dr. Anindya Iqbal; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, Monash University, Australia (Wireless Sensor Networks, Participatory Sensing System, Security and Privacy)
8. Mohammad Saifur Rahman; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET (Networking, Distributed Systems, Bioinformatics, Algorithms)
9. Dr. Sadia Sharmin; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, University of Bergen, Norway (Algorithm, Graph Theory, Parallel Computing, Fixed Parameter tractability, Artificial Intelligence, Bioinformatics, Systems and Networking)

10. Johra Muhammad Moosa; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET (Algorithms and Theory, Bioinformatics and Computational Biology, Graphics, Visualization and Human Computer Interaction)
11. Dr. Atif Hasan Rahman; B. Sc. Engg (CSE), BUET; Ph.D, University of California, Berkeley, USA (Bioinformatics and Computational Biology, Algorithms)

Lecturers

1. Muhammad Ali Nayeem; B. Sc. Engg (CSE), BUET (Artificial Intelligence, Transportation, Web Mining, Information Extraction about the Chain of Narration of Hadith)
2. Md. Aashikur Rahman Azim; B. Sc. Engg (CSE), BUET (Bioinformatics, Artificial Intelligence, Embedded Systems)
3. Toufique Ahmed; B. Sc. Engg (CSE), BUET (Systems and Networking)
4. Abdus Salam Azad; B. Sc. Engg (CSE), BUET (Evolutionary Computation, Memetic Algorithm, Data Mining)
5. Tanvir Ahmed Khan; B. Sc. Engg (CSE), BUET (Cognitive Radio Networks, Embedded Systems, Machine Learning, Wireless Networks)
6. Ishat E Rabban; B. Sc. Engg (CSE), BUET (Computer Graphics, Algorithms)
7. Radi Muhammad Reza; B. Sc. Engg (CSE), BUET (Road Network, Spatial Database)
8. Siddhartha Shankar Das; B. Sc. Engg (CSE), BUET (Artificial Intelligence, Evolutionary Algorithm, Objective Optimization)
9. Mohammed Kaysar Abdullah; B. Sc. Engg (CSE), BUET (Algorithms)
10. Md. Iftekharul Islam Sakib; B. Sc. Engg (CSE), BUET (Computer Security, Data Mining, Networking)
11. Madhusudan Basak; B. Sc. Engg (CSE), BUET (Big Data Analytics, Social Network Analysis, Cloud Computing)
12. Tanmoy Sen; B. Sc. Engg (CSE), BUET (Big Data Analytics, Social Network Analysis, Cloud Computing)
13. Ishtiyaque Ahmad; B. Sc. Engg (CSE), BUET (Machine Learning, Pattern Recognition, Big Data Analytics, Operating Systems)

14. Nazmus Saquib; B. Sc. Engg (CSE), BUET (Machine Learning, Pattern Recognition, Big Data Analytics, Operating Systems)
15. Md. Tarikul Islam Papon; B. Sc. Engg (CSE), BUET (Machine Learning, Pattern Recognition, Big Data Analytics, Operating Systems)
16. Mehnaz Tabassum Mahin; B. Sc. Engg (CSE), BUET (Big Data Analytics, Social Network Analysis, Query Processing for Location-Based Services)
17. Sabbir Ahmad; B. Sc. Engg (CSE), BUET (Artificial Intelligence, Machine Learning, System Security)
18. Shareef Ahmed; B. Sc. Engg (CSE), BUET
19. Ch. Md. Rakin Haider; B. Sc. Engg (CSE), BUET (Machine Learning, Artificial Intelligence, Database and Data Mining)

Chapter 3

Rules and Regulations for Undergraduate Program

3.1 Introduction

From the academic session 1990-1991, the University has introduced a course system for undergraduate studies. The rules and regulations for administering undergraduate curricula through the Course System have been applicable to students henceforth. This new course system has been introduced with an aim of creating a continuous, even and consistent workload throughout the term for the students. This new curriculum does not demand the same rate of academic progress from all students for obtaining the degree but only lays down the pace expected of a normal student. A student whose background or capacity for assimilation is lower is permitted to complete the program at a slower pace by studying a fewer number of courses during a given term, subject to a minimum course load.

Given below is an extract from the report of the Committee for Framing Recommendations for Implementation and Administration of Course System of instruction at undergraduate level as approved in the meetings of the Academic Council held in 1992. Only relevant sections of the report and the amendments that were subsequently made to it are included for clarity.

3.1.1 The Course System

The salient features of the Course System are as follows:

1. Introduction of Letter Grade and Grade Points instead of numerical grades.

2. Limiting the number of theory courses and examination papers to around five in each term.
3. Introduction of more optional courses to enable the students to select courses according to their individual needs and preferences.
4. Continuous evaluation of students' performance.
5. Abolition of a pass or a fail on an annual basis.
6. Providing opportunity to a student to take fewer or more courses than the normal course load depending on own capability and needs.
7. Providing flexibility to allow a student to progress at a desired pace based on one's own ability or convenience, subject to some regulations on minimum earned credits and minimum Grade Point Average (GPA) requirements.
8. Promotion of student-teacher interaction and contact.

Besides the professional courses pertaining to each discipline, the undergraduate curriculum gives a strong emphasis on acquiring thorough knowledge in the basic sciences of mathematics, physics and chemistry. Due importance is also given on the study of several subjects in humanities and social sciences.

The first two terms of bachelor's degree programs generally consist of courses in basic engineering and architecture subjects, while the third and subsequent terms go on to develop competence in specific disciplines.

3.2 Student Admission

Students are admitted in undergraduate curricula in the Department of Architecture, Urban and Regional Planning, Chemical Engineering, Civil Engineering, Water Resources Engineering, Computer Science and Engineering, Electrical and Electronic Engineering, Mechanical Engineering, Industrial and Production Engineering, Materials and Metallurgical Engineering, and Naval Architecture and Marine Engineering as per existing rules of the university. The Registrar's Office serves as the Admissions Office and deals with course registration in addition to student admission.

3.3 Number of Terms in a Year

There will be two terms (Term I and Term II) in an academic year. In addition to these two regular terms there may be a short term in the

intervening period between the end of Term II and the commencement of Term I of the following academic session. During the short term, students may take additional courses to make up deficiencies in credit and GPA requirements for Bachelor's degree spending less time than the normal duration.

Respective departments will take the decisions about courses to be offered during each short term depending upon the availability of course teachers and number of students willing to take a particular course.

3.3.1 Duration of Terms

The duration of each of Term I and Term II will be 18 weeks that will be used as follows:

Classes	14 weeks
Recess before Term Final Examination	3 weeks
Term Final Examination (approximately)	2 weeks
Total	**18 weeks**

Normally 1 week of mid-term break is provided after 7 weeks of classes, which is followed by another 7 weeks of classes. The duration of a Short Term will be around 8 weeks of which about 7 weeks will be spent for class lectures and one week for Term Final Examination.

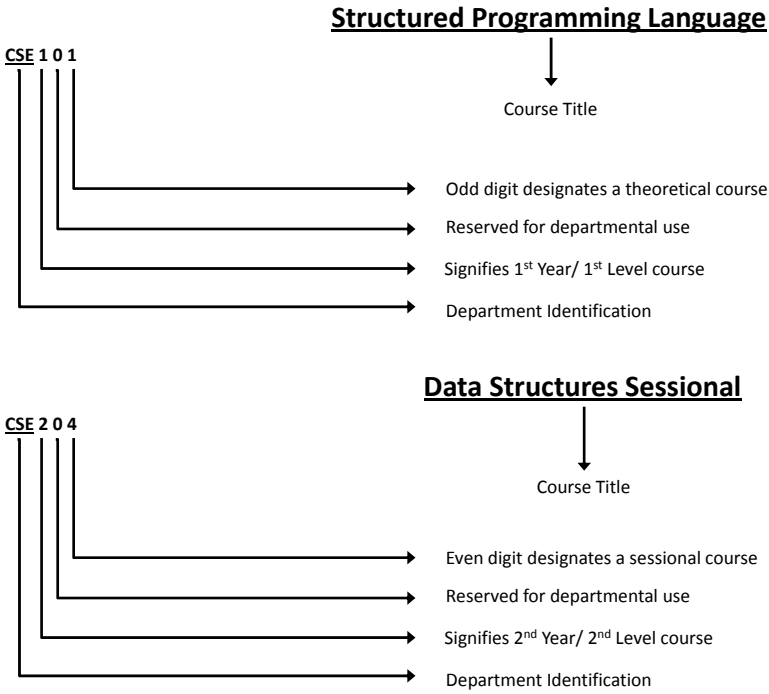
3.4 Course Pattern and Credit Structure

The undergraduate program is covered by a set of theoretical courses along with a set of laboratory/sessional courses to support them.

3.4.1 Course Designation System

Each course is designated by a two to four letter code identifying the department offering the code followed by a three-digit number having the following interpretation:

1. The first digit corresponds to the year/level in which the course is normally taken by the students.
2. The second digit is reserved for departmental use. It usually identifies a specific area of study within the department.
3. The last digit is an odd number for theoretical courses and an even number for sessional courses.



3.4.2 Assignment of Credits

The assignment of credits to a theoretical course follows a different rule from that of a sessional course.

1. Theoretical Courses: One lecture per week per term is equivalent to one credit.
2. Sessional Courses: Credits for sessional courses is half of the class hours per week per term.

Credits are also assigned to project and thesis work taken by the students. The amount of credits assigned to such work varies from one discipline to another.

3.4.3 Types of Courses

The types of courses included in the undergraduate curricula are divided into the following groups:

1. Core Courses: In each discipline, a number of courses are identified as core courses, which form the nucleus of the respective bachelor's degree program. A student has to complete all the designated core courses of his/her discipline.
2. Prerequisite Courses: Some of the core courses are identified as prerequisite courses for a specific subject. A prerequisite course is the one that is required to be completed before some other course(s) can be taken.
3. Optional Courses: Apart from the core courses, the students can choose from a set of optional courses. A required number of optional courses from a specified group have to be chosen.

3.5 Course Offering and Instruction

The courses to be offered in a particular term are announced and published in the Course Catalog along with the tentative Term Schedule before the end of the previous term. The courses to be offered in any term will be decided by the respective Board of Undergraduate Studies (BUGS). Respective departments may arrange to offer one or more prerequisite or core courses in any term depending upon the number of students who dropped or failed the course in the previous term.

Each course is conducted by a course teacher who is responsible for maintaining the expected standard of the course and for the assessment of students' performance. Depending on the strength of registered students (i.e. on the number of students) enrolled for the course, the teacher concerned might have course associates and Teaching Assistants (TA) to aid in teaching and assessment.

3.6 Departmental Monitoring Committee

Consistent with its resilient policy to keep pace with new developments in the field of science and technology, the university updates its course curriculum at frequent intervals (at least every three years). Such updating aims not only to include the expanding frontiers of knowledge in the various fields but also to accommodate the changing social, industrial and professional needs of the country. This can be done through the deletion

and modification of some of the courses and also through the introduction of new ones.

The Board of Undergraduate Studies (BUGS) of each department forms a Departmental Monitoring Committee with three teachers of the department. This committee is in charge of monitoring and evaluating the performance of the course system within the department. In addition to other teachers of the department, the committee may also propose from time to time to the Board of Undergraduate Studies (BUGS) any changes or modifications required for upgrading the undergraduate curriculum and the course system.

3.7 Teacher Student Interaction

The new system encourages students to come in close contact with the teachers. For promotion of a high level of teacher-student interaction, each student is assigned to an adviser and the student is free to discuss with his adviser all academic matters. Students are also encouraged to meet with other teachers any time for help and guidance in academic matters.

3.8 Student Adviser

One adviser is normally appointed for a group of students by the Board of Undergraduate Studies (BUGS) of the concerned department. The adviser advises each student about the courses to be taken in each term by discussing the academic program of that particular term with the student. However, it is also the student's responsibility to keep regular contact with his/her adviser who will review and eventually approve the student's specific plan of study and monitor subsequent progress of the student. The adviser is usually in the rank of an Assistant Professor or above of the concerned department.

For a student of second and subsequent terms, the number and nature of courses for which he/she can register is decided on the basis of academic performance during the previous term. The adviser may permit the student to drop one or more courses based on previous academic performance.

3.9 Course Registration

Any student who uses classroom or laboratory facilities or faculty time is required to register formally. Upon admission to the university each student is assigned to a student adviser with whose consent and advice the student can register for courses he intends to take during a given term.

3.9.1 Registration Procedure

At the commencement of each term, each student has to register for courses online in consultation with and under the guidance of his/her advisor. The date, time and venue of registration are announced in advance by the Registrar's Office. Much counseling and advising are accomplished at this time. It is absolutely essential that all the students be present for registration at the specified time. Late registration is, however, permitted during the first week on payment of a late registration fee.

3.9.2 Pre-conditions for Registration

For first year students, department-wise enrollment/admission is mandatory prior to registration. At the beginning of the first term, an orientation program is conducted for them where they are handed over with the registration package on the production of the enrollment slip/ proof of admission.

Any student other than freshmen having outstanding dues to the university or a hall of residence is not permitted to register. Each student must clear their dues and obtain a clearance certificate, upon production of which, he/she will be given necessary Course Registration Forms to perform course registration.

A student is allowed to register in a particular course subject to the class capacity constraints and satisfaction of pre-requisite courses. However, even if a student fails in a pre-requisite course in any term, the concerned BUGS may allow him/her to register for a course which depends upon the pre-requisite course provided that his/her attendance and performance in the continuous assessment of the mentioned pre- requisite course is found to be satisfactory.

3.9.3 Limits on the Credit Hours to be taken

A student must be enrolled for at least 15 credit hours and is allowed to take a maximum of 24 credit hours. A student must enroll for the sessional courses prescribed in a particular term within the allowable credit hour limits.

In special cases where it is not possible to allot the minimum required 15 credit hours to a student, the concerned BUGS may approve a lesser number of credit hours to suit individual requirements. Such cases are only applicable to students requiring less than 15 credit hours for graduation.

3.9.4 Registration Deadline

Each student must register for the courses to be taken before the commencement of each term. Late registration is permitted only during the first week of classes. Late registration after this date will not be accepted unless the student submits a written appeal to the registrar through the concerned Head of the department and can document extenuating circumstances such as medical problems from the Chief Medical Officer of the university or some other academic commitments which prohibits enrollment prior to the last date of registration.

3.9.5 Penalty for Late Registration

Students who fail to register during the designated dates for registration are charged a late registration fee of Tk. 500.00 (Five hundred only). This is not waived whatever the reason behind the delay in registration.

3.9.6 Course Add/Drop

A student has some limited options to add or delete courses from the registration list. Addition of courses is allowed only within the first two weeks of a regular term and only during the first week of a short term. Dropping a course is permitted within the first four weeks of a regular term and two weeks of a short term.

Any student willing to add or drop courses has to fill up a Course Adjustment Form that is available in the Registrar's Office. This also has to be done in consultation with and under the guidance of the student's respective adviser. The original copy of the Course Adjustment Form has to be submitted to the Registrar's Office, where the required number of photocopies are made for distribution to the concerned adviser, Head, Dean, Controller of Examinations and the student.

All changes must be approved by the adviser and the Head of the concerned department. The Course Adjustment Form has to be submitted after being signed by the concerned persons. The respective course teacher's consent is also required.

3.9.7 Withdrawal from a Term

If a student is unable to complete the Term Final Examination due to serious illness or serious accident, he/she may apply to the Head of the degree awarding department for total withdrawal from the term within a week after the end of the Term Final Examination. However, he/she

may choose not to withdraw any laboratory/sessional/design course if the grade obtained in such a course is 'D' or better. The application must be supported by a medical certificate from the Chief Medical Officer of the university. The Academic Council will take the final decision about such applications.

3.10 The Grading System

The total performance of a student in a given course is based on a scheme of continuous assessment. For theory courses this continuous assessment is made through a set of quizzes, class evaluation, class participation, homework assignment and a term final examination. The assessment in laboratory/sessional courses is made through observation of the student at work during the class, viva-voce during laboratory hours and quizzes.

Each course has a certain number of credits, which describes its corresponding weights. A letter grade with a specified number of grade points is awarded to each course for which a student is registered. A student's performance is measured both by the number of credits completed satisfactorily and by the weighted average of the grade point earned. A minimum grade point average (GPA) is essential for satisfactory progress. A minimum number of earned credits also have to be acquired in order to qualify for the degree.

Letter grades and corresponding grade points will be awarded in accordance with the provisions shown below.

Grade	Grade Point	Numerical Markings
A+	4.00	80% and above
A	3.75	75% to below 80%
A-	3.50	70% to below 75%
B+	3.25	65% to below 70%
B	3.00	60% to below 65%
B-	2.75	55% to below 60%
C+	2.50	50% to below 55%
C	2.25	45% to below 50%
D	2.00	40% to below 45%
F*	0.00	below 40%
X	-	Continuation (for project and thesis/design courses)
S	-	Satisfactory (non credit course)
U	-	Unsatisfactory (non credit course)

* Subject in which the student gets F grades shall not be counted towards credit hours requirements and for the calculation of Grade Point Average (GPA).

3.11 Distribution of Marks

Thirty percent (30%) of marks of a theoretical course shall be allotted for continuous assessment, i.e. quizzes, home assignments, class evaluation and class performance. The rest of the marks will be allotted to the Term Final Examination that is conducted centrally by the university. There are internal and external examiners for each course in the Term Final Examination of three hours duration. Distribution of marks for a given course is as follows.

Class Participation	10%
Homework assignment and quizzes	20%
Final Examination (3 hours)	70%
Total	**100%**

Basis for awarding marks for class participation and attendance will be as follows.

Attendance	Marks
90% and above	10
85% to less than 90%	9
80% to less than 85%	8
75% to less than 80%	7
70% to less than 75%	6
65% to less than 70%	5
60% to less than 65%	4
Below 60%	0

The number of class tests of a course shall be $n + 1$, where n is the number of credits of the course. Evaluation of performance in class tests will be on the basis of the best n class tests. The scheme of continuous assessment that a particular teacher wishes to follow for a course will be announced on the first day of classes.

3.12 Calculation of GPA

Grade Point Average (GPA) is the weighted average of the grade points obtained of all the courses passed/completed by a student. For example, if a student passes/completes n courses in a term having credits of $C_1, C_2, \ldots, C_n$ and his grade points in these courses are $G_1, G_2, \ldots, G_n$ respectively then,

$$\text{GPA} = \frac{\sum_{i=1}^{n} C_i \times G_i}{\sum_{i=1}^{n} C_i}.$$

The Cumulative Grade Point Average (CGPA) is the weighted average of the GPA obtained in all the terms passed/completed by a student. For example, if a student passes/completes n terms having total credits of $TC_1, TC_2, \ldots, TC_n$ and his GPA in these terms are $\text{GPA}_1, \text{GPA}_2, \ldots, \text{GPA}_n$ respectively then,

$$\text{CGPA} = \frac{\sum_{i=1}^{n} TC_i \times \text{GPA}_i}{\sum_{i=1}^{n} TC_i}.$$

3.12.1 A Numerical Example

Suppose a student has completed eight courses in a term and obtained the following grades:

Course	Credits (C_i)	Grade	Grade Point (G_i)	$C_i * G_i$
PHY 109	4.00	A+	4.00	16.00
PHY 102	1.50	A+	4.00	6.00
CSE 101	3.00	A+	4.00	12.00
CSE 102	1.50	A+	4.00	6.00
EEE 163	3.00	A-	3.50	10.50
EEE 164	1.50	A+	4.00	6.00
MATH 145	3.00	A	3.75	11.25
ME 165	3.00	B	3.00	9.00
ME 174	1.50	A+	4.00	6.00
Total	**22.00**			**82.75**

GPA = 82.75/22.00 = 3.76

Suppose a student has completed four terms and obtained the following GPA:

Level	Term	Credits Hours Earned (TC_i)	GPA Earned (GPA_i)	$TC_i * GPA_i$
1	I	19.50	3.70	72.150
1	II	20.50	3.93	80.565
2	I	21.25	3.96	84.150
2	II	20.25	4.00	81.000
Total		**81.50**		**317.865**

CGPA = 317.865/81.50 = 3.90

3.13 Impacts of Grade Earned

The courses in which a student has earned a 'D' or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained an 'F' grade will not be counted towards his/her earned credits or GPA calculation. However, the 'F' grade will remain permanently on the Grade Sheet and the Transcript.

A student who obtains an 'F' grade in a core course will have to repeat that particular course. However, if a student gets an 'F' in an optional course, he/she may choose to repeat that course or take a substitute course if available. When a student will repeat a course in which he/she has previously obtained an 'F', he/she will not be eligible to get a grade better than 'B' in that repeated course.

If a student obtains a grade lower than 'B' in a particular course he/she will be allowed to repeat the course only once for the purpose of grade improvement by forgoing his/her earlier grade. However, he/she will not be eligible to get a grade better than 'B' for an improvement course. A student will be permitted to repeat for grade improvement purposes a maximum of four courses in B. Sc. Engineering and BURP programs and a maximum of five courses in B. Arch. program.

If a student obtains a 'B' or a better grade in any course he/she will not be allowed to repeat the course for the purpose of grade improvement.

3.14 Classification of Students

At Bangladesh University of Engineering and Technology (BUET), regular students are classified according to the number of credit hours completed/ earned towards a degree. The following classification applies to all the students:

Level	Credit Hours Earned	
	Engineering/URP	Architecture
Level 1	0.0 to 36.0	0.0 to 34.0
Level 2	More than 36.0 to 72.0	More than 34.0 to 72.0
Level 3	More than 72.0 to 108.0	More than 72.0 to 110.0
Level 4	More than 108.0	More than 110.0 to 147.0
Level 5	-	More than 147.0

However, before the commencement of each term all students other than freshmen are classified into three categories:

Category 1: This category consists of students who have passed all the courses described for the term. A student belonging to this category will be eligible to register for all courses prescribed for the upcoming term.

Category 2: This category consists of students who have earned a minimum of 15 credits but do not belong to category 1. A student belonging to this category is advised to take at least one course less

since he might have to register for one or more backlog courses as prescribed by his/her adviser.

Category 3: This category consists students who have failed to earn the minimum required 15 credits in the previous term. A student belonging to this category is advised to take at least two courses less than a category 1 student subject to the constraint of registering at least 15 credits. However, he will also be required registering for backlog courses as prescribed by the adviser.

3.15 Performance Evaluation

The performance of a student will be evaluated in terms of two indices, viz. Term Grade Point Average and Cumulative Grade Point Average which is the grade average for all the terms completed.

Students will be considered to be making normal progress toward a degree if their Cumulative Grade Point Average (CGPA) for all work attempted is 2.20 or higher. Students who regularly maintain a term GPA of 2.20 or better are making good progress toward the degrees and are in good standing with the university. Students who fail to maintain this minimum rate of progress will not be in good standing. This can happen when any one of the following conditions exists.

1. The term GPA falls below 2.20.
2. The Cumulative Grade Point Average (CGPA) falls below 2.20.
3. The earned number of credits falls below 15 times the number of terms attended.

All such students can make up their deficiencies in GPA and credit requirements by completing courses in the subsequent term(s) and backlog courses, if there are any, with better grades. When the minimum GPA and credit requirements are achieved the student is again returned to good standing.

3.16 Probation and Suspension

Undergraduate students who fail to maintain the minimum rate of progress as mentioned before may be placed on academic probation. The objective of the academic probation is to remind or warn the student that satisfactory progress towards graduation is not being made. A student may be placed on academic probation when either of the following conditions exists.

1. The term GPA falls below 2.20.

2. The Cumulative Grade Point Average (CGPA) falls below 2.20.

Students on probation are subject to such restrictions with respect to courses and extracurricular activities as may be imposed by the respective Dean of Faculty.

The minimum period of probation is one term, but the usual period is one academic year. This gives the student an opportunity to improve the GPA through the completion of additional course work during the period the student is on probation. The probation may be extended for additional terms until the students achieve an overall GPA of 2.20 or better.

An academic probation is not to be taken lightly. A student on academic probation who fails to maintain a GPA of at least 2.20 during two consecutive academic years may be suspended from the university. A student who has been suspended may petition to the Dean of Faculty, but this petition will not be considered until the student has been suspended for at least one full term.

Petitions for reinstatement must set forth clearly the reasons for the previous unsatisfactory academic records and it must delineate the new conditions that have been created to prevent the recurrence of such work. Each such petition is considered individually on its own merits.

After consideration of the petition, and perhaps after consultation with the student, the Dean in some cases reinstates the student if this is the first suspension of that student. However, a second suspension from the university will be regarded as final and absolute.

3.17 Measures for Helping Academically Weak Students

First, academically weak students will be identified according to the following criteria:

1. The term GPA falls below 2.20.
2. The Cumulative Grade Point Average (CGPA) falls below 2.20.
3. The earned number of credits falls below 15 times the number of terms attended.

The following provisions will be made as far as possible to help such academically weak students to enable them to complete their studies within the maximum allowable period of 7 years in Engineering and 8 years in Architecture.

1. All such students may be given a load of not more than four courses in the term following the term in which the student's GPA was below 2.20.

2. Some basic and core courses maybe offered during the short term in order to enable academically weak students to partially make up for the reduced work load during the regular terms.

3.18 Rules for Special Courses

A special course is a self-study course, but is among the regular courses listed in the course catalog. This type of course is offered only in exceptional cases. The following rules are applicable to all special courses:

1. Whether a course is to be floated as a special course will be decided by the Head of the concerned department in consultation with the teacher/course coordinator concerned. Such a decision also has to be reported to the Academic Council.
2. A special course may be offered in a particular term only if the course is not running in that term as a regular course.
3. The special course is offered to a student in his/her last term if it helps him/her to graduate in that term.
4. A student is allowed to register for a maximum of two courses on a self-study basis.
5. A special course cannot be utilized for grade improvement purposes.
6. Normally no lecture will be delivered for a special course but laboratory/design classes may be held if they form part of a course.
7. The course coordinator/course teacher will assign homework, administer quizzes, and final examination for giving assessments at the end of the term.

3.19 Rules for Courses Offered in Short Term

1. The courses to be run during the short term shall be decided on the recommendations of departments on the basis of essential deficiencies to be made up by a group of students. Once floated, other students could be allowed to register in those courses subject to the capacity constraints and satisfaction of prerequisites.
2. Student will be allowed to register in a maximum of two courses during the Short Term.
3. A student may be given a weight of up to 6 credits in any Short Term following a graduation/final term if he/she is short by a maximum of

6 earned credits only, on a self-study basis with no formal instruction. In a self-study course, there will be a final examination, beside the continuous assessment.

4. A certain fee for each credit hour to be registered to be borne by the students who enroll during Short Term.

3.20 Minimum Earned Credit and GPA Requirement for Obtaining Degree

Minimum credit hour requirements for the award of bachelor's degree in engineering (B. Sc. Engg.) and architecture (B. Arch.) will be decided by the respective BUGS. However, at least 157 credit hours for engineering and 190 credit hours for architecture must be earned to be eligible for graduation, and this must include the specified core courses.

The minimum GPA requirement for obtaining a Bachelor's degree in engineering and architecture is 2.20.

A student may take additional courses with the consent of his/her Adviser in order to raise GPA, but he/she may take a maximum of 15 such additional credits in engineering and 18 such additional credits in architecture beyond respective credit-hour requirements for Bachelor's degree during his/her entire period of study.

3.20.1 Application for Graduation and Award of Degree

A student who has fulfilled all the academic requirements for Bachelor's degree will have to apply to the Controller of Examinations through his/her Adviser for graduation. Provisional degree will be awarded on completion of credit and GPA requirements. Such provisional degrees will be confirmed by the Academic Council.

3.21 Time Limits for Completion of Bachelor's Degree

A student must complete his studies within a maximum period of seven years for engineering and eight years for architecture.

3.22 Attendance, Conduct and Discipline

The university has strict rules regarding the issues of attendance in class and regarding the disciplinary issues.

3.22.1 Attendance

All students are expected to attend classes regularly. The university believes that attendance is necessary for effective learning. The first responsibility of a student is to attend classes regularly, and one is required to attend at least 60% of all classes held in any course.

3.22.2 Conduct and Discipline

A student is expected conform to a high standard of discipline and conduct himself/herself, within and outside the precincts of the university in a manner befitting the students of a university of national importance. He is expected to show due courtesy and consideration to the employees of the university and Halls of Residence, good neighborliness to his fellow students and the teachers of the university and pay due attention and courtesy to visitors.

To safeguard its ideal of scholarship, character and personal behavior, the university reserves the right to withdraw any student at any time for any reason deemed sufficient.

3.23 Absence During a Term

A student should not be absent from quizzes, class tests, etc. during the term. Such absence will naturally lead to reduction in points/marks which count towards the final grade. Absence in the Term Final Examination will result in an 'F' grade in the corresponding course.

A student who has been absent for short periods, up to a maximum of three weeks due to illness, should approach the course teacher(s) or the course coordinator(s) for make-up quizzes or assignments immediately upon return to classes. Such request has to be supported by medical certificate from a University Medical Officer. The medical certificate issued by a registered medical practitioner (with the registration number shown explicitly on the certificates) will also be acceptable only on those cases where the student has valid reasons for his absence from the university.

3.24 Honors

Candidates for Bachelor's degree in Engineering and Architecture will be awarded the degree with honors if their Cumulative Grade Point Average (CGPA) is 3.75 or better.

3.24.1 Dean's List

As a recognition of excellent academic performance, the names of students obtaining an average GPA of 3.75 or above in two consecutive regular terms of an academic year may be published in the Dean's List in each Faculty. Students who have received an 'F' grade in any course during any of the two regular terms will not be considered for the Dean's List in that year.

3.24.2 Gold Medal

Gold medal for outstanding Computer Science and Engineering graduates has been introduced and the medal is presented to the student who secures the first position in the entire class and whose CGPA is above 3.75. The student must have completed his/her undergraduate coursework within four consecutive academic years and have a satisfactory attendance to his credit.

Chapter 4

Course Requirements for Undergraduate Computer Science and Engineering Students

Undergraduate students of the Department of Computer Science and Engineering have to follow a particular course schedule which is given in this chapter according to term-wise distribution of the courses.

Level-1 Term-I

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE101	Structured Programming Language	3.00	-	3.00	
CSE102	Structured Programming Language Sessional	-	3.00	1.50	
EEE163	Introduction to Electrical Engineering	3.00	-	3.00	
EEE164	Introduction to Electrical Engineering Sessional	-	3.00	1.50	
MATH145	Differential Calculus, Integral Calculus, and Coordinate Geometry	3.00	-	3.00	
ME165	Basic Mechanical Engineering	3.00	-	3.00	
ME174	Mechanical Engineering Drawing and CAD	-	3.00	1.50	
PHY102	Physics Sessional	-	3.00	1.50	
PHY109	Heat & Thermodynamics, Electricity & Magnetism, Waves & Oscillations and Mechanics	4.00	-	4.00	
	Total	**16.00**	**12.00**	**22.00**	

Level-1 Term-II

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE103	Discrete Mathematics	3.00	-	3.00	
CSE107	Object Oriented Programming Language	3.00	-	3.00	CSE101
CSE108	Object Oriented Programming Language Sessional	-	3.00	1.50	
CHEM113	Chemistry	3.00	-	3.00	
CHEM114	Inorganic Quantitative Analysis	-	3.00	1.50	
HUM172	Developing English Skills Sessional	-	3.00	1.50	
HUM183	English	3.00	-	3.00	
MATH147	Ordinary Differential Equations (ODE), Partialy Differential Equations (PDE) and Vector Calculus	4.00	-	4.00	
	Total	**16.00**	**9.00**	**20.50**	

Level-2 Term-I

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE203	Data Structures	3.00	-	3.00	CSE101
CSE204	Data Structures Sessional	-	3.00	1.50	
CSE205	Digital Logic Design	3.00	-	3.00	
CSE206	Digital Logic Design Sessional	-	3.00	1.50	
CSE218	Numerical Methods	-	2.00	2.00	
EEE263	Electronic Circuits	4.00	-	4.00	EEE163
EEE264	Electronic Circuits Sessional	-	3.00	1.50	
MATH245	Complex Variable and Statistics	3.00	-	3.00	
	Total	**13.00**	**11.00**	**19.50**	

Level-2 Term-II

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE207	Algorithms	3.00	-	3.00	CSE103, CSE203
CSE208	Algorithms Sessional	-	1.50	0.75	
CSE211	Theory of Computation	3.00	-	3.00	
CSE215	Database	3.00	-	3.00	
CSE216	Database Sessional	-	3.00	1.50	
EEE269	Electrical Drives and Instrumentation	3.00	-	3.00	
EEE270	Electrical Drives and Instrumentation Sessional	-	3.00	1.50	
MATH247	Linear Algebra, Laplace Transformation and Fourier Analysis	4.00	-	4.00	
	Total	**16.00**	**7.50**	**19.75**	

Level-3 Term-I

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE300	Technical Writing and Presentation	-	1.50	0.75	
CSE305	Computer Architecture	3.00	-	3.00	CSE205
CSE306	Computer Architecture Sessional	-	1.50	0.75	
CSE307	Software Engineering	3.00	-	3.00	
CSE308	Software Engineering Sessional	-	1.50	0.75	
CSE309	Compiler	3.00	-	3.00	CSE211
CSE310	Compiler Sessional	-	1.50	0.75	
CSE311	Data Communication	3.00	-	3.00	MATH247
CSE315	Microprocessors, Microcontrollers, and Embedded Systems	3.00	-	3.00	CSE205
CSE316	Microprocessors, Microcontrollers, and Embedded Systems Sessional	-	3.00	1.50	
	Total	**15.00**	**9.00**	**19.50**	

Level-3 Term-II

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE301	Mathematical Analysis for Computer Science	3.00	-	3.00	
CSE313	Operating System	3.00	-	3.00	
CSE314	Operating System Sessional	-	3.00	1.50	
CSE317	Artificial Intelligence	3.00	-	3.00	
CSE318	Artificial Intelligence Sessional	-	1.50	0.75	
CSE321	Computer Networks	3.00	-	3.00	
CSE322	Computer Networks Sessional	-	3.00	1.50	
CSE325	Information System Design	3.00	-	3.00	
CSE326	Information System Design Sessional	-	1.50	0.75	
	Total	**15.00**	**9.00**	**19.50**	

Level-4 Term-I

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE400	Project and Thesis	-	6.00	3.00	
CSE405	Computer Security	3.00	-	3.00	
CSE406	Computer Security Sessional	-	1.50	0.75	
CSE408	Software Development	-	1.50	0.75	
CSE409	Computer Graphics	3.00	-	3.00	
CSE410	Computer Graphics Sessional	-	1.50	0.75	
CSEnnn	CSE Option 1	3.00	-	3.00	
CSEnnn	CSE Option 2	3.00	-	3.00	
HUM475	Engineering Economics	3.00	-	3.00	
	Total	**15.00**	**10.50**	**20.25**	

Option 1 and 2

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE421	Basic Graph Theory	3.00	-	3.00	CSE103
CSE423	Fault Tolerant Systems	3.00	-	3.00	
CSE425	Human Computer Interaction	3.00	-	3.00	
CSE453	High Performance Database System	3.00	-	3.00	CSE215
CSE457	Wireless Networks	3.00	-	3.00	CSE321
CSE459	Communication Systems	3.00	-	3.00	
CSE463	Introduction to Bioinformatics	3.00	-	3.00	CSE207
CSE465	Semantics of Programming Languages	3.00	-	3.00	CSE211
CSE467	Software Architecture	3.00	-	3.00	
EEE463	Optical Communications	3.00	-	3.00	
EEE465	Telecommunication Systems	3.00	-	3.00	

Level-4 Term-II

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE400	Project and Thesis	-	6.00	3.00	
CSEnnn	CSE Option 3	3.00	-	3.00	
CSEnnn	CSE Option 3 Sessional	-	3.00	1.50	
CSEnnn	CSE Option 4	3.00	-	3.00	
CSEnnn	CSE Option 4 Sessional	-	3.00	1.50	
HUMnnn	HUM Option 1	2.00	-	2.00	
HUM473	Financial, Cost, and Managerial Accounting	2.00	-	2.00	
IPE493	Industrial Management	3.00	-	3.00	
	Total	**13.00**	**12.00**	**19.00**	

Option 3 and 4

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE411	Simulation and Modeling	3.00	-	3.00	
CSE412	Simulation and Modeling Sessional	-	3.00	1.50	
CSE413	High Performance Computing	3.00	-	3.00	
CSE414	High Performance Computing Sessional	-	3.00	1.50	
CSE415	Real-time Embedded Systems	3.00	-	3.00	
CSE416	Real-time Embedded Systems Sessional	-	3.00	1.50	
CSE461	Algorithm Engineering	3.00	-	3.00	CSE207
CSE462	Algorithm Engineering Sessional	-	3.00	1.50	
CSE471	Machine Learning	3.00	-	3.00	CSE317
CSE472	Machine Learning Sessional	-	3.00	1.50	
CSE473	Pattern Recognition	3.00	-	3.00	CSE317
CSE474	Pattern Recognition Sessional	-	3.00	1.50	
CSE475	Robotics	3.00	-	3.00	CSE317
CSE476	Robotics Sessional	-	3.00	1.50	
CSE481	VLSI Design	3.00	-	3.00	CSE205
CSE482	VLSI Design Sessional	-	3.00	1.50	
CSE483	Interfacing	3.00	-	3.00	CSE205
CSE484	Interfacing Sessional	-	3.00	1.50	
CSE485	Digital Signal Processing	3.00	-	3.00	
CSE486	Digital Signal Processing Sessional	-	3.00	1.50	
CSE487	Mobile Applications Development	3.00	-	3.00	CSE107
CSE488	Mobile Applications Development Sessional	-	3.00	1.50	

HUM Option 1

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
HUM411	Business Law	2.00	-	2.00	
HUM477	Sociology for Science and Technology	2.00	-	2.00	
HUM479	Government	2.00	-	2.00	
HUM481	Entrepreneurship for IT Business	2.00	-	2.00	

Summary

Level Term	Hours/Week		Credit	No. of Theory Courses
	Theory	Sessional		
Level 1 Term I	16.00	12.00	22.00	5
Level 1 Term II	16.00	9.00	20.50	5
Level 2 Term I	13.00	11.00	19.50	4
Level 2 Term II	16.00	7.50	19.75	5
Level 3 Term I	15.00	9.00	19.50	5
Level 3 Term II	15.00	9.00	19.50	5
Level 4 Term I	15.00	10.50	20.25	5
Level 4 Term II	13.00	12.00	19.00	5
Total	**119.00**	**80.00**	**160.00**	**39**

Chapter 5

Detailed Outline of Courses

Level-1 Term-I

CSE 101 Structured Programming Language

3 hours in a week, 3.00 credits

Structured programming language: data types, operators, expressions, control structures; Functions and program structure: parameter passing conventions, scope rules and storage classes, recursion; Header files; Preprocessor; Pointers and arrays; Strings; Multidimensional array; User defined data types: structures, unions, enumerations; Input and Output: standard input and output, formatted input and output, file access; Variable length argument list; Command line parameters; Error Handling; Graphics; Linking; Library functions.

Reference language: C.

CSE 102 Structured Programming Language Sessional

3 hours in a week, 1.50 credits

Sessional based on CSE 101; A project work will be included.

EEE 163 Introduction to Electrical Engineering

3 hours in a week, 3.00 credits

Direct current: voltage, current, resistance and power; Laws of electrical circuits and methods of network analysis;
Introduction to filters: Passive and Active filters; Alternating current: Instantaneous and rms values of current, voltage and power, average power,

for various combination of R, L and C circuits, phasor representation of sinusoidal quantities; Balanced three phase circuit circuits; Ideal operational amplifier circuits.

EEE 164 Introduction to Electrical Engineering Sessional

3 hours in a week, 1.50 credits

Sessional based on EEE 163.

MATH 145 Differential Calculus, Integral Calculus and Coordinate Geometry

3 hours in a week, 3.00 credits

Differential Calculus: Continuity and differentiability; Leibnitz's forms; Lagrange's form of remainders; Cauchy's form of remainder; Expansion of functions; Evaluation of indeterminate forms by L 'Hospitals rule; Partial differentiation; Euler's Theorem; Tangent and Normal; Sub-tangent and subnormal in Cartesian and polar coordinates; Maximum and minimum values of functions of single variable. (1.0 credit)

Integral Calculus: Definite integrals and its properties; Wally's formula; Improper integrals; Beta function and Gamma function; Area under a plane curve in Cartesian and polar coordinates; Area of the region enclosed by two curves in Cartesian and polar coordinates; Arc lengths of curves in Cartesian and polar coordinates; Volume of solids of revolution; Area of surface of revolution; Multiple integrals. (1.0 credit)

Coordinate Geometry: Transformation of coordinates axes and its uses; General equations of second degree and their reduction to standard forms; Pair of straight lines; System of circles; Coaxial circles and limiting points; Equations of parabola, ellipse and hyperbola in Cartesian coordinates; Tangents and normal; Pair of tangents; Chord of contact; Chord in terms of its middle point.;Parametric coordinates; Conjugate diameters; Asymptotes. (1.0 credit)

ME 165 Basic Mechanical Engineering

3 hours in a week, 3.00 credits

Sources of energy: conventional and renewable; Introduction to IC engines, Refrigeration and Air conditioning systems. Statics of particles and rigid

bodies; Forces in trusses and frames; Relative motion; Kinematics of particles: Newton's Second Law of Motion; Kinematics of rigid bodies. Introduction to Robotics; Plane, rotational and spatial motion with applications to manipulators; Geometric configurations: structural elements, linkage, arms and grippers; Motion characteristics.

ME 174 Mechanical Engineering Drawing and CAD

3 hours in a week, 1.50 credits

Introduction; Instruments and their uses; Third angle projection; Orthographic drawing; Isometric views; Sectional views; Introduction to computer graphic software: Computer aided drawing (CAD).

PHY 109 Heat & Thermodynamics, Electricity & Magnetism, Waves & Oscillations and Mechanics

4 hours in a week, 4.00 credits

Heat & Thermodynamics: Principle of temperature measurements: platinum resistance thermometer, Thermo-electric thermometer, Pyrometer; Kinetic theory of gases: Maxwell's distribution of molecular speeds, Mean free path, Equipartition of energy, Brownion motion, Van der Wool's equation of state, Review of the First Law of Thermodynomics and its application, Reversible and irreversible processes, Second Law of Thermodynamics, Carnot cycle; Efficiency of heat engines, Carnots theorem, Entropy and disorder, Thermodynamic functions, Maxwell relations, Clausius-Clopeyron equation, Gibbs phase rule, Third Law of Thermodynamics.

Electricity & Magnetism: Coulomb's Law, Electric field (E), Gouss's Law and its application, Electric potential (V), Capacitors and capacitance, Capacitors with dielectrics, Dielectrics on atomic view, Charging and discharging of a capacitor, Ohm's Law, Kirchhoff's Law; Magnetic field: Magnetic induction, Magnetic force on a current carrying conductor, Torque on a current carrying loop, Hall effect, Faraday's Law of electromagnetic induction, Lenz's Law, Self induction, Mutual induction; Magnetic properties of matter: Hysteresis curve, Electromagnetic oscillation: L-C oscillations and its analogy to simple harmonic motion.

Waves & Oscillations: Differential equation of a simple harmonic oscillator, Total energy and average energy, Combination of simple harmonic oscillations, Lissajous figures, Spring mass system,

Calculation of time period of torsional pendulum, Damped oscillation, Determination of damping co-efficient. Forced oscillation, Resonance, Two-body oscillations, Reduced mass, Differential equation of a progressive wave, Power and intensity of wave motion, Stationary wave, Group velocity and phase velocity, Architectural acoustics, Reverberation and Sabine's formula.

Mechanics: Linear momentum of a particle, Linear momentum of a system of particles, Conservation of linear momentum, Some applications of the momentum principle; Angular momentum of a particle, Angular momentum of a system of particles, Kepler's Law of planetary motion, The Law of universal gravitation, The motion of planets and satelites, Introductory quantum mechanics; Wave function, Uncertainity principle, Postulates, Schrodinger time independent equation, Expectation value, Probability, Particle in a zero potential, Calculation of energy.

PHY 102 Physics Sessional

3 hours in a week, 1.50 credits

Sessional based on PHY 109.

Level-1 Term-II

CSE 103 Discrete Mathematics

3 hours in a week, 3.00 credits

Set theory: sets, relations, and partial ordered sets; functions; Mathematical Logic: propositional calculus and predicate calculus; Mathematical reasoning and proof techniques; Counting: permutations, combinations, principles of inclusion and exclusion; Discrete Probability; Recurrence relations and recursive algorithms; Growth of functions; Graph Theory: graphs, paths, and trees; Algebraic structures: rings and groups.

CSE 107 Object Oriented Programming Language

3 hours in a week, 3.00 credits

Philosophy of Object Oriented Programming (OOP); Advantages of OOP over structured programming; Encapsulation, classes and objects, access specifiers, static and non-static members; Constructors, destructors and copy constructors; Array of objects, object pointers, and object references; Inheritance: single and multiple inheritance; Polymorphism:

overloading, abstract classes, virtual functions and overriding; Exceptions; Object Oriented I/O; Template functions and classes; Multi-threaded Programming.

Reference languages: C++ and Java.

CSE 108 Object Oriented Programming Language Sessional

3 hours in a week, 1.50 credits

Sessional based on CSE 107; A project work will be included.

MATH 147 Ordinary Differential Equations (ODE), Partial Differential Equations (PDE) and Vector Calculus

4 hours in a week, 4.00 credits

Ordinary Differential Equation (ODE): Degree and order of ordinary differential equation; Formation of differential equations; Solution of first order differential equations by various methods; Solution of first order but higher degree ordinary differential equations; Solution of general linear equations of second and higher orders with constant coefficients; Solution of homogeneous linear equations and its applications; Solution of differential equations of higher order when dependent and independent variables are absent. (1.5 credit)

Partial Differential Equations (PDE): Introduction; Solution of linear and non-linear PDE of order one; Second order linear PDE: its nomenclature and classifications to standard forms: Parabolic Elliptic and Hyperbolic; Solution of second order linear PDE by separation of variables; Higher order linear PDE with constant coefficients. (1.0 credit)

Vector Calculus: Multiple products of vectors; Differentiation and integration of vectors together with elementary applications; Gradient, divergence and curl of point functions; Various formulae; Definition of line, surface and volume integrals;Green's theorem; Gauss's theorem; Stoke's theorem. (1.5 credit)

CHEM 113 Chemistry

3 hours in a week, 3.00 credits

Dual nature of electron and modern concept of chemical bonds, properties and molecular structure; Solutions and properties of dilute solution; Introduction to colloids and nano chemistry; Phase rule, phase diagram

of mono-component systems; Thermo-chemistry; Kirchhoff's equation and experimental determination of calorific values of foods and fuels; Chemistry of biodegradable and conductive polymer; Theory of electrolytic conduction, ionic mobility, transports number; Chemistry of proteins, nucleic acids (DNA, RNA), carbohydrates and lipids; Introduction to computational chemistry.

CHEM 114 Inorganic Quantitative Analysis

3 hours in a week, 1.50 credits

Analysis of materials: Determination of Cu, Fe, Ca etc.

Analysis of water: Determination of alkali, hardness, chlorides and chlorine and dissolved oxygen.

Analysis of fat and oils: Determination of iodine value, saponification value and acid value.

HUM 183 English

3 hours in a week, 3.00 credits

English Phonetics: the places and manners of articulation of English sounds; Vocabulary: techniques of enriching stock of words; English Grammar: construction of sentences; common grammatical problems;Reading: techniques and strategies for improving comprehension skills; prose pieces by renowned authors; Writing: developing paragraphs as the building blocks of larger discourses; Business Correspondence: importance, classifications and structures; Report: types and layout of reports; Technical Writing: research paper; dissertation and thesis; technical proposals; instruction manual.

HUM 172 Developing English Skills

3 hours in a week, 1.50 credits

Grammar: Tense, Article, Preposition, Subject Verb Agreement, Clause, Conditional, and Sentence structure; Vocabulary Building: Correct and Precise Diction, Affixes, Level of Appropriateness, Colloquial and Standard, Informal and Formal; Developing Reading Skills: Strategies of Reading-Skimming, Scanning, Predicting, Inference, Analysis and Interpreting Variety of Texts, Practicing Comprehension From Literary and Non Literary Texts; Developing Writing Skills: Sentences, Sentence Variety, Generating Sentences, Clarity and Correctness of Sentences, Linking Sentences to Form Paragraphs, Writing Paragraphs, Essays,

Reports, Formal and Informal Letters; Listening Skill and Note Taking: Listening to Recorded Texts and Class Lectures and Learning to Take Useful Notes Based on Listening; Developing Speaking Skills: Oral Skills Including Communicative Expressions For Personal Identification, Life at Home, Giving Advice and Opinion, Instructions and Directions, Requests, Complaints, Apologies, Describing People and Places, Narrating events.

Level-2 Term-I

CSE 203 Data Structures

3 hours in a week, 3.00 credits

Internal data representation; Abstract data types; Elementary asymptotic analysis: growth of functions, O, Ω and Θ notations; Elementary data structures: arrays, linked lists, stacks, queues, trees and tree traversals, graphs and graph representations, heaps, binary search trees; Sorting: heap sort, merge sort, quick sort; Data structures for set operations; Advanced data Structures: balanced binary search trees (AVL trees, red-black trees, splay trees, skip lists), advanced heaps (Fibonacci heaps, binomial heaps); Hashing.

CSE 204 Data Structures Sessional

3 hours in a week, 1.50 credits

Sessional based on CSE 203.

CSE 205 Digital Logic Design

3 hours in a week, 3.00 credits

Digital logic: Boolean algebra, De Morgan's Theorems, logic gates and their truth tables, canonical forms, combinational logic circuits, minimization techniques; Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and demultiplexers; Combinational circuit design; Flip-flops; race around problems; Counters: asynchronous and synchronous counters and their applications; Asynchronous and synchronous logic design: State diagram, Mealy and Moore machines; State minimizations and assignments; Pulse mode logic; Fundamental mode design; PLA design; Design using MSI and LSI components.

CSE 206 Digital Logic Design Sessional

3 hours in a week, 1.50 credits

Sessional based on CSE 205;

Reference tool: Verilog; Shall include Implementations in Hardware.

CSE 218 Numerical Methods

4 hours in a week, 2.00 credits

Introduction; Solution of Non-linear Equations: Fixed Point Iteration, Bi-Section method, False Position method, Newton-Raphson method, Bairstow's Method; Solution of Linear equations: Triangular systems and back substitution, Gauss-Jordan elimination method, Pivoting, LU-factorization, Cholesky's method, Dolittle and Crout factorization; Interpolation and Approximation: Taylor's Series, Lagrangian interpolation, Divided differences formula, Newton's forward and backward interpolation, Spline interpolation; Differentiation: Numerical differentiation, Richardson's extrapolation; Integration: Newton's-Cote integration, Trapezoidal rule, Simpson's rule, Romberg's integration; Ordinary Differential Equations: Euler's method, Picard's method, Milne's method, Taylor's series method, Runge-Kutta method; Curve Fitting: Least squares lines, Least square polynomials, Non-linear curve fitting; Numerical Optimization: Golden Ratio search, Newton's search, Powell's method, Gradient search.

Reference Tools: Matlab. Codes are to be written as well in Matlab.

EEE 263 Electronic Circuits

4 hours in a week, 4.00 credits

Ideal device characteristics of Diode, Bipolar Junction Transistor (BJT), Metal-Oxide-Semiconductor Field Effect Transistor (MOSFET); Wave shaping circuits: Diode wave shaping techniques, clipping and clamping circuits, comparator circuits, switching circuits; Amplifiers: BJT and MOSFET amplifiers; Linear Integrated Circuits: Op-amps, Oscillators, Timers (555), function generators, Phase locked loop (PLL), analog switches; Digital Circuits: Logic gates; Logic Families: TTL and CMOS logic; Flip-flops, counters and registers, memory systems; A/D and D/A converters; S/H circuits.

EEE 264 Electronic Circuits Sessional

3 hours in a week, 1.50 credits

Sessional based on EEE 263.

MATH 245 Complex Variable and Statistics

3 hours in a week, 3.00 credits

Complex Variable: Functions of a complex variable; Limits and continuity of functions of complex variable; Complex differentiation and Cauchy-Riemann Equations; Mapping by elementary functions; Line integral of a complex function; Cauchy's Integral Theorem; Cauchy's Integral Formula; Liouville's Theorem; Taylor's Theorem and Laurent's theorem; Singular points; Residue; Cauchy's Residue Theorem; Contour integration; Mapping. (1.5 Credit)

Statistics: Frequency distribution; Measures of central tendency; Standard deviation and other measures of dispersion; Moments, Skewness and kurtosis; Elementary probability theory; Random variables, Mathematical expectations; Discontinuous probability distribution: Binomial, Poisson and Negative binomial; Continuous probability distribution: Normal and Exponential; Hypothesis testing and regression analysis. (1.5 Credit)

Level-2 Term-II

CSE 207 Algorithms

3 hours in a week, 3.00 credits

Introduction to algorithms; Correctness proof and techniques for analysis of algorithms; Master Theorem; Methods for the design of efficient algorithms: divide and conquer, greedy methods, dynamic programming; Graph algorithms: DFS, BFS, Applications of DFS and BFS, MST algorithms, shortest path algorithms, maximum flow and maximum bipartite matching; Lower bound theory; NP-completeness; NP-hard and NP-complete problems; Coping with hardness: backtracking, branch and bound, approximation algorithms;String matching algorithms; FFT and its applications.

CSE 208 Algorithms Sessional

3 hours in alternate weeks, 0.75 credits

Sessional based on CSE 207.

CSE 211 Theory of Computation

3 hours in a week, 3.00 credits

Regular languages: regular expressions, nonregular languages; Finite automata: deterministic finite automata, nondeterministic finite automata, equivalence and conversion of deterministic and nondeterministic finite automata, pushdown automata; Context free languages: Context free grammars, ambiguity, Chomsky normal form, pumping lemma; Turing machines: basic machines, configuration, computing with Turing machines, combining Turing machines, Church-Turing thesis, Hilbert's problems; Decidability: Decidable Languages, Undecidability, halting problem, Reducibility; Complexity: Time complexity, class P, class NP, NP-completeness, space complexity, Savitch's theorem.

CSE 215 Database

3 hours in a week, 3.00 credits

Concepts of database systems; Data Models: Entity-Relationship model, Relational model; Query Languages: Relational algebra, SQL; Constraints and triggers; Functional dependencies and normalization; File organization and data storage; Indexing: primary and secondary indexes, B+ trees, hash tables; Query optimization; Transaction management; Recovery; Concurrency control; Access control and security; Semi-structured database: XML, XPath, XQuery; Object oriented and object relational databases.

CSE 216 Database Sessional

3 hours in a week, 1.50 credits

Sessional based on CSE 215; A project work will be included

EEE 269 Electrical Drives and Instrumentation

3 hours in a week, 3.00 credits

Introduction to three phase circuits, alternators and transformers; Principles of operation of DC, synchronous, induction, universal, and stepper motors; Thyristor and microprocessor based speed control

of motors. Instrumentation amplifiers: differential, logarithmic and chopper amplifiers; Frequency and voltage measurements using digital techniques; Recorders and display devices, spectrum analyzers and logic analyzers; Data acquisition and interfacing to microprocessor based systems; Transducers: terminology, types, principles and application of photovoltaic, piezoelectric, thermoelectric, variable reactance and opto-electronic transducers; Noise reduction in instrumentation.

EEE 270 Electrical Drives and Instrumentation Sessional

3 hours in a week, 1.50 credits

Sessional based on EEE 269.

MATH 247 Linear Algebra, Laplace Transformation and Fourier Analysis

4 hours in a week, 4.00 credits

Linear Algebra: Introduction to systems of linear equations; Gaussian elimination; Inverse of a matrix; Eigen values and eigen vectors; Cayley-Hamilton theorem; Euclidean n-space; Linear transformations from IRn to IRm; Properties of linear transformations from IRn to IRm; Real vector spaces and subspaces; Basis and Dimension, Change of basis, Rank and Nullity; Inner product spaces; Diagonalization; Linear transformations: Kernel and Range. (1.5 credit)

Laplace Transform & Fourier Analysis: Laplace transforms of some elementary functions including unit step functions, Periodic functions etc.; Inverse Laplace transforms; Solutions of differential equations by Laplace transforms. (1 credit)

Fourier Series: Fourier Integrals; Fourier transforms and their uses in solving boundary value problems of wave equations. (1.5 credit)

Level-3 Term-I

CSE 300 Technical Writing and Presentation

3 hours in alternate weeks, 0.75 credits

Issues of technical writing and effective oral presentation in Computer Science and Engineering; Writing styles of definitions, propositions, theorems and proofs; Preparation of reports, research papers, theses

and books: abstract, preface, contents, bibliography and index; Writing of book reviews and referee reports; Writing tools: LaTeX; Diagram drawing software; presentation tools.

CSE 305 Computer Architecture

3 hours in a week, 3.00 credits

Information representation; Measuring performance; Instructions and data access methods: operations and operands of computer hardware, representing instruction, addressing styles; Arithmetic Logic Unit (ALU) operations, floating point operations, designing ALU; Processor design: datapaths - single cycle and multicycle implementations; Control Unit design - hardwired and microprogrammed; Hazards; Exceptions; Pipeline: pipelined datapath and control, superscalar and dynamic pipelining; Memory organization: cache, virtual memory, channels; Concepts of DMA and Interrupts; Buses: overview of computer BUS standards; Multiprocessors: types of multiprocessors, performance, single bus multiprocessors, multiprocessors connected by network, clusters.

CSE 306 Computer Architecture Sessional

3 hours in alternate weeks, 0.75 credits

Sessional based on CSE 305; A short project work will be included such as the following: ALU Design and Implementation, Booth Multiplier Design and Implementation, Small Microprocessor Design and Implementation

CSE 307 Software Engineering

3 hours in a week, 3.00 credits

Concepts of software engineering: software engineering paradigms, different phases of software system development, different types of information, qualities of information; Project management concepts: software process and project metrics, software project planning, risk analysis and management, project scheduling and tracking, software cost analysis, COCOMO model; Analysis concepts and principles: requirement analysis, analysis modeling, data modeling; Design concepts and principles: architectural design, user interface design, object oriented software development and design, iterative development and the unified process, sequential waterfall life cycles, use case model for requirement writing, elaboration using system sequence diagram, domain model, visualizing concept classes; UML diagrams: Interaction and Collaboration Diagram for

designing Software, class diagram; GoF design patterns: adapter, factory, singleton, strategy, composite, facade, and observer; Content management systems: concepts, planning and developing dynamic web content sites; Software testing: white box and black box testing, basis path testing, testing for specialized environment; Software testing strategies: unit testing, integration testing, validation testing, system testing; Art of debugging; Analysis of system maintenance and upgrading: software repair, downtime, error and faults, specification and correction, maintenance cost models, documentation; Software quality assurance: quality factors. software quality measures, cost impact of software defects, concepts of software reliability, availability and safety, function based metrics and bang metrics, metrics for analysis and design model, metrics for source code, testing and maintenance.

CSE 308 Software Engineering Sessional

3 hours in alternate weeks, 0.75 credits

Sessional based on CSE 307; Sample topics include following: Design pattern implementation, Software Prototyping, Software Testing, Software Documentation, etc.

CSE 309 Compiler

3 hours in a week, 3.00 credits

Basic issues, compiler structure, front end, back end; Lexical analysis: Tokens, patterns, and lexemes, input buffering, transition diagrams, lexical-analyzer generator; Syntax analysis: Elimination of left recursion, left factoring, FIRST and FOLLOW, LL(1) grammars, nonrecursive predictive parsing, parser generators; Syntax-directed translation: Syntax-directed definitions, inherited and synthesized attributes, dependency graphs, syntax-directed translation schemes; Semantic analysis: Type expressions, type equivalence, type-checking; Run-time environments: Storage organization, static versus dynamic storage allocation, activation trees, activation records; Intermediate code generation: Directed acyclic graphs for expressions, three-address code, quadruples, triples, static single-assignment form; Code generation; Code optimization: Basic blocks and flow graphs, next-use information, optimization of basic blocks.

CSE 310 Compiler Sessional

3 hours in alternate weeks, 0.75 credits

Sessional based on CSE 309.

CSE 311 Data Communication

3 hours in a week, 3.00 credits

Introduction to signals; Review of Fourier Transform; Frequency Response of Linear Systems; Analog Modulation: AM, DSB-SC, SSB-SC, VSB, FM, PM; Introduction to digital data communication; Sampling theorem; Quantization; Pulse modulation: PAM, PDM, PPM, PCM, delta modulation, differential PCM; Intersymbol interference; Pulse shaping; Line coding; Digital modulation: ASK, FSK, BPSK, QPSK, Offset QPSK, $\pi/4$-shifted QPSK, MSK, GMSK, QAM; Multiple access techniques: TDM, FDM; Random processes; Additive White Gaussian Noise (AWGN); Error rate due to noise; Introduction to information theory; Concept of channel coding and capacity.

CSE 315 Microprocessors, Microcontrollers, and Embedded Systems

3 hours in a week, 3.00 credits

Introduction to 8-bit, 16-bit, and 32-bit microprocessors: architecture, addressing modes, instruction set, interrupts, multi-tasking and virtual memory; Memory interface; Bus interface; Arithmetic co-processor; Microcontrollers; Integrating microprocessor with interfacing chips; Programmable peripheral interfacing chip with interface to A/D and D/A converters; Keyboard/display interface; Programmable timer; Programmable interrupt controller, DMA controller; Introduction to embedded systems: overview of the design flow, Embedded systems specifications and modeling; Embedded hardware platforms and peripherals; Interfacing to the external world through sensors and actuators.

CSE 316 Microprocessors, Microcontrollers, and Embedded Systems Sesssional

3 hours in a week, 1.50 credits

Sessional based on CSE 315; Assembly Language will be taught; Contents of Assembly Language are following: Instruction set, Instruction types and

their formats; Assembly program format; Assembly process; Interrupts and system services; Addressing methods; High level control structure formation; Use of subroutines and macros; Numeric processing and string processing. Experiments will be performed using Microprocessor and Microcontroller

Level-3 Term-II

CSE 301 Mathematical Analysis for Computer Science

3 hours in a week, 3.00 credits

Recurrent problems; Manipulation of sums; Integer functions; Number theory; Binomial coefficient; Special numbers; Generating functions; Combinatorial game theory; Introduction to probability theory, expectation; Random variables; Conditional Probability and Conditional Expectation; Stochastic process; Markov chains: discrete parameter, continuous parameter, birth-death process; Queuing models: birth-death model, Markovian model, open and closed queuing network; Application of queuing models.

CSE 313 Operating System

3 hours in a week, 3.00 credits

Operating system: its role in computer systems; multitasking, multiuser, multiprocessing OS; Operating system structures; Process: process concept and scheduling, inter-process communication, communication in client-server systems; CPU scheduling: scheduling criteria and algorithms, thread scheduling, multiple-processor scheduling; Process synchronization: critical-section problem, semaphores, monitors; Deadlock: resource allocation and deadlock, deadlock detection, prevention and recovery; Memory management: swapping, paging, segmentation, virtual memory; Input/ Output: hardware, software, disk, terminals, clocks; File Systems: files, directories, security, protection; Case study of some operating systems.

CSE 314 Operating System Sessional

3 hours in a week, 1.50 credits

Sessional based on CSE 313.

CSE 317 Artificial Intelligence

3 hours in a week, 3.00 credits

Introduction to old and new AI techniques; Search techniques in AI; Constraint satisfaction problems; Game playing; Knowledge representation and reasoning; Propositional and first order logic, inference in first order logic; Planning; Probabilistic reasoning; Learning in symbolic and non-symbolic representation; Expert systems and knowledge engineering; Natural language processing; Computer vision and image understanding.

CSE 318 Artificial Intelligence Sessional

3 hours in alternate weeks, 0.75 credits

Sessional based on CSE 317.

CSE 321 Computer Networks

3 hours in a week, 3.00 credits

Introduction to Computer Networks; Protocol hierarchies; Data link control: Link layer and services; Error Detection and Correction; Multiple access protocol: Standards IEEE 802.*; Hubs, Bridges, and Switches, Fast Ethernet; Routing architecture and algorithms; IPV4, IPV6, ARP, RARP; Introduction to transport layer: UDP,TCP; Principles of Reliable data transfer, Principles of congestion control, TCP, Congestion control; Application layer services: Web, HTTP, FTP, SMTP, DNS architecture; Network security: Cryptography, DES, public key algorithm; Authentication; Digital signatures.

CSE 322 Computer Networks Sessional

3 hours in a week, 1.50 credits

Sessional based on CSE 321.

CSE 325 Information System Design

3 hours in a week, 3.00 credits

System analysis fundamentals: systems, roles, and development methodologies; Understanding and modeling organizational system; Project management; Information requirements analysis: Interactive methods; Information gathering: Unobtrusive methods; agile modeling and prototyping; The analysis process: Using data flow diagrams; Analyzing systems using data dictionaries; Process specifications and structured decisions; Object oriented systems analysis and design using

UML; The essentials of design: Designing effective output, Designing effective input; Designing databases; Human-computer interaction; Quality assurance and implementation: Designing accurate data entry procedures; Quality assurance and implementation.

CSE 326 Information System Design Sessional

3 hours in alternate weeks, 0.75 credits

Sessional based on CSE 325.

Level-4 Term-I

CSE 400 Project and Thesis

6 hours in a week, 3.00 credits

Study of problems in the field of Computer Science and Engineering.

CSE 405 Computer Security

3 hours in a week, 3.00 credits

Fundamental concepts: confidentiality, integrity and availability, assurance, authenticity and anonymity; threats and attacks, security principles; Cryptographic concepts: encryption, digital signatures, simple attacks on cryptosystems, cryptographic hash functions, digital certificates; Cryptography: symmetric cryptography, public-key cryptography, cryptographic hash functions, digital signatures, details of AES and RSA cryptography; Security: Operating systems concepts, process security, memory and file system security, physical security, application program security, network security concepts, browser security, physical security, applications security, Security Attacks: buffer overflow and other vulnerabilities due to insecure programming, foot printing, social engineering , Trojans and backdoors, sniffing, denial of service, session hijacking, threats on components like webservers, web Applications, mobile platforms, wireless networks, Security Measures: Firewall, Intrusion detection and prevention.

CSE 406 Computer Security Sessional

3 hours in alternate weeks, 0.75 credits

Sessional based on CSE 405.

CSE 408 Software Development

3 hours in alternate weeks, 0.75 credits

Term project of making software on some practical problems with sound software engineering practices.

CSE 409 Computer Graphics

3 hours in a week, 3.00 credits

Basics of computer graphics and its applications; Raster graphics: images and colours; 3D rasterization pipeline; 3D modeling: parametric curves and surfaces using B-spline and Bezier curves and surfaces, polygonal meshes, subdivision surfaces, BSP trees, voxels, sweeps, fractals; Scene graphs; Transformations: modelling, viewing, projection, and viewport transformations; 3D rendering; Visible surface detection and hidden surface removal methods: back-face detection, depth buffer method, depth-sorting method, BSP trees method, ray casting methods; Direct illumination; Global illumination: shadows, ray tracing, and radiosity; Shading and textures; Scan conversion and clipping; Computer animation: kinematics, motion capture, and dynamics-passive and active; Application development using OpenGL.

CSE 410 Computer Graphics Sessional

3 hours in alternate weeks, 0.75 credits

Sessional based on CSE 409

CSE 421 Basic Graph Theory

3 hours in a week, 3.00 credits

Graphs and their applications; Basic graph terminologies; Basic operations on graphs; Graph representations; Degree sequence and graphic sequence; Paths, cycles and connectivity; Trees and counting of trees; Distance in graphs and trees; Euler tours; Hamiltonian cycles; Ear decomposition; Graph labeling; Matching and covering; Planar graphs; Graph coloring; Special classes of graphs.

CSE 423 Fault Tolerant Systems

3 hours in a week, 3.00 credits

Introduction: background and motivation, dependability attributes, probability distributions; Reliability modeling: combinational modeling,

state-space modeling; System view of high availability design; Defects: defect avoidance, shielding and hardening, defect circumvention, yield enhancement; Faults: fault testing, design for testability, fault masking, replication with voting; Errors: error detection, self-checking modules, error correction, redundant disk arrays; Hardware redundancy: basic approaches, static and dynamic, voting, fault tolerant interconnection networks; Software redundancy: software reliability models, software aging, N-version programming; Degradation allowance: performability of a fail-soft system, checkpointing and rollback.

CSE 425 Human Computer Interaction

3 hours in a week, 3.00 credits

User interface development: iterative design, rapid prototyping, low-fidelity interactive prototyping, comparative evaluation of multiple interfaces, evaluation of user interface, heuristic evaluation; UI design models: system model, interface model, user model; Usability: consistency, simplicity, learnability, efficiency, safety, ergonomics, aesthetics; Accessibility: kinds of impairments, assistive technology, universal design, accessibility APIs; Internationalization and Localization: translation, text direction, sort order, formatting, color conventions, icons; User research methods: experiments, experiment design techniques, field study, survey; Multimodal signal processing: recognize human emotions through combination of spoken language, gestures, facial expressions; Case studies.

CSE 453 High Performance Database System

3 hours in a week, 3.00 credits

High performance database systems: client-server databases, parallel and distributed databases, cloud databases; Transaction oriented computing: transaction models, flat transactions, nested transactions, distributed transactions, long-lived transactions, transaction processing monitors; Concurrency control: isolation theorems, locking, nested transaction locking, scheduling and deadlock, deadlock detection and management; Failure and recovery; Replica management, Transactional and tuple oriented file system; Transaction and database performance benchmarks; NoSQL systems: data models, system architecture, transactions, elasticity, and optimizations.

CSE 457 Wireless Networks

3 hours in a week, 3.00 credits

Cellular concepts: frequency reuse, handoff strategies, interference and system capacity, grade of service, improving capacity and coverage, call blocking probability; Propagation effects: outdoor propagation models, indoor propagation models, power control, Doppler's effect, small and large scale fades; Wireless LAN Technology; IEEE 802.11: standard, protocol architecture, physical layer and media access control; Mobile IP; Wireless Application Protocol; IEEE 802.16 Broadband Wireless Access; Brief review of 2nd and 3rd generation wireless: GSM, GPRS, CDMA; Cordless system; Wireless local loop; Bluetooth: overview and baseband specifications

CSE 459 Communication Systems

3 hours in a week, 3.00 credits

Communication link engineering: Fundamental noise processes, Brightness and antenna noise, Polarization-wave and antenna, Wave propagation, Channel impairment effects, Receiver system noise, Receiver types and sub-assembly survey, Low noise antenna design; Signal power budgets and system design techniques; Interference and frequency reuse; System- and circuit-level design and implementation of communication hardware: mixers, RF amplifiers, filters, oscillators and frequency synthesizers, modulators and detectors, carrier and symbol timing recovery subsystems; Issues in software-defined radio transmitter and receiver implementation.

CSE 463 Introduction to Bioinformatics

3 hours in a week, 3.00 credits

Molecular biology basics: DNA, RNA, genes, and proteins; Genome rearrangements; DNA sequence alignments; Gene prediction; Dynamic Programming, Local and Global Alignment; DNA sequencing, genome sequencing, protein sequencing, spectrum graphs; Combinatorial pattern matching: Database Search, Rapid String Matching, BLAST, FASTA; Genome Assembly: Consensus-alignment-overlap, Graph-based assembly; Expression Analysis, Clustering and classification; Evolutionary trees and Phylogenetics; Statistical and machine Learning Methods in Bioinformatics.

CSE 465 Semantics of Programming Languages

3 hours in a week, 3.00 credits

Fundamentals: semantics of a programming language, static vs. dynamic semantics; Approaches: operational, denotational and axiomatic semantics of imperative program constructs; program verification; semantics of data structures; inductive and recursive definitions; fixed point operators and constructions; selected topics like non-determinism, parallelism, semantics and models of concurrency.

CSE 467 Software Architecture

3 hours in a week, 3.00 credits

Definition and overview; Architecture design: patterns, Attribute-Driven Design (ADD) method; Architecture influence cycle: what influences software architects and software architecture; Understanding and achieving quality attributes: Quality Attribute Workshop (QAW) method for identifying critical quality attributes; Documenting software architecture; Evaluating software architecture: Architecture Tradeoff Analysis Method (ATAM) for evaluating software architecture; Architecture reuse; Architecture review; Improving an existing architecture design; Software Architecture in Agile projects; Software Architecture in service oriented systems; Software Architecture in embedded and mobile systems.

EEE 463 Optical Communications

3 hours in a week, 3.00 credits

Introduction to optical communication; Guided and unguided optical communication system, Light propagation through guided medium; Optical Fibers: SMF and MMF, SI fibers and GI fibers; Transmission impairments: fiber loss, chromatic dispersion in a fiber, polarization mode dispersion (PMD); Different types of fibers: DSF, DCF, Dispersion compensation schemes, Fiber cabling process, Fiber joints/connectors and couplers; Optical transmitter: LED and laser, Operating principles and characteristics; Optical receivers: PN, PIN and APD detectors, Noise at the receiver, SNR and BER. IM/DD and Coherent communication systems; Nonlinear effects in optical fibers; Optical amplifiers, Optical modulators; Multichannel optical systems: Optical FDM, OTDM and WDM; Lightwave networks: WDMA, FDMA, TDMA and CDMA, Optical Access Network, Optical network access protocols, Optical link design.

EEE 465 Telecommunication Systems

3 hours in a week, 3.00 credits

Introduction: Principle, evolution and telecommunication networks; National and International regulatory bodies, Basic elements of Telecommunication, Message source and bandwidth; Transmission media: twisted pair cable, coaxial cable, wireless channel and electromagnetic spectrum, satellite channel and fiber-optic cable, Transmission impairments, Noise and signal-to-noise ratio, Transmission capacity, Analog and digital transmission; Telephone apparatus, telephone exchanges, subscriber loop, supervisory tones, PSTN; Switching systems: Introduction to analogy system: Strowger and Crossbar switching systems, Stored program control (SPC) systems; Digital switching systems: space division switching, time division switching; Traffic analysis: Traffic characterization, grades of service, network blocking probabilities, delay system and queuing; Integrated services digital network (ISDN): N-ISDN and B-ISDN, architecture of ISDN, B-ISDN implementation; Digital subscriber loop (DSL), Wireless local loop (WLL), FTTx, PDH and SONET/SDH, WDM Network, IP telephony and VoIP, ATM network and Next Generation Network (NGN).

HUM 475 Engineering Economics

3 hours in a week, 3.00 credits

Economics and engineering; microeconomics and macroeconomics; theory of demand and supply and their elasticities; demand estimation; price determination; indifference curve technique; theory of production; theory of cost and cost estimation; market structure; national income accounting; depreciation; circular flow of income and expenditure; cost-benefit analysis; pay back period, net present value (NPV), internal rate of return (IRR), inflation; economic feasibility of engineering undertakings; Development Economics.

Level-4 Term-II

CSE 400 Project and Thesis

6 hours in a week, 3.00 credits

Study of problems in the field of Computer Science and Engineering.

CSE 411 Simulation and Modeling

3 hours in a week, 3.00 credits

Simulation modeling basics: systems, models and simulation; Classification of simulation models; Steps in a simulation study; Concepts in discrete-event simulation: event-scheduling vs. process- interaction approaches, time-advance mechanism, organization of a discrete-event simulation model; Continuous simulation models; Combined discreet-continuous models; Monte Carlo simulation; Simulation of queuing systems. Building valid and credible simulation models: validation principles and techniques, statistical procedures for comparing real-world observations and simulated outputs, input modeling; Generating random numbers and random variates; Output analysis; Simulation languages; Analysis and modeling of some practical systems.

CSE 412 Simulation and Modeling Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 411

CSE 413 High Performance Computing

3 hours in a week, 3.00 credits

Introduction to high performance computing: motivation, applications, challenges; Multi-processor computer organization: architecture, memory hierarchy, and pipelines; Performance measures and analysis: speedup, efficiency and scalability, algorithmic techniques, instruction-level optimizations; Parallelization strategies: task parallelism, data parallelism, and work sharing techniques; Parallel algorithms: problem decomposition, partitioning and load balancing; High performance parallel programming: shared memory and message passing models, OpenMP and MPI programming; High performance cloud and cluster computing: MapReduce programming model, Apache Hadoop, Hadoop distributed file system (HDFS), Apache Spark, Apache Cassandra.

CSE 414 High Performance Computing Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 413.

CSE 415 Real-time Embedded Systems

3 hours in a week, 3.00 credits

Embedded architectures: 16/32/64-bit embedded processors; Interaction with devices: buses, memory architectures, memory management, device drivers; Concurrency: software and hardware interrupts, timers; Real-time principles: synchronization, scheduling, multi-tasking; Real-time task scheduling: scheduleablity analysis, rate and deadline monotonic scheduling, fixed and dynamic priority scheduling; Feedback control theory and application; Profiling and code optimization; Embedded software systems: exception handling, loading, mode-switching, programming embedded systems.

CSE 416 Real-time Embedded Systems Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 415.

CSE 461 Algorithm Engineering

3 hours in a week, 3.00 credits

Computational complexity; Exact Algorithms; Parameterized complexity; Practical computing and heuristics; Approximation algorithms; LP based approximation algorithms; Randomized algorithms; On-line algorithms; Experimental algorithmics; Contemporary and state-of-the-art algorithms.

CSE 462 Algorithm Engineerings Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 461.

CSE 471 Machine Learning

3 hours in a week, 3.00 credits

Introduction to machine learning; Regression analysis: Logistic regression, linear regression; Classification techniques: Supervised and unsupervised classification; Neural networks; Support vector machines; Classification trees; Rule based learning; Instance based learning; Reinforcement learning; Ensemble learning; Negative correlation learning; Evolutionary algorithms; Genetic algorithm, Statistical performance evaluation techniques of learning algorithms: bias-variance tradeoff; Practical applications of machine learning.

CSE 472 Machine Learning Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 471

CSE 473 Pattern Recognition

3 hours in a week, 3.00 credits

Introduction to Pattern Recognition; Statistical and Neural Pattern Recognition; Bayesian decision theory; Linear classifiers; Nonlinear classifiers; Parametric Estimation Techniques; Non-Parametric Estimation Techniques; Template matching techniques; Context dependent classification; Hidden Markov models; Syntactic Pattern Recognition; Clustering algorithms; Principal Component Analysis.

CSE 474 Pattern Recognition Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 473.

CSE 475 Robotics

3 hours in a week, 3.00 credits

Introduction: What is a robot, types of robots, robotics and AI; Automation & autonomy architectures; Robot hardware: sensors, effectors; Robotic mapping: localization, Monte Carlo localization, multi-object localization; Robotic navigation and locomotion: motion planning, dynamics and control; Human-robot interaction: Natural language learning; Multi-agents: tasks and teams.

CSE 476 Robotics Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 475

CSE 481 VLSI Design

3 hours in a week, 3.00 credits

VLSI design methodology: PLA, FPGA, cell-based and full custom design methods, System-on-chip design, Design Partitioning: structural and behavioral design with HDL, Physical design, Introduction to CMOS technology: characteristics and performance, CMOS processing technology,

CMOS building blocks: inverters and basic gates, adder, multiplier, data path and memory structures, CMOS layout design rules, Design robustness: Variability, Reliability and Scaling, Testing, Debugging and Verification. VLSI Design Automation and Optimization: partitioning, floor-planning, channel routing, data-path synthesis.

CSE 482 VLSI Design Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 481.

CSE 483 Interfacing

3 hours in a week, 3.00 credits

Serial communication interface; Computer BUS standards and their interfaces: ISA, PCI, AGP, PS/2 and USB; Interfacing with hard-disk; Printer interface; Barcodes, Barcodes reader and interfacing with them; Sound card and MIDI interface; Introduction to stepper motors and their interfacing;Interfacing with semiconductor power switches - BJT, MOSFET, SCR and Triac, Application of Opto-coupler and relays;Real Time Embedded Systems, Real Time Operating Systems, Embedded Communication Systems, Embedded Computer Security.

CSE 484 Interfacing Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 483.

CSE 485 Digital Signal Processing

3 hours in a week, 3.00 credits

Discrete time signals and systems: Fourier and Z transforms, DFT, 2-dimensional versions; Linear time invariant discrete time systems; Digital signal processing topics: flow graphs, realizations, FFT, quantization effects, linear prediction; Digital filter design methods: windowing, frequency sampling, S-to-Z methods, frequency-transformation methods, optimization methods, 2-dimensional filter design; Quantization of signals and filter coefficients; Oversampling techniques for ADC and DAC.

CSE 486 Digital Signal Processing Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 485.

CSE 487 Mobile Applications Development

3 hours in a week, 3.00 credits

Mobile platforms: anatomy of mobile devices, mobile OS (e.g., Android, iOS), mobile programming (e.g., Java, Objective C); Android programming basics: SDKs, activities, life cycles, views, intent, resource, storage, UIs; Android advanced programming: SQLite, networking, maps, multimedia; iOS programming basics: objective C, SDKs, views, view controllers, gestures, storage; iOS advanced programming: memory management, data management, networking, graphics, location technologies; Web-based mobile applications (e.g., HTML5).

CSE 488 Mobile Applications Development Sessional

3 hours in a week, 1.50 credits

Sesssional based on CSE 487.

HUM 473 Financial, Cost and Managerial Accounting

2 hours in a week, 2.00 credits

Financial Accounting: Basic Accounting Concepts; Accounting as an Information System; Computerized Accounting System; Conceptual Framework of Accounting; Double Entry Mechanism; Accounting Equation; Introduction to Journal Accounting; Posting to Ledger Accounts; Preparing Trial Balance; Adjusting Entries, Preparing an Adjusted Trial Balance; Preparing Financial Statements; Financial Statements Analysis & Interpretation.

Cost and Management Accounting: Cost Concepts, Cost Classifications & Cost Functions; Job Order Costing & Preparing Job Cost Sheet; Cost Allocation; Cost Volume Profit Analysis; Variable Costing Vs. Absorption Costing; Short Term Investment Decision: Relevant & Differential Cost Analysis; Long-term Investment Decision: Capital Budgeting; Working Capital Management; Linear Programming for Management Decision.

HUM 411 Business Law

2 hours in a week, 2.00 credits

Principles of law of contract; Company Law: law regarding formation, incorporation, management and winding up of companies; Labor Law: law in relation to wages hours, health, safety and other condition to work; The trade union legislation arbitration, the policy of the state in relation to labor; Bangladesh Labour Act, 2006; International Labour Law; The Factory Act (1965); Law of compensation (1965).

HUM 477 Sociology for Science and Technology

2 hours in a week, 2.00 credits

Society, Science and Technology; Social Research: Methods, Social Impact Assessment (SIA); Culture, civilization and professional ethics; Socialization and leadership development; Social stratification and social mobility; Globalization, mass media and technology; Deviance, crime, and juvenile delinquency; Social groups and organizations; Population and society: concepts and theories; Environment and Urbanization; Social change and technology.

HUM 479 Government

2 hours in a week, 2.00 credits

Basic concepts of government and politics: form of government, organs of government, democracy; socialism, bureaucracy, good governance, e-government; Government and Politics of Bangladesh: major amendments to the constitution, local government, NGOs, public policies, managing development project, constitutional bodies: EC, PSC; Foreign policy of Bangladesh; International Organization: UNO

HUM 481 Entrepreneurship for IT Business

2 hours in a week, 2.00 credits

The foundations of entrepreneurship; Inside the entrepreneurship mind: from ideas to reality; The rewards and challenges of entrepreneurship: driving forces behind small business, ethics and social responsibility, creativity and innovation; New business planning process: conducting a feasibility analysis, designing a competitive business model, building a solid strategic plan and crafting a winning business plan; Forms of business ownership: franchising and the entrepreneur, buying an existing business;

Building a marketing plan: building a bootstrap marketing plan, creative use of advertising and promotion, pricing and credit strategies, global marketing strategies, e-commerce; Building a financial plan: creating a successful financial plan, managing cash-flow, sources of financing-equity and debt; Building an operational plan: location, layout and physical facilities, supply chain management, managing inventory, staffing and leading a growing company; Legal aspects of small business: succession, ethics, business law and government regulation; Strategic plan and risk management; Global aspects of entrepreneurship; Building a new venture team and planning for the next generation.

IPE 493 Industrial Management

3 hours in a week, 3.00 credits

Introduction, evolution, management function, organization and Environment; Organization: Theory and structure; Coordination; Span of control; Authority delegation; Groups; Committee and task force; Manpower Planning; Personnel Management: Scope; Importance; Need hierarchy; Motivation; Job redesign; Leadership; Participative management; Training; Performance Appraisal; Wages and incentives; Informal groups; Organizational change and conflict; Cost and Financial Management: Elements of costs of products depreciation; Break-even analysis; Investment analysis; Benefit cost analysis. Management Accounting: Cost planning and control; Budget and budgetary control; Development planning process. Marketing Management: Concepts; Strategy; Sales promotion; Patent Laws; Technology Management: Management of innovation and changes; Technology life cycle; Case studies.

Chapter 6

Courses Offered to Other Departments

6.1 Courses Offered to the Department of EEE

6.1.1 Course List

Course Number	Course Title	Hours/Week		Credit	Level/ Term
		Theory	Sessional		
CSE109	Computer Programming	3.00	-	3.00	1/I
CSE110	Computer Programming Sessional	-	3.00	1.50	1/I
CSE451	Computer Networks	3.00	-	3.00	4/II
CSE452	Computer Networks Sessional	-	3.00	1.50	4/II

6.1.2 Course Details

CSE 109 Computer Programming

3 hours in a week, 3.00 credits

Introduction to digital computers. Programming languages, algorithms and flow charts. Structured Programming using C: Variables and constants, operators, expressions, control statements, functions, arrays, pointers, structure unions, user defined data types, input-output and files. Object-oriented Programming using C++: introduction, classes and objects; polyorphism; function and operator overloading; inheritance.

CSE 110 Computer Programming Sessional

3 hours in a week, 1.50 credits

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in CSE 109. In the second part, students will learn program design.

CSE 451 Computer Networks

3 hours in a week, 3.00 credits

Switching and multiplexing; ISO, TCP-IP and ATM reference models. Different Data Communication Services: Physical Layer- wired and wireless transmission media, Cellular Radio: Communication satellites; Data Link Layer: Elementary protocols, sliding window protocols. Error detection and correction, HDLC, DLL of internet, DLL of ATM; Multiple Access protocols, IEEE.802 Protocols for LANs and MANs, Switches, Hubs and Bridges; High speed LAN; Network layer: Routing, Congestion control, Internetworking, Network layer in internet: IP protocol, IP addresses, ARP; NI in ATM transport layer: transmission control protocol. UDP, AT M adaptation layer; Application layer: Network security; Email, Domain Name System; Simple Network Management Protocol; HTTP and World Wide Web.

CSE 452 Computer Networks Sessional

3 hours in a week, 1.50 credits

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in CSE 451. In the second part, students will design systems using the principles learned in CSE 451.

6.2 Courses Offered to the Department of IPE

6.2.1 Course List

Course Number	Course Title	Hours/Week		Credit	Level/ Term
		Theory	Sessional		
CSE295	Computer Programming Techniques	3.00	-	3.00	2/I
CSE296	Computer Programming Techniques Sessional	-	3.00	1.50	2/I

6.2.2 Course Details

CSE 295 Computer Programming Techniques

3 hours in a week, 3.00 credits

Introduction to number system: binary, octal, hexadecimal, binary arithmetic, basic programming concepts, program development stages: flow charts, pseudo codes, programming constructs: data types, operators, expressions, statement, control statements, single dimensional arrays, functions and program structure: parameter passing conventions, scope rules, recursion, library functions, pointers, strings, multidimensional arrays, user defined data types: structures, unions, enumerations, input and output: standard input and output, formatted input and output, file access, command line parameters.

CSE 296 Computer Programming Techniques Sessional

3 hours in a week, 1.50 credits

Sessional work based on course CSE 295 using C programming language.

6.3 Courses Offered to the Department of BME

6.3.1 Course List

Course Number	Course Title	Hours/Week		Credit	Level/ Term
		Theory	Sessional		
CSE281	Computer Programming	3.00	-	3.00	2/I
CSE282	Computer Programming Sessional	-	3.00	1.50	2/I
CSE283	Digital Techniques	3.00	-	3.00	2/II
CSE284	Digital Techniques Sessional	-	3.00	1.50	2/II
CSE391	Embedded Systems and Interfacing	3.00	-	3.00	3/I
CSE392	Embedded Systems and Interfacing Sessional	-	3.00	1.50	3/I
CSE493	Medical Informatics	3.00	-	3.00	4/I
CSE495	Bioinformatics	3.00	-	3.00	4/I

6.3.2 Course Details

CSE 281 Computer Programming

3 hours in a week, 3.00 credits

Introduction to digital computers; Programming lang uages, algorithms and flow charts; Structured Programming using C: Variables and constants, operators, expressions, control statements, functions, arrays, pointers, structure unions, user defined data types, input-output and files; Object-oriented Programming using C++: introduction; classes and objects; polyorphism; function and operator overloading; inheritance.

CSE 282 Computer Programming Sessional

3 hours in a week, 1.50 credits

This course consists of two parts. In the first par t, students will perform experiments to verify practically the theories and concepts learned in CSE 281 In the second part, students will learn program design.

CSE 283 Digital Techniques

3 hours in a week, 3.00 credits

Digital Logic Design: Boolean algebra, logic gates and their truth tables, canonical forms, combinatorial logic circuits; Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and demultiplextures; Flip-flops, Counters, Registers; Sequential logic circuits. Digital Electronics: Diod logic gates, transistor gates, MOS gates; Logic Families: TTL, ECL, IIL and CMOS logic with operation details; Electronic circuits for flip-flops; A/D and D/A converters with applications; OP AMPs; Timing circuits.

CSE 284 Digital Techniques Sessional

3 hours in a week, 1.50 credits

Experiments based on CSE 283.

CSE 391 Embedded Systems and Interfacing

3 hours in a week, 3.00 credits

Introduction to embedded systems with applications: Overview of the design flow, Embedded system specification and modeling; Introduction to embedded processors and microcontrollers: types of processors, architecture, addressing modes, instruction sets, interrupts, parallelism;

Memory architectures: memory technologies, memory hierarchy, memory models; memory interface; Bus interface; I/O hardware and interface; Integrating microcontrollers with interfacing chips; Programmable peripheral interfacing chip with interface to A/D and D/A converter; Programmable interrupt controller, DMA controller; Sensor and Actuators: models of sensors and actuators, common sensors, actuators; Interfacing to the external world through sensors and actuators.

CSE 392 Embedded Systems and Interfacing Sessional

3 hours in a week, 1.50 credits

Sessional based on CSE 391.

CSE 493 Medical Informatics

3 hours in a week, 3.00 credits

Integration of Information technology and Biomedical Engineering. Introduction to networking, communications, and information infrastructures in medical environment. Exposure to basic concepts related to networking at several levels: low-level (TCP/IP, services), medium-level (network topologies), and high-level (distributed computing, Web-based services) implementations. Commonly used medical communication protocols (HL7, DICOM) and current medical information systems (HIS, RIS, PACS). Advances in networking, such as wireless health systems, peer-to-peer topologies, grid/cloud computing. Introduction to security and encryption in networked environments.

CSE 495 Bioinformatics

3 hours in a week, 3.00 credits

Introduction to algorithms and computational complexity; Basic graph theoretic terminologies; Graph algorithms: DNA sequencing, DNA fragment assembly, Spectrum graphs; Sequence similarity; Suffix Tree and variants with applications; Genome Alignment: maximum unique match, LCS, mutation sensitive alignments; Database search: Smith-Waterman algorithm, Fast A, BLAST and its variations, Locality sensitive hashing; Multiple sequence alignment; Phylogeny reconstruction; Phylogeny comparison: similarity and dissimilarity measurements, consensus tree problem; Genome rearrangement: types of genome rearrangements, sorting by reversal and other operations; Motif finding; RNA secondary structure prediction; Peptide sequencing; Population genetics.

Appendix A

Equivalence Table

Old Course			*New Course*		
Course No.	*Course Title*	*Cr.*	*Course No.*	*Course Title*	*Cr.*
CHEM 113	Chemistry	3.00	CHEM 113	Chemistry	3.00
CHEM 114	Inorganic Quantitative Analysis	1.50	CHEM 114	Inorganic Quantitative Analysis	1.50
CSE 100	Introduction to Computer Systems	2.00	-	-	-
CSE 103	Discrete Mathematics	3.00	CSE 103	Discrete Mathematics	3.00
CSE 105	Structured Programming Language	3.00	CSE 101	Structured Programming Language	3.00
CSE 106	Structured Programming Language Sessional	1.50	CSE 102	Structured Programming Language Sessional	1.50
CSE 201	Object Oriented Programming Language	3.00	CSE 107	Object Oriented Programming Language	3.00
CSE 202	Object Oriented Programming Language Sessional	1.50	CSE 108	Object Oriented Programming Language Sessional	1.50
CSE 203	Data Structures	3.00	CSE 203	Data Structures	3.00
CSE 204	Data Structures Sessional	0.75	CSE 204	Data Structures Sessional	1.50
CSE 205	Digital Logic Design	3.00	CSE 205	Digital Logic Design	3.00

Old Course			*New Course*		
CSE 206	Digital Logic Design Sessional	1.50	CSE 206	Digital Logic Design Sessional	1.50
CSE 207	Algorithms	3.00	CSE 207	Algorithms	3.00
CSE 208	Algorithms Sessional	0.75	CSE 208	Algorithms Sessional	0.75
CSE 209	Digital Electronics and Pulse Techniques	3.00	-	-	-
CSE 210	Digital Electronics and Pulse Techniques Sessional	1.50	-	-	-
CSE 211	Theory of Computation	2.00	CSE 211	Theory of Computation	3.00
CSE 214	Assembly Language Programming	1.50	-	-	-
CSE 300	Technical Writing and Presentation	0.75	CSE 300	Technical Writing and Presentation	0.75
CSE 301	Mathematical Analysis for Computer Science	3.00	CSE 301	Mathematical Analysis for Computer Science	3.00
CSE 303	Database	3.00	CSE 215	Database	3.00
CSE 304	Database Sessional	1.50	CSE 216	Database Sessional	1.50
CSE 305	Computer Architecture	3.00	CSE 305	Computer Architecture	3.00
CSE 307	Software Engineering and Information System Design	4.00	CSE 307 + CSE 325	Software Engineering + Information System Design	3.00 + 3.00
CSE 308	Software Engineering and Information System Design Sessional	1.50	CSE 308 + CSE 326	Software Engineering Sessional + Information System Design Sessional	0.75 + 0.75
CSE 309	Compiler	3.00	CSE 309	Compiler	3.00
CSE 310	Compiler Sessional	0.75	CSE 310	Compiler Sessional	0.75
CSE 311	Data Communication-I	3.00	CSE 311	Data Communication	3.00
CSE 313	Operating System	3.00	CSE 313	Operating System	3.00
CSE 314	Operating System Sessional	1.50	CSE 314	Operating System Sessional	1.50

Old Course			*New Course*		
CSE 315	Microprocessors and Microcontrollers	3.00	CSE 315	Microprocessors, Microcontrollers, and Embedded Systems Sessional	3.00
CSE 316	Microprocessors and Microcontrollers Sessional	1.50	CSE 316	Microprocessors, Microcontrollers, and Embedded Systems Sessional	1.50
CSE 317	Neumerical Methods	3.00	-	-	-
CSE 321	Computer Networks	4.00	CSE 321	Computer Networks	3.00
CSE 322	Computer Networks Sessional	0.75	CSE 322	Computer Networks Sessional	1.50
CSE 324	Software Development	0.75	CSE 408	Software Development	0.75
CSE 400	Project and Thesis	3.00	CSE 400	Project and Thesis	3.00
CSE 401	Artificial Intelligence	3.00	CSE 317	Artificial Intelligence	3.00
CSE 402	Artificial Intelligence Sessional	0.75	CSE 318	Artificial Intelligence Sessional	0.75
CSE 403	Digital System Design	3.00	-	-	-
CSE 404	Digital System Design Sessional	1.50	-	-	-
CSE 409	Computer Graphics	3.00	CSE 409	Computer Graphics	3.00
CSE 410	Computer Graphics Sessional	0.75	CSE 410	Computer Graphics Sessional	0.75
CSE 411	Simulation and Modeling	3.00	CSE 411	Simulation and Modeling	3.00
CSE 421	Basic Graph Theory	3.00	CSE 421	Basic Graph Theory	3.00
CSE 423	Fault Tolerant Systems	3.00	CSE 423	Fault Tolerant Systems	3.00
CSE 433	Digital Image Processing	3.00	-	-	-
CSE 435	Basic Multimedia Theory	3.00	-	-	-
CSE 455	Data Communication-II	3.00	-	-	-

Old Course			*New Course*		
CSE 456	Data Communication-II Sessional	1.50	-	-	-
CSE 457	Wireless Networks	3.00	CSE 457	Wireless Networks	3.00
CSE 458	Wireless Networks Sessional	1.50	CSE 458	Wireless Networks Sessional	1.50
CSE 461	Algorithm Engineering	3.00	CSE 461	Algorithm Engineering	3.00
CSE 462	Algorithm Engineering Sessional	1.50	CSE 462	Algorithm Engineering Sessional	1.50
CSE 463	Computational Geometry	3.00	-	-	-
CSE 464	Computational Geometry Sessional	1.50	-	-	-
CSE 471	Machine Learning	3.00	CSE 471	Machine Learning	3.00
CSE 472	Machine Learning Sessional	1.50	CSE 472	Machine Learning Sessional	1.50
CSE 473	Pattern Recognition	3.00	CSE 473	Pattern Recognition	3.00
CSE 474	Pattern Recognition Sessional	1.50	CSE 474	Pattern Recognition Sessional	1.50
CSE 481	VLSI Design	3.00	CSE 481	VLSI Design	3.00
CSE 482	VLSI Design Sessional	1.50	CSE 482	VLSI Design Sessional	1.50
CSE 483	Computer Interfacing	3.00	CSE 483	Interfacing	3.00
CSE 484	Computer Interfacing Sessional	1.50	CSE 484	Computer Interfacing Sessional	1.50
EEE 163	Introduction to Electrical Engineering	3.00	EEE 163	Introduction to Electrical Engineering	3.00
EEE 164	Introduction to Electrical Engineering Sessional	1.50	EEE 164	Introduction to Electrical Engineering Sessional	1.50
EEE 263	Electronic Devices and Circuits	4.00	EEE 263	Electronic Circuits	4.00
EEE 264	Electronic Devices and Circuits Sessional	1.50	EEE 264	Electronic Circuits Sessional	1.50

Old Course			*New Course*		
EEE 269	Electrical Drives and Instrumentation	3.00	EEE 269	Electrical Drives and Instrumentation	3.00
EEE 270	Electrical Drives and Instrumentation Sessional	1.50	EEE 270	Electrical Drives and Instrumentation Sessional	1.50
HUM 175	English	3.00	HUM 183	English	3.00
HUM 211	Sociology	2.00	HUM 477	Sociology for Science and Technology	2.00
HUM 213	Government	2.00	HUM 479	Government	2.00
HUM 272	Developing English Skills Laboratory	1.50	HUM 172	Developing English Skills Sessional	1.50
HUM 275	Economics	2.00	HUM 475	Engineering Economics	3.00
HUM 371	Financial and Managerial Accounting	2.00	HUM 473	Financial, Cost, and Managerial Accounting	2.00
HUM 411	Business Law	2.00	HUM 411	Business Law	2.00
IPE493	Industrial Management	3.00	IPE493	Industrial Management	3.00
MATH 141 + MATH 143	Differential Calculus and Coordinate Geometry + Integral Calculus, Ordinary and Partial Differential Equations, and Series Solutions	3.00 + 3.00	MATH 145 + MATH 147	Differential Calculus, Integral Calculus, and Coordinate Geometry + Ordinary Differential Equations (ODE), Partialy Differential Equations (PDE) and Vector Calculus	3.00 + 3.00
MATH 241	Complex Variable and Statistics	3.00	MATH 245	Complex Variable and Statistics	3.00
MATH 243	Matrices, Vectors, Fourier Analysis, and Laplace Transforms	4.00	MATH 247	Linear Algebra, Laplace, Transformation and Fourier Analysis	4.00
ME 160	Mechanical Engineering Drawing-I	1.50	ME 174	Mechanical Engineering Drawing and CAD	1.50
ME 165	Basic Mechanical Engineering	3.00	ME 165	Basic Mechanical Engineering	3.00
PHY 102	Physics Sessional	1.50	PHY 102	Physics Sessional	1.50

Old Course			*New Course*		
PHY 109	Physics (Heat and Thermodynamics, Structure of Matter, Waves and Oscillations, and Physical Optics)	4.00	PHY 109	Heat & Thermodynamics, Waves & Oscillations, and Physical Optics	3.00
-	-	-	CSE 218	Numerical Methods	2.00
-	-	-	CSE 306	Computer Architecture Sessional	0.75
-	-	-	CSE 405	Computer Security	3.00
-	-	-	CSE 406	Computer Security Sessional	0.75
-	-	-	CSE 412	Simulation and Modeling Sessional	1.50
-	-	-	CSE 413	High Performance Computing	3.00
-	-	-	CSE 414	High Performance Computing Sessional	1.50
-	-	-	CSE 415	Real-time Embedded Systems	3.00
-	-	-	CSE 416	Real-time Embedded Systems Sessional	1.50
-	-	-	CSE 425	Human Computer Interaction	3.00
-	-	-	CSE 453	High Performance Database System	3.00
-	-	-	CSE 459	Communication Systems	3.00
-	-	-	CSE 463	Introduction to Bioinformatics	3.00
-	-	-	CSE 465	Semantics of Programming Languages	3.00
-	-	-	CSE 467	Software Architecture	3.00
-	-	-	CSE 475	Robotics	3.00
-	-	-	CSE 476	Robotics Sessional	1.50

Old Course			*New Course*		
-	-	-	CSE 485	Digital Signal Processing	3.00
-	-	-	CSE 486	Digital Signal Processing Sessional	1.50
-	-	-	CSE 487	Mobile Applications Development	3.00
-	-	-	CSE 488	Mobile Applications Development Sessional	1.50
-	-	-	EEE 463	Optical Communications	3.00
-	-	-	EEE 465	Telecommunication Systems	3.00
-	-	-	HUM 481	Entrepreneurship for IT Business	2.00

This "Undergraduate Course Calendar" was typeset using the LaTeX (the `memoir` class) typesetting system created by Leslie Lamport. The body text is set 10.0pt with Palatino designed by Hermann Zapf, which includes italics and small caps. Other fonts include Sans, Slanted and Typewriter from Donald Knuth's Computer Modern family.

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