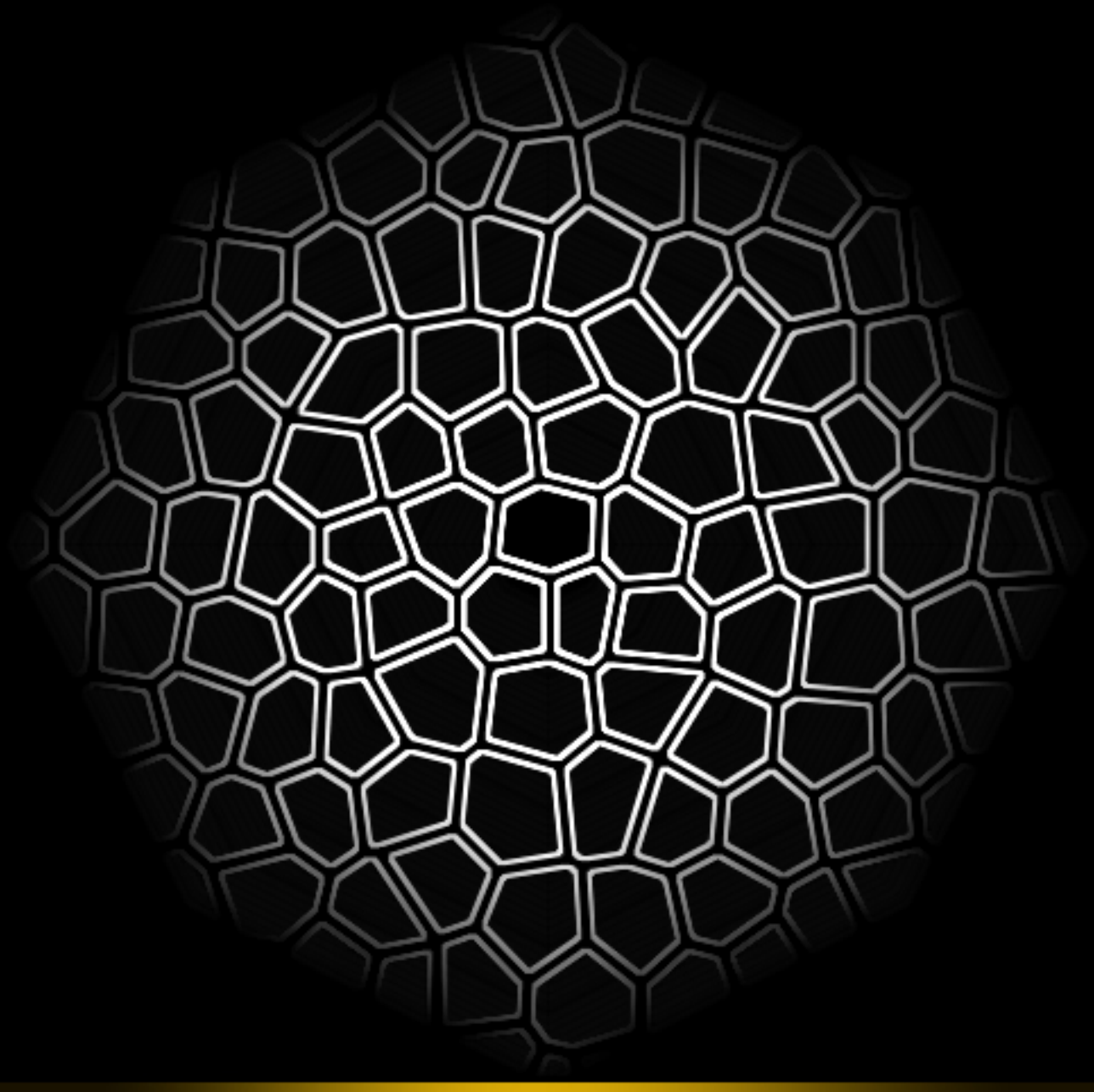
UNDERGRADUATE COURSE CALENDAR

JANUARY 2006



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY
DHAKA 1000, BANGLADESH

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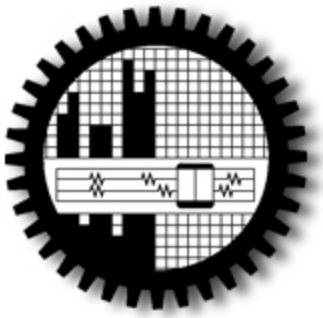

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY

DHAKA 1000, BANGLADESH

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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 consultancy service will find this book helpful.

This calendar provides general information about this university, its 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 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. The introduction of a basic course on computer systems for a gentle introduction of the field to the newcomers is among the worth mentionable changes. Other changes include introduction of English laboratory and technical writing courses to augment the reading, listening, speaking and writing skills of the students. Number of subjects in some semesters has also been reduced keeping the total credit hour almost unchanged. 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 has been approved by the academic council, BUET for the CSE undergraduate students commencing their Level-1 Term-I classes in the 2005-2006 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
January, 2006

Dr. Muhammad Masroor Ali
Head, Department of CSE

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CHAPTER 1
GENERAL INFORMATION

1.1 History

Bangladesh University of Engineering and Technology, abbreviated as BUET, is the oldest institution for the study of 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 its present premise) as a Faculty of Engineering under the University of Dhaka, offering four year Bachelor's courses in Civil, Electrical, Mechanical, Chemical and Metallurgical Engineering. This action was taken with a view to meet the increasing demand for engineers in the country and to expand 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 giving a new name of East Pakistan University of Engineering and Technology in the year 1962. After the independence of Bangladesh in 1971, it was renamed as the Bangladesh University of Engineering and Technology (BUET).

Till today, the Bangladesh University of Engineering and Technology has produced around 23,000 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 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 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 five faculties, two institutes, the Club and residential accommodation of teachers, staff and employees and the Vice-Chancellor's bungalow.

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, Electrical and Electronic Engineering, Computer Science and 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 Masters Degrees and some of the departments have Ph.D. programs. 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 and courses and curricula to meet the growing technological challenges confronting the country.

1.5 Administration

The University has the following Statutory Authorities:

- Syndicate
- Academic Council
- Finance Committee
- Faculties
- Selection Boards

- Committee for Advanced Studies and Research (CASR)
- Planning and Development Committee
- Boards of Postgraduate Studies (BPGS)
- Boards of Undergraduate Studies (BUGS)

The Syndicate is the supreme authority in major policy-making matter 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 CASR, Boards of Undergraduate and Postgraduate Studies and the Faculties recommend.

Vice Chancellor	:	**Prof. Dr. Md. Alee Murtuza**
Deans of Faculties		
Civil Engineering	:	**Prof. Dr. Md. Hossain Ali**
Architecture and Planning	:	**Prof. Dr. Md. Shahidul Ameen**
Electrical and Electronic Engineering	:	**Prof. Dr. Mohammad Ali Choudhury**
Mechanical Engineering	:	**Prof. Dr. Gazi Md. Khalil**
Engineering	:	**Prof. Dr. A. S. W. Kurny**
Administrative Officers		
Registrar	:	**Md. Shahjahan**
Controller of Examinations	:	**Prof. Dr. Abu Siddique**
Comptroller	:	**A. K. M. Anisur Rahman Khan**
Director of Students' Welfare	:	**Prof. Dr M. Monowar Hossain**
Director, Advisory, Extension and Research Services	:	**Prof. Dr. Abu Rayhan Md. Ali**
Director, Bureau of Research, Testing and Consultation	:	**Prof. Dr. Abdul Muqtadir**
Librarian	:	**Mohammad Zahirul Islam**
Provost of Residential Halls		
Ahsanullah Hall	:	**Prof. Dr. Md. Rafique Ullah**
Chattri Hall	:	**Dr. Md. Abdul Maleque**
Nazrul Islam Hall	:	**Prof. Dr. Md. Ehsan**
Shahid Smriti Hall	:	**Prof. Dr. Gazi Md. Khalil**
Sher-e-Bangla Hall	:	**Prof. Dr. Chowdhury Md. Feroz**
M. A. Rashid Hall	:	**Prof. Dr. Quazi Deen Mohd Khosru**

Sohrawardy Hall	:	**Dr. Tahmeed Malik Al-Hussaini**
Titumir Hall	:	**Prof. Dr. M. A. Rashid Sarkar**

1.6 Faculties, Departments and Teachers

At present, the University has seventeen teaching departments under five faculties. A total of 525 teachers are teaching in these faculties. There are additional teaching posts like Dr. Rashid Professor, Professor Emeritus and Supernumerary Professors.

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 Electronics 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 legendary 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 14 batches 535 students have been awarded B.Sc. Engineering, more than 100 M.Sc Engineering and 1 Ph.D. degree from this department. The department has now active faculty strength of 35 with 8 having Ph.D. Degree in different branches of Computer Science and Engineering. Currently 18 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 in 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 on the west wing of the third, fourth and fifth floors of the Electrical and Mechanical Engineering (EME) building. The classrooms occupy the fourth floor, whereas the laboratories are located on the third and fourth

floors. The departmental library and the room for the teaching staff are located on the fifth floor.

2.3 Study Program

The Department of Computer Science and Engineering offers the degrees of B. Sc. Engg., M. Engg., M. Sc. Engg. and Ph.D. 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 has already achieved reputation through its research activities. The research work undertaken by the teachers and students of this department in the last few years is diversified in nature. Undergraduate students of the department have already achieved extraordinary success in their research works through the publication of a number of papers in journals of international repute. Since 1997 the number of publications in international conferences and journals of the department exceeds over 200. It includes research on graph theory, parallel processing, image processing and pattern recognition, database management system and information management system, expert system design, networking, computer aided teaching etc. The research works are not only of academic interest, but also aim at improving the socioeconomic condition of Bangladesh by implementing the results.

The teachers and students of the department have publications in various reputed international journals like Journal of Algorithms, Journal of Graph Algorithms and Applications, Journal of Heuristics, Theoretical Computer Science, Computational Geometry: Theory and Applications, IEEE Transactions on Neural Networks, Information Processing Letters, Studia Informatica Universalis, Telecommunication Systems, IEICE Transactions on Information and Systems, Applied Mathematics E-Notes etc.

Faculty members often present their research works in reputed international conferences like ISAAC (International Symposium on Algorithms and Computation), COCOON (Annual International Computing and Combinatorics Conference), GD (International

Symposium on Graph Drawing), WG (International Workshop on Graph-Theoretic Concepts in Computer Science), ICCIT (International Conference on Computer and Information Technology), IEEE International Symposium on Intelligent Signal, Processing and Communications Systems, IEEE International Performance Computing and Communications Conference, IEEE International Conference on Communications etc.

One of the faculty members Dr. Md. Saidur Rahman along with prominent Computer Scientist Takao Nishizeki of Tohoku University, Japan wrote a book entitled "**Planar Graph Drawing**" which was published by World Scientific. This is the first book on Computer Science authored by a researcher from Bangladesh in the international level.

2.5 Laboratory Facilities

The laboratory facilities of the department have been increased significantly over the last few years. At present there are seven different laboratories in the department premises. A brief description of each of the laboratory facility 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 45 Pentium IV workstations and five servers.. All the workstations provide Windows XP 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. 20 of the workstations are P-IV (with Hyper-Threading Technology) and the rests are P-III. 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), 12 Pentium-IV and

14 Pentium-III 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 30 Pentium-IV and 6 Pentium-III 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 and two Intel Pentium-III 1 GHz Notebook Computers. 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 facility is a new addition to the department. This laboratory has 8 Pentium-III and 28 Pentium-IV high performance workstations with multimedia support. All the workstations provide Windows XP and Linux platforms and have important software installed.

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 team has 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 nine times starting from 1998 to this 2006.

In recognition of the extraordinary achievements of Bangladeshi students, the Honorable Prime Minister Begum Khaleda Zia 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. On the 6th convocation of graduated BUET students, 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.

Shahriar Manzoor and Rezaul Alam Chowdhury, graduates of the Department, have been playing a leading role in hosting international programming contests. In recognition of the extraordinary achievement of BUET students, BUET had honor to host one of the Asia regional ACM-ICPC held in 2001, 2002 and 2003.

Following table summarizes the programming contest performance of department team in different world finals of ACM-ICPC.

ACM Finals	Date	Venue	Team	Place
22nd	28.02.1998	Atlanta, Georgia, USA	Bengal Tigers Suman Kumar Nath Rezaul Alam Chowdhury Tarique Mesbaul Islam	24

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

*H.M. = Honorable Mention

2.7.2 Software and Hardware Project Competitions

CSE department students 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 Shanghi, 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 "3SM System", a 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, the first ever introduced in Bangladesh 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.

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. Department offers various short courses like computer networking, system administration using Linux, software development with Oracle9*i*, 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. Occasionally 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 Services

The department offers several consultation services to different government and private organizations for their computerization. These services include feasibility study (both technical and financial), machine and peripheral specification preparation and supervision of their proper installation, system analysis, software development, course curriculum development etc.

2.10 List of Working Teaching Staffs

Professors

1. Dr. Md. Shamsul Alam; B.Sc. Engg (EEE), BUET; P.G. Diploma (Digital techniques), Int. Institute, Eindhoven, Netherlands; M.Sc. Engg (EEE), BUET; Ph.D, West Virginia University, Morgantown, West Virginia, U.S.A (Digital Systems, Wireless Communications, Computer Networks).

2. Dr. Muhammad Masroor Ali; B. Sc. Engg (EEE), BUET; M. Engg, Kyushu University, Japan; Ph.D, Kyushu University, Japan (Machine Translation, Bangla Language Processing, Pattern Recognition).

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).

Associate Professors

4. 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, Data Warehouse, High Performance Database System using Compression, MMDBMS).

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. 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, Network Routing Protocols, Bioinformatics).

Assistant Professors

7. Md. Abdus Sattar; B. Sc. Engg (EEE), BIT, Rajshahi; M. Sc. Engg (CSE), BUET; (Natural Language Processing, Computer Aided Design, Digital System Design, Computer Architecture).

8. 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)).

9. Dr. Masud Hasan; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET; Ph.D, University of Waterloo, Canada (Computational Geometry, Algorithm).

10. Abu Wasif; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET (Artificial Intelligence, Machine Learning).

Lecturers

11. A. K. M. Azad; B. Sc. Engg (CSE), BUET; M. Sc. Engg (CSE), BUET (Algorithm, Graph Theory, Bioinformatics, Sensor Networks).

12. Sabbir Ahmed; B. Sc. Engg (CSE), BUET (Database, Distributed Systems, 3-D Graphics, Network, Multimedia Systems).

13. Md. Shohrab Hossain; B. Sc. Engg (CSE), BUET (Artificial Intelligence, Web Mining, Evolutionary Algorithms, Genetic Algorithms).

14. S.M. Farhad; B. Sc. Engg (CSE), BUET (Multimedia Network, Bioinformatics).

15. Md. Yusuf Sarwar Uddin; B. Sc. Engg (CSE), BUET (Distributed Computing, Communication Systems, Wireless Ad hoc Networks, Optical Networks).

16. Mohammad Tanvir Parvez; B. Sc. Engg (CSE), BUET (Combinatorics, Stochastic Modeling, Simulation).

17. Utpal Kumar Paul; B. Sc. Engg (CSE), BUET (Graph Theory, Graph Drawing, Networks).

18. Tanzima Hashem; B. Sc. Engg (CSE), BUET (Graph Theory, Sensor Networks, Databases).

19. Khaled Mahmud Shahriar; B. Sc. Engg (CSE), BUET (Graph Theory, Networks).

20. S. M. Hasibul Haque; B. Sc. Engg (CSE), BUET (Computing Systems, Embedded Systems, Bioinformatics).

21. Md. Mostofa Ali Patwary; B. Sc. Engg (CSE), BUET (Graph Theory, Graph Drawing, Sensor Networks, Embedded Systems).

22. Mohammad Tanvir Irfan; B. Sc. Engg (CSE), BUET (Computational Geometry, Pattern Recognition, Computational Perception).

23. Mohammad Moazzem Hossain; B. Sc. Engg (CSE), BUET (Algorithms, Graph Theory, Graph Drawing, Networks).

24. Tanveer Awal; B. Sc. Engg (CSE), BUET (Graph Theory, Bioinformatics, Networks).

25. Md. Mustafizur Rahman; B. Sc. Engg (CSE), BUET (Grid Computing, Sensor Networks, Neural Networks).

26. Abdullah Al Muzahid; B. Sc. Engg (CSE), BUET (Network, Operating Systems, Compilers).

27. Imranul Hoque; B. Sc. Engg (CSE), BUET (Distributed Information Systems: Middleware, Web Service and Web Service Security, Ubiquitous Computing).

28. Ahmed Khurshid; B. Sc. Engg (CSE), BUET (Distributed Systems, Networks, Embedded Systems, Operating Systems, Software Engineering).

29. Mohammad Salim Ahmed; B. Sc. Engg (CSE), BUET (Computer Networks, Database Systems, Multimedia).

30. Abdullah Al Reza; B. Sc. Engg (CSE), BUET (Distributed Systems, Networks, Wireless Communications, Computer Architectures).

31. Abedul Haque; B. Sc. Engg (CSE), BUET (Artificial Intelligence, Neural Networks).

32. Md. Muhibur Rasheed; B. Sc. Engg (CSE)., BUET (Artificial Intelligence, Neural Networks, Computational Geometry).

33. Md. Ashraful Alam; B. Sc. Engg (CSE), BUET (Artificial Intelligence, Neural Networks, Pattern Recognition).

34. Sonia Jahid; B. Sc. Engg (CSE), BUET (Ubiquitous Computing, Networks and Security Issues).

35. Anindya Iqbal; B. Sc. Engg (CSE), BUET (Data Mining, Neural Networks).

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 system has been introduced with an aim to create 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:

- Introduction of Letter Grade and Grade Points instead of numerical grades.
- Limiting the number of theoretical courses and examination papers to around five in each term.
- Introduction of more optional courses to enable the students to select courses according to their individual needs and preferences.
- Continuous evaluation of student’s performance.
- Abolition of a pass or a fail on an annual basis.

- Providing opportunity to a student to take fewer or more courses than the normal course load depending on own capability and needs.
- Providing flexibility to allow a student to progress at desired pace depending on own ability or convenience, subject to some regulations on minimum earned credits and minimum Grade Point Average (GPA) requirements.
- 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	2 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.

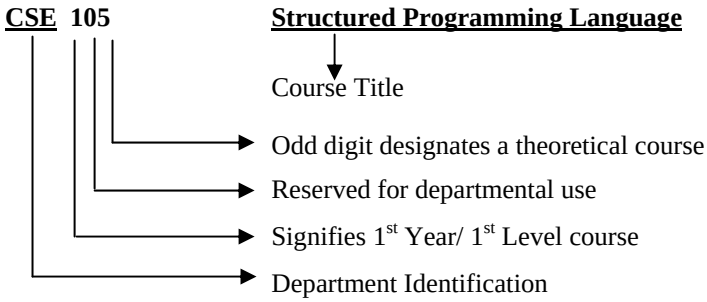
3.4 Course Pattern and Credit Structure

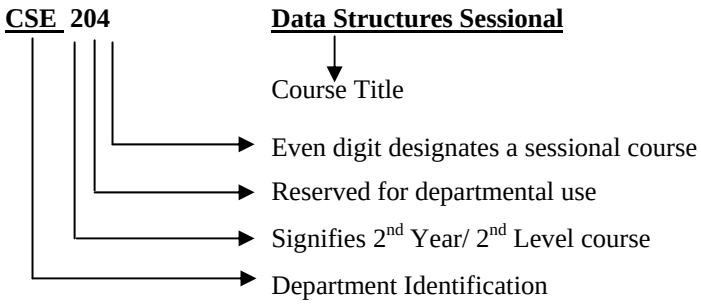
The undergraduate program is covered by a set of theoretical courses along with a set of laboratory/sessional courses to support them.

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:

- The first digit corresponds to the year/level in which the course is normally taken by the students.
- The second digit is reserved for departmental use. It usually identifies a specific area of study within the department.
- 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.

- Theoretical Courses: One lecture per week per term is equivalent to one credit.
- 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:

- 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.
- 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.
- 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 student 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 also may 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 fill up a course registration form 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 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, on the 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 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 to the provisions shown below.

Grade	Grade Points	Numerical Markings
A+	4.0	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%
I**	-	Incomplete
X	-	Continuation (For project and thesis/design courses)
S	-	Satisfactory (non credit courses)
U	-	Unsatisfactory (non credit courses)
W***	-	Withdrawal

* 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)

** Given only a student is unable to complete the course because of circumstances beyond his control, it must be made up by the close of next two semesters or the incomplete grade becomes a failure. He may, however, be allowed to register without further payment of tuition fees for that course.

***A student must withdraw officially from a course within two working weeks of the commencement of the semester or else his grade in that course shall be recorded as failure unless he is eligible to get a grade of I (incomplete). A student may be permitted to withdraw and change his course within the specified period with the approval of his adviser, Head of the department and the respective teacher(s) concerned.

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 quizzes of a course shall be n+1, where n is the number of credits of the course. Evaluation of performance in quizzes will be on the basis of the best n quizzes. 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, … , C_n and his grade points in these courses are G_1, G_2, … , G_n respectively then

$$GPA = \frac{\sum_{i=1}^{n} C_i * G_i}{\sum_{i=1}^{n} C_i}$$

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, … , TC_n and his GPA in these terms are GPA_1, GPA_2, … , GPA_n respectively then

$$CGPA = \frac{\sum_{i=1}^{n} TC_i * GPA_i}{\sum_{i=1}^{n} TC_i}$$

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 Points, G_i	C_I*G_i
CSE 100	2.00	A+	4.00	8.000
EEE 163	3.00	A+	4.00	12.000
EEE 164	1.50	A	3.75	5.625
MATH 141	3.00	B	3.00	9.000
ME 160	1.50	A-	3.50	5.250
ME 165	3.00	A+	4.00	12.000
PHY 109	4.00	A	3.75	15.000
PHY 102	1.50	A-	3.50	5.250
Total	**19.50**			**72.125**

GPA = 72.125/19.50 = 3.7

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

Level	Term	Credit Hours Earned, TC_I	GPA Earned, GPA_i	GPA_i*TC_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 the 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	**Architecture**
Level 1	0 to 36	0 to 35
Level 2	37 to 72	36 to 70
Level 3	73 to 108	71 to 113
Level 4	109 and above	114 to 154
Level 5	-	155 and above

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 for 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 amongst 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:

- 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.
- A special course may be offered in a particular term only if the course is not running in that term as a regular course.
- The special course is offered to a student in his/her last term if it helps him/her to graduate in that term.
- A student is allowed to register for a maximum of two courses on a self-study basis.

- A special course cannot be utilized for grade improvement purposes.
- Normally no lecture will be delivered for a special course but laboratory/design classes may be held if they form part of a course.
- 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

- 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.
- Student will be allowed to register in a maximum of two courses during the Short Term.
- A course 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.
- 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, 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 that year.

3.24.2 Gold Medal

Gold medal for outstanding Computer Science and Engineering graduates was 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		
CSE 100	Introduction to Computer Systems	–	4.00	2.00	
EEE 163	Introduction to Electrical Engineering	3.00	–	3.00	
EEE 164	Introduction to Electrical Engineering Sessional	–	3.00	1.50	
MATH 141	Differential Calculus and Co-ordinate Geometry	3.00	–	3.00	
ME 160	Mechanical Engineering Drawing-I	–	3.00	1.50	
ME 165	Basic Mechanical Engineering	3.00	–	3.00	
PHY 109	Physics (Heat and Thermodynamics, Structure of Matter, Waves and Oscillations, and Physical Optics)	4.00	–	4.00	
PHY 102	Physics Sessional	–	3.00	1.50	
	Total	**13.00**	**13.00**	**19.50**	

LEVEL-1 TERM-II

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 103	Discrete Mathematics	3.00	–	3.00	
CSE 105	Structured Programming Language	3.00	–	3.00	CSE 100
CSE 106	Structured Programming Language Sessional	–	3.00	1.50	
CHEM 101	Chemistry	3.00	–	3.00	
CHEM 114	Inorganic Quantitative Analysis	–	3.00	1.50	
HUM 175	English	3.00	–	3.00	
HUM 272	Developing English Skills Laboratory	–	3.00	1.50	
MATH 143	Integral Calculus, Ordinary and Partial Differential Equations, and Series Solutions	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		
CSE 201	Object Oriented Programming Language	3.00	–	3.00	CSE105
CSE 202	Object Oriented Programming Language Sessional	–	3.00	1.50	
CSE 203	Data Structures	3.00	–	3.00	CSE 105
CSE 204	Data Structures Sessional	–	1.50	0.75	
CSE 205	Digital Logic Design	3.00	–	3.00	
CSE 206	Digital Logic Design Sessional	–	3.00	1.50	
EEE 263	Electronic Devices and Circuits	4.00	–	4.00	EEE 163
EEE 264	Electronic Devices and Circuits Sessional	–	3.00	1.50	
MATH 241	Complex Variable and Statistics	3.00	–	3.00	
	Total	**16.00**	**10.50**	**21.25**	

LEVEL-2 TERM-II

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 207	Algorithms	3.00	–	3.00	CSE 103, CSE 203
CSE 208	Algorithms Sessional	–	1.50	0.75	
CSE 209	Digital Electronics and Pulse Techniques	3.00	–	3.00	EEE 263
CSE 210	Digital Electronics and Pulse Techniques Sessional	–	3.00	1.50	
CSE 211	Theory of Computation	2.00	–	2.00	
CSE 214	Assembly Language Programming	–	3.00	1.50	
EEE 269	Electrical Drives and Instrumentation	3.00	–	3.00	EEE 163
EEE 270	Electrical Drives and Instrumentation Sessional	–	3.00	1.50	
MATH 243	Matrices, Vectors, Fourier Analysis, and Laplace Transforms	4.00	–	4.00	
	Total	**15.00**	**10.50**	**20.25**	

LEVEL-3 TERM-I

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 300	Technical Writing and Presentation	–	1.50	0.75	
CSE 303	Database	3.00	–	3.00	
CSE 304	Database Sessional	–	3.00	1.50	
CSE 305	Computer Architecture	3.00	–	3.00	CSE 205
CSE 307	Software Engineering and Information System Design	4.00	–	4.00	
CSE 308	Software Engineering and Information System Design Sessional	–	3.00	1.50	
CSE 309	Compiler	3.00	–	3.00	CSE 211
CSE 310	Compiler Sessional	–	1.50	0.75	
CSE 311	Data Communication-I	3.00	–	3.00	MATH 243
	Total	**16.00**	**9.00**	**20.50**	

LEVEL-3 TERM-II

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 301	Mathematical Analysis for Computer Science	3.00	–	3.00	
CSE 313	Operating System	3.00	–	3.00	
CSE 314	Operating System Sessional	–	3.00	1.50	
CSE 315	Microprocessors and Microcontrollers	3.00	–	3.00	CSE 205
CSE 316	Microprocessors and Microcontrollers Sessional	–	3.00	1.50	
CSE 317	Numerical Methods	3.00	–	3.00	
CSE 321	Computer Networks	4.00	–	4.00	
CSE 322	Computer Networks Sessional	–	1.50	0.75	
CSE 324	Software Development	–	1.50	0.75	
	Total	**16.00**	**9.00**	**20.50**	

LEVEL-4 TERM-I

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 400	Project and Thesis	–	6.00	3.00	
CSE 401	Artificial Intelligence	3.00	–	3.00	
CSE 402	Artificial Intelligence Sessional	–	1.50	0.75	
CSE 403	Digital System Design	3.00	–	3.00	CSE 315
CSE 404	Digital System Design Sessional	–	3.00	1.50	
CSE nnn	Option-I	3.00	–	3.00	
HUM nnn	Option-II	2.00	–	2.00	
IPE 493	Industrial Management	3.00	–	3.00	
	Total	**14.00**	**10.50**	**19.25**	

Option I

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 411	Simulation and Modeling	3.00	–	3.00	
CSE 421	Basic Graph Theory	3.00	–	3.00	
CSE 423	Fault Tolerant Systems	3.00	–	3.00	
CSE 433	Digital Image Processing	3.00	–	3.00	
CSE 435	Basic Multimedia Theory	3.00	–	3.00	

Option II

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
HUM 211	Sociology	2.00	–	2.00	
HUM 213	Government	2.00	–	2.00	
HUM 411	Business Law	2.00	–	2.00	

LEVEL-4 TERM-II

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 400	Project and Thesis	–	6.00	3.00	
CSE 409	Computer Graphics	3.00	–	3.00	MATH 243
CSE 410	Computer Graphics Sessional	–	1.50	0.75	
CSE nn1	Option-III	3.00	–	3.00	
CSE nn2	Option-III Sessional	–	1.50	0.75	
CSE nn3	Option-III	3.00	–	3.00	
CSE nn4	Option-III Sessional	–	1.50	0.75	
HUM 275	Economics	2.00	–	2.00	
HUM 371	Financial and Managerial Accounting	2.00	–	2.00	
	Total	**13.00**	**10.50**	**18.25**	

Option III

(Two theory and two sessional courses from one of the following groups have to be taken)

Network and Communications group

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 451	Data Communication-II	3.00	–	3.00	CSE 311
CSE 452	Data Communication-II Sessional	–	1.50	0.75	
CSE 453	Wireless Networks	3.00	–	3.00	
CSE 454	Wireless Networks Sessional	–	1.50	0.75	

Theoretical Computer Science group

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 461	Algorithm Engineering	3.00	–	3.00	CSE 207
CSE 462	Algorithm Engineering Sessional	–	1.50	0.75	
CSE 463	Computational Geometry	3.00	–	3.00	CSE 207
CSE 464	Computational Geometry Sessional	–	1.50	0.75	

Artificial Intelligence group					
Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 471	Machine Learning	3.00	–	3.00	CSE 401
CSE 472	Machine Learning Sessional	–	1.50	0.75	
CSE 473	Pattern Recognition	3.00	–	3.00	
CSE 474	Pattern Recognition Sessional	–	1.50	0.75	

Hardware group					
Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Sessional		
CSE 481	VLSI Design	3.00	–	3.00	
CSE 482	VLSI Design Sessional	–	1.50	0.75	
CSE 483	Computer Interfacing	3.00	–	3.00	CSE 315
CSE 484	Computer Interfacing Sessional	–	1.50	0.75	

Summary

Level Term	**Hours/Week**		**Credits**	**No. of theory courses**
	Theory	**Sessional**		
Level 1 Term 1	13.00	13.00	19.50	4
Level 1 Term 2	16.00	9.00	20.50	5
Level 2 Term 1	16.00	10.50	21.25	5
Level 2 Term 2	15.00	10.50	20.25	5
Level 3 Term 1	16.00	9.00	20.50	5
Level 3 Term 2	16.00	9.00	20.50	5
Level 4 Term 1	14.00	10.50	19.25	5
Level 4 Term 2	13.00	10.50	18.25	5
Total	119.00	82.00	160.00	39

CHAPTER 5
DETAIL OUTLINE OF UNDERGRADUATE COURSES OFFERED BY THE DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LEVEL-1 TERM-I

CSE 100 Introduction to Computer Systems
4 hours in a week, 2.00 Cr.

Introduction to computations; Early history of computing devices; Computers; Major components of a computer; Hardware: processor, memory, I/O devices; Software: Operating system, application software; Basic architecture of a computer; Basic Information Technology; The Internet; Number system: binary, octal, hexadecimal, binary arithmetic; Basic programming concepts; Program development stages: flow charts; Programming constructs: data types, operators, expressions, statements, control statements, functions, array.

EEE 163 Introduction to Electrical Engineering
3 hours in a week, 3.00 Cr.

Fundamental electrical concepts and measuring units. Direct current: voltage, current, resistance and power. Laws of electrical circuits and methods of network analysis; Introduction to magnetic circuits. Alternating current: instantaneous and r.m.s. current, voltage and power, average power for various combinations of R, L and C circuits, phasor representation of sinusoidal quantities.

EEE 164 Introduction to Electrical Engineering Sessional
3 hours in a week, 1.50 Cr.

Laboratory works based on EEE 163.

MATH 141 Differential Calculus and Co-ordinate Geometry

3 hours in a week, 3.00 Cr.

Differential Calculus: Limits, continuity and differentiability; Successive differentiation of various types of functions; Leibniz's Theorem; Rolle's Theorem; Mean value Theorem in finite and infinite forms; Lagrange's form of remainders; Cauchy's form of remainder; Expansion of functions; Evaluation of indeterminate forms by L'Hospital's rule; Partial differentiation; Euler's Theorem; Tangent and Normal, Subtangent and subnormal in cartesian and polar co-ordinates; Maximum and minimum values of functions of single variable; Points of inflexion; Curvature, radius of curvature, center of curvature; Asymptotes, curve tracing.
Co-ordinate Geometry: Transformation of co-ordinates axes and its uses; Equation of conics and its reduction to standard forms; Pair of straight lines; Homogeneous equations of second degree; Angle between a pair of straight lines; Pair of lines joining the origin to the point of intersection of two given curves, circles; System of circles; Orthogonal circles; Radical axis, radical center, properties of radical axes; Coaxial circles and limiting points; Equations of parabola, ellipse and hyperbola in cartesian and polar co-ordinates; Tangents and normals, pair of tangents; Chord of contact; Chord in terms of its middle points; Pole and polar parametric co-ordinates; Diameters; Conjugate diameters and their properties; Director circles and asymptotes.

ME 160 Mechanical Engineering Drawing-I

3 hours in a week, 1.50 Cr.

Introduction; Instruments and their uses; First and third angle projections; Orthographic drawings; Isometric views; Missing lines and views; Sectional views and conventional practices; Auxiliary views.

ME 165 Basic Mechanical Engineering

3 hours in a week, 3.00 Cr.

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.

PHY 109 Physics (Heat and Thermodynamics, Structure of Matter, Waves and Oscillations, and Physical Optics)

4 hours in a week, 4.00 Cr.

Heat and 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, Brownian motion, Van der Waal's equation of state, review of the First Law of thermodynamics and its application, reversible and irreversible processes, Second Law of thermodynamics, Carnot cycle; Efficiency of heat engines, Carnot's Theorem, entropy and disorder, thermodynamic functions, Maxwell relations, Clausius-Clapeyron Equation, Gibbs Phase Rule, Third Law of thermodynamics.
Structure of Matter: Crystalline and non-crystalline solids, single crystal and polycrystal solids, unit cell, crystal systems, co-ordinations number, crystal planes and directions, sodium chloride and CsCl structure, packing factor, Miller indices, relation between interplanar spacing and Miller indices, Bragg's Law, methods of determination of interplanar spacing from diffraction patterns; Defects in solids: point defects, line defects; Bonds in solids, inter-atomic distances, calculation of cohesive and bonding energy; Introduction to band theory: distinction between metal, semiconductor and insulator.
Waves and 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.

Physical Optics: Theories of light; Interference of light, Young's double slit experiment; Displacements of fringes and its uses; Fresnel Bi-prism, interference at wedge shaped films, Newton's rings, interferometers; Diffraction of light: Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit & N-slits-diffraction grating; Polarization: production and analysis of polarized light, Brewster's law, Malus law, Polarization by double refraction, retardation plates, Nicol prism, optical activity, polarimeters, polaroid.

PHY 102 Physics Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on PHY 109.

LEVEL-1 TERM-II

CSE 103 Discrete Mathematics

3 hours in a week, 3.00 Cr.

Set theory; Relations; Functions; Graph theory; Propositional calculus and predicate calculus; Mathematical reasoning: induction, contradiction and recursion; counting; Principles of inclusion and exclusion; Recurrence relations; Algebraic structures: rings and groups.

CSE 105 Structured Programming Language

3 hours in a week, 3.00 Cr.

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 106 Structured Programming Language Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 105.

CHEM 101 Chemistry

3 hours in a week, 3.00 Cr.

Atomic structure, quantum numbers, electronic configuration, periodic table; Properties and uses of noble gases; Different types of chemical bonds and their properties; Molecular structure of compounds; Selective organic reactions; Different types of solutions and their compositions; Phase rule, phase diagram of monocomponent system; Properties of dilute solutions; Thermochemistry, chemical kinetics, chemical equilibria; Ionization of water and pH concept; Electrical properties of Solution.

CHEM 114 Inorganic Quantitative Analysis

3 hours in a week, 1.50 Cr.

Volumetric analysis: acid-base titration, oxidation-reduction titration, determination of Fe, Cu, Ca volumetrically.

HUM 175 English

3 hours in a week, 3.00 Cr.

English phonetics: the places and manners of articulation of the English sounds; Vocabulary; English grammar: construction of sentences, some grammatical problems; Comprehension; Paragraph writing; Précis writing; Amplification; Report writing; Business communication and tenders; Short stories written by some well-known classic writers.

HUM 272 Developing English Skills Laboratory

3 hours in a week, 1.50 Cr.

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 skill: Strategies of reading – skimming, scanning, predicting, inferring; analyzing and interpreting variety of texts; practicing comprehension from literary and nonliterary texts.
Developing writing skill: 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 skill: Oral skills including communicative expressions for personal identification, life at home, giving advice and opinion, instruction and directions, requests, complaints, apologies, describing people and places, narrating events.

MATH 143 Integral Calculus, Ordinary and Partial Differential Equations, and Series Solutions

4 hours in a week, 4.00 Cr.

Integral Calculus: Definitions of integration; Integration by the method of substitutions; Integration by parts; Standard integrals; Integration by the method of successive reduction; Definite integrals and its properties and use in summing series; Walli's formula, Improper integrals, Beta function and Gamma function; Area under a plane curve in cartesian and polar co-ordinates; Area of the region enclosed by two curves in cartesian and polar co-ordinates; Trapezoidal rule, Simpson's rule. Arc lengths of curves in cartesian and polar co-ordinates, parametric and pedal equations; Intrinsic equation; Volume of solids of revolution; Volume of hollow solids of revolution by shell method. Area of surface of revolution; Jacobian, multiple integrals and their application.
Ordinary Differential Equation (ODE): Degree and order of ordinary differential equations; 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; Solution of differential equation by the method based on factorization of operators.

Partial Differential Equations (PDE): Four rules for solving simultaneous equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$; Lagrange's method of solving PDE of order one; Integral surfaces passing through a given curve; Nonlinear PDE of order one (complete, particular, singular and general integrals): standard forms $f(p,q) = 0$, $z = px + qy + f(p,q)$, $f(p,q,z) = 0$, $f_1(x,p) = f_2(y, q)$; Charpit's method; Second order PDE: its nomenclature and classifications to canonical (standard)- parabolic, elliptic, hyperbolic; Solution by separation of variables. Linear PDE with constant coefficients.

Series Solution: Solution of differential equations in series by the method of Frobenius; Bessel's functions, Legendre's polynomials and their properties.

LEVEL-2 TERM-I

CSE 201 Object Oriented Programming Language

3 hours in a week, 3.00 Cr.

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 202 Object Oriented Programming Language Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 201.

CSE 203 Data Structures

3 hours in a week, 3.00 Cr.

Internal data representation; Abstract data types; Elementary data structures: arrays, lists, stacks, queues, trees, graphs; Advanced data Structures: heaps, Fibonacci heaps, B-trees; Recursion, sorting, searching, hashing, storage management.

CSE 204 Data Structures Sessional

3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 203.

CSE 205 Digital Logic Design

3 hours in a week, 3 Cr.

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 counters, synchronous counters and their applications; PLA design; Synchronous and asynchronous logic design; State diagram, Mealy and Moore machines; State minimizations and assignments; Pulse mode logic; Fundamental mode design.

CSE 206 Digital Logic Design Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 205.

EEE 263 Electronic Devices and Circuits

4 hours in a week, 4.00 Cr.

Introduction to semiconductors, p-type and n-type semiconductors; p-n junction diode characteristics; Diode applications: half and full wave rectifiers, clipping and clamping circuits, regulated power supply using zener diode.
Bipolar Junction Transistor (BJT): principle of operation, I-V characteristics; Transistor circuit configurations (CE, CB, CC), BJT biasing, load lines; BJTs at low frequencies; Hybrid model, *h*

parameters, simplified hybrid model; Small-signal analysis of single and multi-stage amplifiers, frequency response of BJT amplifier.
Field Effect Transistors (FET): principle of operation of JFET and MOSFET; Depletion and enhancement type NMOS and PMOS; biasing of FETs; Low and high frequency models of FETs, Switching circuits using FETs; Introduction to CMOS.
Operational Amplifiers (OPAMP): linear applications of OPAMPs, gain, input and output impedances, active filters, frequency response and noise.
Introduction to feedback, Oscillators, Silicon Controlled Rectifiers (SCR), TRIAC, DIAC and UJT: characteristics and applications; Introduction to IC fabrication processes.

EEE 264 Electronic Devices and Circuits Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on EEE 263.

MATH 241 Complex Variable and Statistics

3 hours in a week, 3.00 Cr.

Complex Variable: Complex number system; General functions of a complex variable; Limits and continuity of a function of complex variable and related theorems; Complex differentiation and the 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. Evaluation of residues; Contour integration; Conformal mapping.
Statistics: Frequency distribution; Mean, median, mode and other measures of central tendency; Standard deviation and other measures of dispersion; Moments, skewness and kurtosis; Elementary probability theory and discontinuous probability distribution, (binomial, Poisson and negative binomial); Characteristics of distributions; Elementary sampling theory; Estimation; Hypothesis testing and regression analysis.

LEVEL-2 TERM-II

CSE 207 Algorithms
3 hours in a week, 3 Cr.

Techniques for analysis of algorithms; Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic programming, back tracking, branch and bound; Basic search and traversal techniques; Topological sorting; Connected components, spanning trees, shortest paths; Flow algorithms; Approximation algorithms; Parallel algorithms; Algebraic simplification and transformations; Lower bound theory; NP-completeness, NP-hard and NP-complete problems.

CSE 208 Algorithms Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory work based on CSE 207.

CSE 209 Digital Electronics and Pulse Techniques
3 hours in a week, 3 Cr.

Diode logic gates, transistor switches, transistor gates, MOS gates; Logic Families: TTL, ECL, IIL and CMOS logic with operation details; Propagation delay, product and noise immunity; Open collector and high impedance gates; Electronic circuits for flip-flops, counters and register, memory systems, PLAs; A/D and D/A converters with applications; S/H circuits, LED, LCD and optically coupled oscillators; Non-linear applications of OP AMPs; Analog switches.
Linear wave shaping: diode wave shaping techniques, clipping and clamping circuits, comparator circuits, switching circuits; Pulse transformers, pulse transmission, pulse generation; monostable, bistable and astable multivibrators, Schmitt trigger, blocking oscillators and time-base circuit; Timing circuits; Simple voltage sweeps, linear current sweeps.

CSE 210 Digital Electronics and Pulse Techniques Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 209.

CSE 211 Theory of Computation

2 hours in a week, 2 Cr.

Language theory; 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; Turing Machines: basic machines, configuration, computing with Turing machines, combining Turing machines; Undecidability.

CSE 214 Assembly Language Programming

3 hours in a week, 1.50 Cr.

Hardware architecture and software architecture; 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; Concurrent processes and high level linking; Disk geometry, file system and file I/O handling.

EEE 269 Electrical Drives and Instrumentation

3 hours in a week, 3.00 Cr.

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 Cr.

Laboratory works based on EEE 269.

MATH 243 Matrices, Vectors, Fourier Analysis, and Laplace Transforms

4 hours in a week, 4.00 Cr.

Matrices: Definition of matrix; Different types of matrices; Algebra of matrices; Adjoint and inverse of a matrix; Elementary transformations of matrices; Matrix polynomials; Calay-Hamilton theory with uses of rank and nullity; Normal and canonical forms; Solution of linear equations; Eigenvalues and eigenvectors.

Vector Spaces: Definition and properties, subspaces, basis and dimension, change of basis; Linear Transformation (LT): definition and properties, linear operator matrix, geometry of LT, standard plane LT.

Vector Algebra: Scalars and vectors, equality of vectors; Addition and subtraction of vectors; Multiplication of vectors by scalars; Scalar and vector product of two vectors and their geometrical interpretation; Triple products and multiple products; Linear dependence and independence of vectors.

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

Fourier Analysis: Real and complex form of Fourier series; Finite transform; Fourier Integral; Fourier transforms and their uses in solving boundary value problems of wave equations.

Laplace Transforms: Definition; Laplace transforms of some elementary functions; Sufficient conditions for existence of Laplace transforms; Inverse Laplace transforms; Laplace transforms of derivatives. The unit step function; Periodic function; Some special theorems on Laplace transforms; Partial fraction; Solutions of differential equations by Laplace transforms; Evaluation of improper integrals.

LEVEL-3 TERM-I

CSE 300 Technical Writing and Presentation

3 hours in alternate week, 0.75 Cr.

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 303 Database

3 hours in a week, 3.00 Cr.

Concepts of database systems; Models: Entity-Relationship model, Relational model; Relational algebra; SQL; Integrity constraint; Relational database design; File organization and retrieval, file indexing; Transaction manager; Concurrency controller; Recovery manager; Security system; Database administration; Advanced database management systems: distributed, multimedia, object-oriented, object-relational; Some applications using SQL.

CSE 304 Database Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 303.

CSE 305 Computer Architecture

3 hours in a week, 3.00 Cr.

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 - hardwared and microprogrammed; Hazards; Exceptions; Pipeline: pipelined datapath and control, superscalar and dynamic pipelining; Memory organization: cache, virtual memory,

channels; DMA and Interrupts; Buses; Multiprocessors: types of multiprocessors, performance, single bus multiprocessors, multiprocessors connected by network, clusters.

CSE 307 Software Engineering and Information System Design

4 hours in a week, 4.00 Cr.

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.
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, Inception. 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. Designing Objects with responsibilities. GRASP patterns with General Principles in assigning responsibilities: Information expert, Creator, Low Coupling and High Cohesion, Creating design class diagrams and mapping design to codes. Advanced GRASP patterns: Polymorphism, Pure Fabrication, Indirection, Project Variation. GoF Design Patterns: Adapter, Factory, Singleton, Strategy, Composite, Façade, and Observer.
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 and Information System Design Sessional

3 hours in a week, 1.50 Cr.

Lab works based on CSE307 and a term project.

CSE 309 Compiler

3 hours in a week, 3.00 Cr.

Introduction to compiling; Basic issues; Lexical analysis; Syntax analysis; Syntax-directed translation; Semantic analysis: type-checking; Run-time environments; Intermediate code generation; Code generation; Code optimization.

CSE 310 Compiler Sessional

3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 309 and project works using some lexical analyzer and parser designing tools.

CSE 311 Data Communication-I

3 hours in a week, 3.00 Cr.

Signal and random processes; Review of Fourier Transform; Hilbert Transform, continuous wave modulation: AM, PM, FM; Sampling theorem; Pulse modulation: PAM, PDM, PPM, PCM, companding, delta modulation, differential PCM; Multiple access techniques: TDM, FDM; Digital modulation: ASK, PSK, BPSK, QPSK, FSK, MSK, constellation, bit error rate (BER); Noise; Echo cancellation; Intersymbol Interference; Concept of channel coding and capacity.

LEVEL-3 TERM-II

CSE 301 Mathematical Analysis for Computer Science

3 hours in a week, 3.00 Cr.

Recurrent problems; Manipulation of sums; Number theory; Special numbers; Generating functions.
Random variables; 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 Cr.

Operating System: its role in computer systems; Operating system concepts; Operating system structure; Process: process model and implementation, Inter-Process Communication (IPC), classical IPC problems, process scheduling, multiprocessing and time-sharing; Memory management: swapping, paging, segmentation, virtual memory; Input/Output: hardware, software, disk, terminals, clocks; Deadlock: resource allocation and deadlock, deadlock detection, prevention and recovery; File Systems: files, directories, security, protection; Case study of some operating systems.

CSE 314 Operating System Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 313.

CSE 315 Microprocessors and Microcontrollers

3 hours in a week, 3.00 Cr.

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.

CSE 316 Microprocessors and Microcontrollers Sessional

3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 315.

CSE 317 Numerical Methods

3 hours in a week, 3 Cr.

Introduction; Solution of algebraic and transcendental equations: method of iteration, False Position method, Newton-Rhapson method; Solution of simultaneous linear equations: Cramer's rule, Iteration method, Gauss-Jordan Elimination method, Choleski's process; Interpolation: diagonal and horizontal difference, differences of a polynomial, Newton's formula for forward and backward interpolation, Spline interpolation; Numerical differentiation and integration; Solution of ordinary differential equations: Euler's method, Picard's method, Milne's method, Taylor's series method, Runge-Kutta method; Least squares approximation of functions: linear and polynomial regression, fitting exponential and trigonometric functions.

CSE 321 Computer Networks

4 hours in a week, 4.00 Cr.

Protocol hierarchies; Data link control: HLDC; DLL in Internet; DLL of ATM; LAN Protocols: Standards IEEE 802.*; Hubs, Bridges, and Switches, FDDI, Fast Ethernet; Routing algorithm; Congestion control; Internetworking, WAN; Fragmentation; Firewalls; IPV4, IPV6, ARP, RARP, Mobile IP, Network layer of ATM; Transport protocols; Transmission control protocol: connection management, transmission policy, congestion control, timer management; UDP; AAL of ATM; Network security: Cryptography, DES, IDEA, public key algorithm; Authentication; Digital signatures; Gigabit Ethernet; Domain Name System: Name servers; Email and its privacy; SNMP; HTTP; World Wide Web.

CSE 322 Computer Networks Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 321.

CSE 324 Software Development
3 hours in alternate week, 0.75 Cr.

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

LEVEL-4 TERM-I

CSE 400 Project and Thesis
6 hours in a week, 3.00 Cr.

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

CSE 401 Artificial Intelligence
3 hours in a week, 3.00 Cr.

Introduction to old and new AI techniques; Knowledge representation; Propositional and first order logic, inference in first order logic; Frame problem; Search techniques in AI; Game playing; Planning; Probabilistic reasoning; Learning in symbolic and non-symbolic representation; Natural language processing. Introduction to expert system.

CSE 402 Artificial Intelligence Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 401.

CSE 403 Digital System Design

3 hours in a week, 3.00 Cr.

Designing I/O system; I/O devices; Designing Microprocessor based system with interfacing chips; Programmable peripheral interface (interface to A/D and D/A converter); Keyboard/display interface; Programmable timer; Programmable interrupt controller, DMA controller;
Design using MSI and LSI components; Design of memory subsystem using SRAM and DRAM; Design of various components of a computer: ALU, memory and control unit – hardwired and micro programmed; Microprocessor based designs; Computer BUS standards; Design special purpose controllers.

CSE 404 Digital System Design Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on CSE 403.

IPE 493 Industrial Management

3 hours in a week, 3.00 Cr.

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.

CSE 411 Simulation and Modeling
3 hours in a week, 3.00 Cr.

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 421 Basic Graph Theory
3 hours in a week, 3.00 Cr.

Graphs: simple graphs, digraphs, subgraphs, vertex-degrees, walks, paths and cycles; Trees, spanning trees in graphs, distance in graphs; Complementary graphs, cut-vertices, bridges and blocks, k-connected graphs; Euler tours, Hamiltonian cycles, Chinese Postman Problem, Traveling Salesman Problem; Chromatic number, chromatic polynomials, chromatic index, Vizing's theorem, planar graphs, perfect graphs.

CSE 423 Fault Tolerant Systems
3 hours in a week, 3.00 Cr.

Introduction of Fault Tolerant Systems and architectures; Fault detection and location in combinational and sequential circuits; Fault test generation for combinational and sequential circuits; Digital simulation as a diagnostic tool; Automatic test pattern generator; Fault modeling; Automatic test equipment, faults in memory, memory test pattern and reliability; Performance monitoring, self checking circuits, burst error correction and triple modular redundancy; Maintenance processors.

CSE 433 Digital Image Processing
3 hours in a week, 3.00 Cr.

Introduction; Digitization of images and its properties; Data structures for image analysis; Image processing; Segmentation: detection of discontinuities, edge linking and boundary detection, thresholding, region oriented segmentation, use of motion in segmentation; Image transforms: Z-transform, 2D Fourier transform, discrete cosine transform, Hadamard transform, Walsh transform, Slant transform; Image compression: run-length coding, transform coding, standards.

CSE 435 Basic Multimedia Theory
3 hours in a week, 3.00 Cr.

Multimedia systems - introduction; Coding and compression standards; Architecture issues in multimedia; Operating systems issues in multimedia - real-time OS issues, synchronization, interrupt handling; Database issues in multimedia - indexing and storing multimedia data, disk placement, disk scheduling, searching for a multimedia document; Networking issues in multimedia - Quality-of-service guarantees, resource reservation, traffic specification, shaping, and monitoring, admission control; Multicasting issues; Session directories; Protocols for controlling sessions; Security issues in multimedia – digital water-marking, partial encryption schemes for video streams; Multimedia applications - audio and video conferencing, video on demand, voice over IP.

HUM 211 Sociology
2 hours in a week, 2.00 Cr.

Sociological perspective: definition, nature, scope and importance of sociology; Sociology and scientific approach: methods of social research, stages of social research; Primary concepts of sociology: society, community, association, institution, group; Social evolution: stages in the evolution of human civilization; Culture: definition, characteristics, culture contents (material and non-material), cultural lag, culture and civilization; Industrial revolution: the growth of capitalism, features and social consequences, socialism; Social organization: family, forms and functions of family, functions of family

in modern industrial society, marriage, forms of marriage, functions of marriage; Social stratification: main types of social stratification – slavery-caste and social class and status, social stratification and social mobility; Social control: religion and morality, custom and public opinion, taboo-law, state and education; Social change: change-evolution-progress-development, factors in social change; Society and population: human migration, population and resources; Some current social problems: crime, deviance, juvenile delinquency, youth unrest; Technology and society: effects of technological factors on social life.

HUM 213 Government

2 hours in a week, 2.00 Cr.

Some basic concepts of government and politics; Functions, organs and forms of modern state and government; Socialism, Fascism, Marxism. Government and politics of Bangladesh; Some major administrative systems of developed countries; Local self government; Some major aspects of international politics.

HUM 411 Business Law

2 hours in a week, 2.00 Cr.

Principles of law of contracts; 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; The Factory Act (1965); The Law of compensation (1965).

LEVEL-4 TERM-II

CSE 400 Project and Thesis

6 hours in a week, 3.00 Cr.

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

CSE 409 Computer Graphics

3 hours in a week, 3.00 Cr.

Graphics hardware: display devices, input devices etc; Basic raster graphics algorithms for drawing 2D primitives; Two-dimensional and three-dimensional viewing, clipping and transformations; Three-dimensional object representations: polygon surface, B-Spline curves and surfaces, BSP trees, Octrees, Fractal-Geometry methods; Visible surface detection methods: Z-buffer method, BSP tree method, Ray casting method; Illumination models; Surface rendering methods: polygon rendering, ray tracing, terrain visualization with height mapping, modeling surface details with texture mapping; Color models; Computer animation.

CSE 410 Computer Graphics Sessional

3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 409.

HUM 275 Economics

2 hours in a week, 2.00 Cr.

Definition of Economics; Economics and engineering; Principles of economics.

Micro-Economics: Introduction to various economic systems – capitalist, command and mixed economy; Fundamental economic problems and the mechanism through which these problems are solved; Theory of demand and supply and their elasticities; Theory of consumer behavior; Cardinal and ordinal approaches of utility analysis; Price determination; Nature of an economic theory; Applicability of economic theories to the problems of developing countries; Indifference curve techniques; Theory of production, production function, types of productivity; Rational region of production of an engineering firm; Concepts of market and market structure; Cost analysis and cost function; Small scale production and large scale production; Optimization; Theory of distribution; Use of derivative in economics: maximization and minimization of economic functions, relationship among total, marginal and average concepts.

Macro-economics: Savings; investment, employment; National income analysis; Inflation; Monetary policy; Fiscal policy and trade policy with reference to Bangladesh; Economics of development and planning.

HUM 371 Financial and Managerial Accounting

2 hours in a week, 2.00 Cr.

Financial Accounting: Objectives and importance of accounting; Accounting as an information system; computerized system and applications in accounting; Recording system: double entry mechanism; Accounts and their classification; Accounting equation; Accounting cycle: journal, ledger, trial balance; Preparation of financial statements considering adjusting and closing entries; Accounting concepts (principles) and conventions.
Financial statement analysis and interpretation: ratio analysis.
Cost and Management Accounting: Cost concepts and classification; Overhead cost: meaning and classification; Distribution of overhead cost; Overhead recovery method/rate; Job order costing: preparation of job cost sheet and quotation price; Inventory valuation: absorption costing and marginal/variable costing technique; Cost-Volume-Profit analysis: meaning, breakeven analysis, contribution margin approach, sensitivity analysis.
Short-term investment decisions: relevant and differential cost analysis.
Long-term investment decisions: capital budgeting, various techniques of evaluation of capital investments.

CSE 451 Data Communication-II

3 hours in a week, 3.00 Cr.

Synchronous and asynchronous communications; Hardware interfaces, multiplexers, concentrators and buffers; Communication mediums and their characteristics; Data communication services: SMDS and ATM; Error control codes: linear block codes, cyclic codes, MLDC codes, convolution codes, Trellis code modulation; Digital switching: space and time division switching; Radio system design; Fiber optics communication: transmitter, receivers, network components, WDM; Line coding, trunks, multiplexing, switching, ATM switches; Satellite communications: frequency bands and characteristics, types of satellites, transmission impairments, capacity allocation; Multiple access techniques.

CSE 452 Data Communication-II Sessional

3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 451.

CSE 453 Wireless Networks

3 hours in a week, 3.00 Cr.

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 2^{nd} and 3^{rd} generation wireless: GSM, GPRS, CDMA; Cordless system; Wireless local loop; Bluetooth: overview and baseband specifications.

CSE 454 Wireless Networks Sessional

3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 453.

CSE 461 Algorithm Engineering

3 hours in a week, 3.00 Cr.

Computational complexity, Parameterized complexity, Algorithms for combinatorial optimization, practical computing and heuristics, Approximation algorithms, LP based approximation algorithms, randomized algorithms, Experimental algorithmic, Algorithms in state-of-the-art fields like Bioinformatics, Grid Computing, VLSI design etc.

CSE 462 Algorithm Engineering Sessional

3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 461.

CSE 463 Computational Geometry
3 hours in a week, 3.00 Cr.

Algorithm and complexity of fundamental geometric objects: polygon triangulations and art gallery theorem, polygon partitioning, convex hulls in 2-dimension.
Proximity: Voronoi diagrams and Delaunary triangulations.
Graph Drawing: drawing styles and applications, drawing of rooted trees, straight line drawing of planar graphs.

CSE 464 Computational Geometry Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 463.

CSE 471 Machine Learning
3 hours in a week, 3.00 Cr.

Introduction to machine learning; Learning algorithms: supervised, unsupervised, reinforcement, attribute based, neural network based, relational supervised and negative correlation; Genetic algorithm, genetic programming and evolutionary programming; Practical application of machine learning.

CSE 472 Machine Learning Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 471.

CSE 473 Pattern Recognition
3 hours in a week, 3.00 Cr.

Pattern Recognition: introduction, importance; Statistical and Neural Pattern Recognition: Bayesian classifier, Bayes decision theory, discriminant functions and decision surfaces; Bayesian classifier for normal distributions; Linear classifiers: discriminant functions and decision hyperplanes, Perceptron algorithm and its variants, Kessler’s

construction; Nonlinear classifiers: two and three layer perceptrons, backpropagation algorithm and its variants; Template matching: optimal path searching techniques, dynamic programming methods, correlation based matching and 2D log search algorithm for image matching; Context dependent classification: Viterbi algorithm, channel equalization, observable and hidden Markov models, three problems of HMM and their application in speech recognition; Syntactic Pattern Recognition: introduction to Syntactic Pattern Recognition, grammar-based approach, parsing, graph-based approach; Unsupervised classification: basic concepts of clustering, proximity measures, categories of clustering algorithms, sequential clustering algorithms.

CSE 474 Pattern Recognition Sessional

3 hours in alternate week, 0.75 Cr.

Introduction to MATLAB; Laboratory works based on CSE 473 and using MATLAB: Bayesian classifier, linear classifier, nonlinear classifier, image matching, speech recognition, context dependent classification.

CSE 481 VLSI Design

3 hours in a week, 3.00 Cr.

VLSI design methodology: top-down design approach, technology trends and design automation algorithms; Introduction to CMOS inverters and basic gates; Brief overview of CMOS fabrication process: layout and design rules; Basic CMOS circuit characteristics and performance estimation; Buffer circuit design; Complex CMOS gates, CMOS building blocks: adder, multiplier; data path and memory structures.

Hardware modeling: hardware modeling languages, logic networks, state diagrams, data-flow and sequencing graphs, behavioral optimization.

Architectural Synthesis: circuit specification, strategies for architectural optimization, data-path synthesis, control unit synthesis and synthesis of pipelined circuits.

ASIC design using FPGA and PLDs.

CSE 482 VLSI Design Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 481.

CSE 483 Computer Interfacing
3 hours in a week, 3.00 Cr.

Interfacing with floppy and hard-disk controller; serial communication interface; Barcode reader; Sound card; MIDI interface; Printer interface; ISA, PCI, AGP, PS/2 and USB interfaces; Interfacing with stepper motors, controlling semiconductor power switches – BJT, MOSFET, SCR and Triac, Application of Opto-coupler and relays, Embedded Processors, Embedded Computing Platform, Real Time Embedded Systems, Real Time Operating Systems, Embedded Systems Programming, Mapping between languages and hardware, Embedded Communication Systems, Embedded Computer Security.

CSE 484 Computer Interfacing Sessional
3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE 483.

EQUIVALENCE TABLE

Old Course			New Course		
Course No	Course Title	Cr.	Course No	Course Title	Cr.
–	–	–	CSE 100	Introduction to Computer Systems	2.00
–	–	–	CSE 300	Technical Writing and Presentation	0.75
–	–	–	CSE 324	Software Development	0.75
CSE 101N	Structured Programming Language	3.00	CSE 105	Structured Programming Language	3.00
CSE 102N	Structured Programming Language Sessional	1.50	CSE 106	Structured Programming Language Sessional	1.50
CSE 103N	Discrete Mathematics	3.00	CSE 103	Discrete Mathematics	3.00
CSE 105N	Object Oriented Programming Language	2.00	CSE 201	Object Oriented Programming Language	3.00
CSE 106N	Object Oriented Programming Language Sessional	1.50	CSE 202	Object Oriented Programming Language Sessional	1.50
CSE 201N	Numerical Methods	3.00	CSE 317	Numerical Methods	3.00
CSE 203N	Data Structures	3.00	CSE 203	Data Structures	3.00
CSE 204N	Data Structures Sessional	0.75	CSE 204	Data Structures Sessional	0.75
CSE 205N	Digital Logic Design	3.00	CSE 205	Digital Logic Design	3.00
CSE 206N	Digital Logic Design Sessional	1.50	CSE 206	Digital Logic Design Sessional	1.50
CSE 207N	Algorithms	3.00	CSE 207	Algorithms	3.00
CSE 208N	Algorithms Sessional	0.75	CSE 208	Algorithms Sessional	0.75
CSE 209N	Digital Electronics and Pulse Techniques	3.00	CSE 209	Digital Electronics and Pulse Techniques	3.00
CSE 210N	Digital Electronics and Pulse Techniques Sessional	1.50	CSE 210	Digital Electronics and Pulse Techniques Sessional	1.50
CSE 211N	Theory of Computation	2.00	CSE 211	Theory of Computation	2.00

Old Course			New Course		
Course No	Course Title	Cr.	Course No	Course Title	Cr.
CSE 214N	Assembly Language Programming	1.50	CSE 214	Assembly Language Programming	1.50
CSE 301N	Mathematical Analysis for Computer Science	3.00	CSE 301	Mathematical Analysis for Computer Science	3.00
CSE 303N	Database	3.00	CSE 303	Database	3.00
CSE 304N	Database Sessional	1.50	CSE 304	Database Sessional	1.50
CSE 305N	Computer Architecture	3.00	CSE 305	Computer Architecture	3.00
CSE 307N + CSE405N	Software Engineering + System Analysis and Design	3.00 + 3.00	CSE 307	Software Engineering and Information System Design	4.00
CSE 309N	Compiler	3.00	CSE 309	Compiler	3.00
CSE 310N	Compiler Sessional	0.75	CSE 310	Compiler Sessional	0.75
CSE 311N	Data Communication	3.00	CSE 311	Data Communication-I	3.00
CSE 313N	Operating System	3.00	CSE 313	Operating System	3.00
CSE 314N	Operating System Sessional	0.75	CSE 314	Operating System Sessional	1.50
CSE 315N	Microprocessors and Microcontrollers	3.00	CSE 315	Microprocessors and Microcontrollers	3.00
CSE 316N	Microprocessors and Microcontrollers Sessional	1.50	CSE 316	Microprocessors and Microcontrollers Sessional	1.50
CSE 317N	Artificial Intelligence	3.00	CSE 401	Artificial Intelligence	3.00
CSE 318N	Artificial Intelligence Sessional	0.75	CSE 402	Artificial Intelligence Sessional	0.75
CSE 321N	Communication Engineering	3.00	CSE 451	Data Communication-II	3.00
CSE 400N	Project and Thesis	4.50	CSE 400	Project and Thesis	6.00
CSE 401N	Computer Networks	3.00	CSE 321	Computer Networks	4.00
CSE 402N	Computer Networks Sessional	0.75	CSE 322	Computer Networks Sessional	0.75
CSE 403N	Digital System Design	3.00	CSE 403	Digital System Design	3.00
CSE 404N	Digital System Design Sessional	1.50	CSE 404	Digital System Design Sessional	1.50

Old Course			New Course		
Course No	Course Title	Cr.	Course No	Course Title	Cr.
CSE 406N	System Analysis, Design, and Development Sessional	1.50	CSE 308	Software Engineering and Information System Design Sessional	1.50
CSE 409N	Computer Graphics	3.00	CSE 409	Computer Graphics	3.00
CSE 410N	Computer Graphics Sessional	0.75	CSE 410	Computer Graphics Sessional	0.75
CSE 421N	Basic Graph Theory	3.00	CSE 421	Basic Graph Theory	3.00
CSE 423N	Fault Tolerant Systems	3.00	CSE 423	Fault Tolerant Systems	3.00
CSE 431N	Simulation and Modeling	3.00	CSE 411	Simulation and Modeling	3.00
CSE 433N	Image Processing	3.00	CSE 433	Digital Image Processing	3.00
CSE 435N	Basic Multimedia Theory	3.00	CSE 435	Basic Multimedia Theory	3.00
–	–	–	CSE 452	Data Communication-II Sessional	0.75
–	–	–	CSE 453	Wireless Networks	3.00
–	–	–	CSE 454	Wireless Networks Sessional	0.75
–	–	–	CSE 461	Algorithm Engineering	3.00
–	–	–	CSE 462	Algorithm Engineering Sessional	0.75
–	–	–	CSE 463	Computational Geometry	3.00
–	–	–	CSE 464	Computational Geometry Sessional	0.75
–	–	–	CSE 472	Machine Learning Sessional	0.75
CSE 319N	Pattern Recognition	3.00	CSE 473	Pattern Recognition	3.00
CSE 320N	Pattern Recognition Sessional	0.75	CSE 474	Pattern Recognition Sessional	0.75
CSE 407N	Computer Interfacing	3.00	CSE 483	Computer Interfacing	3.00
CSE 408N	Computer Interfacing Sessional	0.75	CSE 484	Computer Interfacing Sessional	0.75
CSE 411N	VLSI Design	3.00	CSE 481	VLSI Design	3.00

Old Course			New Course		
Course No	Course Title	Cr.	Course No	Course Title	Cr.
CSE 412N	VLSI Design Sessional	0.75	CSE 482	VLSI Design Sessional	0.75
CSE 425N	Machine Learning	3.00	CSE 471	Machine Learning	3.00
MATH 141	Mathematics-I (Differential Calculus and Coordinate Geometry)	3.00	MATH 141	Differential Calculus and Coordinate Geometry	3.00
MATH 143	Mathematics-II (Integral Calculus, and Ordinary and Partial Differential Equations)	4.00	MATH 143	Integral Calculus, Ordinary and Partial Differential Equations, and Series Solution	4.00
MATH 241 + MATH 243	Mathematics-III (Complex Variable, Laplace Transformation, and Statistics) + Mathematics-IV (Matrices, Vectors, and Fourier Analysis)	4.00 + 3.00	MATH 241 + MATH 243	Complex Variable and Statistics + Matrices, Vectors, Fourier Analysis, and Laplace Transforms	3.00 + 4.00
Total Credits Requirement: 161.75			Total Credits Requirement: 160		