

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY



SYLLABUS

BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND ENGINEERING (CSE)

APPLICABLE FOR CSE- 15, 16 & 17 BATCHES


REVISED ON July 2014

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CSE)
MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY (MIST)
MIRPUR CANTONMENT, DHAKA-1216, BANGLADESH**

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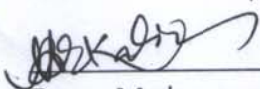


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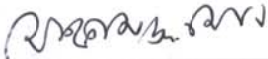


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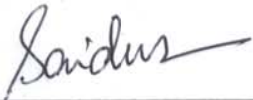
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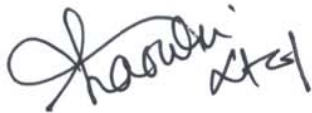
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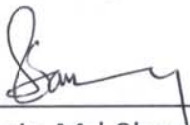
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PREFACE

Military Institute of Science and Technology (MIST) offers undergraduate programs. This syllabus is for the undergraduate students in the Department of Computer Science and Engineering (CSE) of MIST. Although this syllabus has been written mainly for the students, student advisers and teachers will find it valuable as a reference document. Also, anybody who desires to know about the course contents of CSE Department will find this book helpful.

This syllabus provides general information about MIST, its historical background and departments. Different aspects of the course system, such as rules and regulations relating to admission, grading system, 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. 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 syllabus is approved by the committee of courses. It will be placed before the academic council, MIST for necessary approval. This syllabus will be introduced for the CSE undergraduate students commencing their Level-1 Term-I classes in January 2015.

According to the policy of MIST, the syllabus is revised minimum once in every three years. Some of the information recorded in this syllabus 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. It is hoped that this syllabus will be of much use to everybody concerned.

Dhaka, Bangladesh
July 2014

Group Captain Md Afzal Hossain, psc
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CONTENTS

CHAPTER 1

GENERAL INFORMATION

1

1.1	Introduction	1
1.2	Attributes of MIST	2
1.3	Objectives	2
1.4	Location	2
1.5	Capabilities	3
1.6	Affiliation	3
1.7	Eligibility of Students for Admission in MIST	3
1.8	Admission Procedure	4
1.8.1	Syllabus for Admission Test	4
1.8.2	Final Selection	4
1.8.3	Medical Checkup	5
1.9	Withdrawal Policy	5
1.9.1	Definition of Terms	5
1.9.2	General Policy of Withdrawal	6
1.9.3	Expulsion/Withdrawal on Disciplinary Ground	7
1.9.4	Withdrawal on Own Accord	7

CHAPTER 2

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

8

2.1	Introduction	8
2.2	Historical Background	8
2.3	Study Programs	9
2.4	Laboratory Facilities of the Department	9
2.5	Research Activities	10
2.6	Co-curricular Activities	10
2.6.1	Programming Contests	10
2.6.2	Software and Hardware Project Competitions	10
2.6.3	Sports and Cultural program	11

CHAPTER 3

RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAM

12

3.1	Number of Terms in an Academic Year (Level)	12
3.2	Duration of Terms	12
3.3	Course Pattern and Credit Structure	12
3.3.1	Course Designation System	12
3.3.2	Assignment of Credits	13
3.3.3	Types of Courses	13

3.4	The Grading System	14
3.4.1	The Letter Grade	14
3.4.2	Distribution of Marks	14
3.4.3	Calculation of CGPA	16
3.4.4	Minimum Earned Credit and GPA Requirement for Obtaining Degree	18
3.5	Attendance	18
3.6	Teacher-Student Interaction	18
3.7	Conduct and Discipline	18
3.8	Absence During a Term	18
3.9	Recognition of Performance	18

CHAPTER 4

COURSE REQUIREMENTS FOR UNDERGRADUATE COMPUTER SCIENCE AND ENGINEERING STUDENTS

LEVEL-1 TERM-I	20
LEVEL-1 TERM-II	20
LEVEL-2 TERM-I	21
LEVEL-2 TERM-II	21
LEVEL-3 TERM-I	22
LEVEL-3 TERM-II	22
LEVEL-4 TERM-I	23
Option-I	23
LEVEL-4 TERM-II	24
Option-II	24
SUMMARY	25

CHAPTER 5

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

LEVEL-1 TERM-I	26
LEVEL-1 TERM-II	30
LEVEL-2 TERM-I	32
LEVEL-2 TERM-II	35
LEVEL-3 TERM-I	38
LEVEL-3 TERM-II	41
LEVEL-4 TERM-I	44
LEVEL-4 TERM-II	46
Option-I	49
Option-II	53

CHAPTER 1

GENERAL INFORMATION

1.1 Introduction

Military Institute of Science and Technology (MIST), the pioneer Technical Institute of Armed Forces, started its journey from 19 April 1998. It was the visionary leadership of the Honorable Prime Minister of People's Republic of Bangladesh Sheikh Hasina to establish a Technical Institute of Armed Forces. Accordingly, the Honorable Prime Minister, People's Republic of Bangladesh, Sheikh Hasina unveiled the Foundation Plaque on 19 April 1998. MIST is located at Mirpur Cantonment, which is on the northwest of Dhaka City. Mirpur Cantonment is well known to be as an Education Village of Bangladesh Armed Forces, a hub of knowledge for military and civil professionals. First Academic Program at MIST was launched on 31 January 1999 with the maiden batch of Civil Engineering (CE). The pioneer batch comprised of only military students. Computer Science & Engineering (CSE) Program got underway from academic session 2000-2001. Following those Programs, Electrical, Electronic & Communication Engineering (EECE) and Mechanical Engineering (ME) Programs including induction of Civil Students (both male and female) to various disciplines started from the session 2002-2003. Aeronautical Engineering (AE) program started at MIST from Academic Session 2008-2009. The department of Naval Architecture and Marine Engineering (NAME) began its journey from academic session 2012-2013 with 30 students. Number of students in this new dept has been increased to 50 with effect from academic year 2014. Each of CE, CSE, EECE and ME dept has started its 2nd section with 55 students with effect from academic year 2014. Foreign students from Sri Lanka were admitted for the first time in the same Academic Session. Presently students from Maldives, Palestine, Nepal and Gambia are also studying different Engineering Programs. MIST enters into the domain of "Online Admission System" since 06 Sep 2010. MIST envisages creating facilities for military as well as civil students from home and abroad dedicated to pursue standard curriculum leading to Graduation Degree. As an Institution without any gender biasness, MIST is already on steady stride upholding its motto "Technology for Advancement". MIST remains committed to contributing to the wider spectrum of National Educational Arena and play a significant role in the development of Human Resources and ardently pursuing its goal to grow into a "Centre of Excellence".

MIST has well equipped class rooms with multimedia and web camera with internet facilities and Laboratories with modern equipment. The medium of instruction for all engineering programs is English. All academic programs of MIST are affiliated with the Bangladesh University of Professionals (BUP) and have close cooperation with Bangladesh University of Engineering and Technology (BUET) and Dhaka University (DU). Academic Session of MIST normally starts in the last week of January. Admission process starts in September/October and Admission Test held in November every year. Admission formalities are completed by December/January. The total number of intake in a year is 595. In general a maximum of 50% seats are allocated to Armed Forces Officers. MIST has other miscellaneous facilities such as Medical Centre, Fitness Centre, Cyber Café, Broadband Internet facilities, Library and Students' Accommodation (Male & Female). Out of six programs, so far four departments of MIST namely CE, EECE, ME and CSE have achieved

accreditation from BAETE (IEB) which is certainly considered to be a pronounced achievement for its academic excellence in national and international arena.

1.2 Attributes of MIST

MIST is an educational entity where there is an opportunity of blending civil and military students with diversified skills, exposure, experience and outlook. Attributes those may be considered as strengths of MIST are:

- Rigorous admission and selection process for best possible screening.
- Interactive sessions in the classroom.
- Regular guest lectures and educational visits.
- Culture of timeliness, commitment and uninterrupted curriculum.
- Flexibility in choosing competent faculties through outsourcing.
- Well thought-out and continuous feedback and assessment system.
- Effective teaching through innovative method.
- Industrial attachment for on job training.
- Emphasis on code of conduct and dress code.
- Focus to develop students as a good human with all possible attributes of successful leader.
- Continuous effort to build strong industry-academia bondage.
- Tranquil, pollution free and secure campus life.

1.3 Objectives

- To establish a prestigious academic institute for studies in different fields of engineering and technology for military personnel and civil officials/ students from home and abroad at degree and post graduate levels.
- To organize courses on military science and technology in various areas of interest.
- To hold examinations and confer certificates of diplomas/ degrees, other academic distinctions, to and on persons who have persued a course of study and have passed examinations conducted by the institute.
- To confer research degrees, award fellowship, scholarship, exhibition, prizes, medals and honorary degrees to persons who have carried out research works under conditions as prescribed in the MIST regulations.
- To make provisions for advisory, research and consultation service including supervisions, material testing and to enter into suitable agreement with any persons/organizations for this purpose.
- To co-operate with Universities / Technical Institutions (both military and civil) including signing of Memoranda of Understanding (MOU) at home and abroad, in the manner and purpose as the institute may determine.
- To do such other acts, related to above-mentioned objectives, as may be required in order to expand the objectives of the institute.

1.4 Location

MIST is located at Mirpur Cantonment, northwest edge of the greater Dhaka city, a hub of knowledge for the armed forces. Mirpur Cantonment is a small, calm and quiet education

village and free from all possible pollution of a city life. A garland like lake with migratory birds, three sides with extended green fields in the summer and water bodies in the rainy season, whistling birds on the tree branches and overall bounty of nature adds to the already existing splendid academic atmosphere. Other neighboring academic institutions are National Defense College (NDC) and Defense Services Command and Staff College (DSCSC) - two international standard education centers.

1.5 Capabilities

- To conduct under-graduate programs leading to B.Sc. Engineering Degrees in the following disciplines:
 - Civil Engineering (CE)
 - Computer Science and Engineering (CSE)
 - Electrical, Electronic and Communication Engineering (EECE)
 - Mechanical Engineering (ME)
 - Aeronautical Engineering (AE)
 - Navel Architecture and Marine Engineering (NAME)
- To conduct post graduate program.
- To conduct diploma courses in surveying & mapping.
- To conduct diploma and certificate courses in CSE.
- To conduct professional advanced courses.

1.6 Affiliation

All academic programs of MIST are affiliated with the Bangladesh University of Professionals (BUP). All examinations are conducted as per the schedule approved by the same university. BUP also approves the results and awards certificates amongst the qualified students.

1.7 Eligibility of Students for Admission in MIST (Subject to review each year)

The students must fulfill the following requirements (as per the academic year 2011-12):

For Bangladeshi Students

Minimum qualifications to take part in the admission test are as follows:

1. Applicants must have passed SSC/Dhakhil/equivalent examination from Board of Intermediate and Secondary Education/ Madrasa Education Board/ Technical Education Board in Science group with minimum GPA 4.00 in a 5-point scale.
2. Applicants must have passed HSC/Alim/equivalent examination from Board of Intermediate and Secondary Education/ Madrasa Education Board/ Technical Education Board in Science group with minimum GPA 4.00 in a 5-point scale.
3. In HSC/Alim/equivalent examination the applicant must have obtained minimum “A” grade in any two (02) subjects out of four (04) subjects including Mathematics,

Physics, Chemistry & English and minimum “A-” (A minus) grade in rest two (02) subjects.

4. Applicants with GCE “O” Level/equivalent background must have to qualify in minimum five (05) subjects including Mathematics, Physics, Chemistry and English with minimum “B” grade in average.
5. Applicants with GCE “A” Level/equivalent background must have to qualify in minimum three (03) subjects including Mathematics, Physics and Chemistry with minimum “B” grades separately.
6. Applicants who have passed HSC or equivalent examination in the current year or one year before the notification for admission can apply.
7. Sex: Male and female.

For Foreign Students

Maximum 3% of overall vacancies available will be kept reserved for the foreign students and will be offered to foreign countries through AFD of the Government of the People’s Republic of Bangladesh. Applicants must fulfill the following requirements:

1. Educational qualifications as applicable for Bangladeshi civil students or equivalent.
2. Must have security clearance from respective Embassy/ High Commission in Bangladesh.
3. Sex: Male and female.

1.8 Admission Procedure

1.8.1 Syllabus for Admission Test

Admission test will be conducted on the basis of the syllabus of Mathematics, Physics, Chemistry and English (Comprehension and Functional) subjects of HSC examinations of all Boards of Secondary and Higher Secondary School Certificates. Admission test will be conducted out of 200 marks and the syllabus and distribution of marks is given below:

Serial	Subjects	Syllabus	Marks
1.	Mathematics	Syllabi of the current year of HSC Examinations of all Boards of Intermediate and Secondary Education	80
2.	Physics		60
3.	Chemistry		40
4.	English		20
	Total =		200

1.8.2 Final Selection

Minimum qualifying marks in the written admission test is 40%. But in special circumstances for fulfillment of specified number of seats, President Admission Committee with approval

from Commandant, MIST, may consider relaxation of this condition. Merit list of candidates for final selection and admission to MIST will be prepared on the basis of the following:

Written Admission Test	75%.
GPA of SSC/ Dakhil (without 4th subject) / “O”level/ equivalent examination	10%.
Total GPA of Mathematics, Physics and Chemistry of HSC/ Alim/ “A” level/ equivalent examination	15%.
Total	100%

In case of tie, merit position will be determined on the basis of marks obtained in admission test in Mathematics, Physics, Chemistry and English respectively. Further dispute will be solved giving priority of result of HSC over SSC examination.

1.8.3 Medical Checkup

Civil candidates selected through admission test will go for medical checkup in MIST/CMH. If the medical authority considers any candidate unfit for study in MIST due to critical/contagious/mental diseases as shown in medical policy of MIST will be declared unsuitable for admission.

1.9 Withdrawal Policy

The MIST has been established with an aim of providing quality education in various disciplines of Engineering leading to B.Sc Engineering to be conferred by BUP. A definite standard of education and general discipline will be followed in every level of the program. The unsuccessful students will therefore be withdrawn from the institute.

1.9.1 Definition of Terms

Permanent Withdrawal

It will imply a complete/permanent discontinuity from any course/program of the institute.

Temporary Withdrawal

It means that the student has been allowed by the Academic Council, MIST to discontinue temporarily from any course/program for a definite period. The student, so withdrawn, may re-enter the course as per terms and conditions as set by the authority.

Permanent Expulsion

It means expulsion permanently from the institution on disciplinary ground. A student, if expelled permanently will never be allowed to re-enter the course or similar program in MIST and be subjected to other terms and conditions as set by the authority while approving the permanent expulsion order.

Temporary Expulsion

It means expulsion from an academic course/program for a certain period on disciplinary ground. A student, if expelled temporarily, may be allowed to re-enter the course/program on expiry of the punishment period and on fulfillment of other terms and conditions (if any) as set by the authority while approving the temporary expulsion order.

1.9.2 General Policy of Withdrawal

The under graduate (B.Sc) Engineering programs, in the disciplines of CE, EECE, ME, CSE and AE are planned for 04 regular levels, comprising of 08 regular terms. It is expected that all students will earn degree by clearing all the offered courses in the stipulated time. In case of failure the following policies will be adopted:

- Students failing in maximum two courses/subjects in any level, each comprising of two regular terms will be allowed to appear in the referred/re-examination on failed course(s)/subject(s) after a short term as per academic schedule.
- Referred/re-examination, after a short term is to be conducted within 02 (two) weeks of commencement of the next academic session at the latest.
- Students failing in maximum one course/subject in the referred/re-examination will be promoted to the next higher level. The failed course/subject will be termed as “Backlog” subject and the students have to pass the “Backlog” subject in the next scheduled referred/re-examination, but without any short term. Otherwise, he/she will be withdrawn permanently from the course/program.
- No student will be allowed to appear in the referred/re-examination in the same subject more than twice in the whole undergraduate program.
- Students in all levels will be allowed to appear in the referred/re-examination on two courses/subjects including the “Backlog” one.
- Students will be promoted to the second term of each level irrespective of their results in the first term of the level.
- Students failing in three or more courses/subjects in any level, comprising of two regular terms, will be allowed to repeat the level once. Students repeating a level will be granted exemption for that/those subject(s) in which they earned “B+” and above grade in the previous academic year. For a military student, repeating a level will be subject to the approval of the respective Services Headquarters.
- Students will be allowed to repeat a particular level only once in the whole undergraduate program.
- After level-4 referred/re-examination, if any military student fails in maximum one course/subject, but not the “Backlog” subject, then he/she will leave MIST and will be allowed to appear in the next scheduled referred/re-examination of the respective course. In that examination if he/she cannot pass the course/subject, or if he/she does not appear in the referred examination within 06 (six) years of registration will lose the scope of completing graduation. This failure will also be recorded in the dossier of military student officers.
- In case of sickness, which leads to missing of more than 40% classes or miss term final examination (supported by requisite medical documents), students may be allowed to withdraw temporarily from that term and repeat the whole level with the regular level in the next academic session, subject to the approval of Academic Council, MIST. However, he/she has to complete the whole undergraduate program within 06 (six) academic years from the date of his/her registration.
- Whatever may be the cases, students have to complete the whole undergraduate program within 06 (six) academic years from the date of registration.

- Failure to secure/achieve minimum CGPA of 2.20 in two consecutive levels will also lead to withdrawal of the student from the program.

1.9.3 Expulsion/Withdrawal on Disciplinary Ground

Unfair Means

Adoption of unfair means may result in expulsion of a student from the program and so from the institution. The Academic Council of MIST will authorize such expulsion on the basis of recommendation of the Disciplinary Committee, MIST and as per policy approved by the affiliating university. Following would be considered as unfair means adopted during examinations and other contexts:

- Communicating with fellow students for obtaining help in the examination.
- Copying from another student's script/report/paper.
- Copying from desk or palm of a hand or from other incriminating documents.
- Possession of any incriminating document whether used or not.

Influencing Grades

Academic council of MIST may expel/withdraw any student for approaching directly or indirectly in any form to influence a teacher or MIST authority for grades.

Other Indiscipline Behaviors

Academic council of MIST may withdraw/expel any student on disciplinary ground, if any form of indiscipline or unruly behavior is seen in him/her which may disrupt the academic environment/program or is considered detrimental to MIST's image.

Immediate Action by the Disciplinary Committee of MIST

The disciplinary committee, MIST may take immediate disciplinary action against any student of the institution. In case of withdrawal/expulsion, the matter will be referred to the academic council, MIST for post-facto approval.

1.9.4 Withdrawal on Own Accord

Permanent Withdrawal

A student who has already completed some courses and has not performed satisfactorily may apply for a permanent withdrawal.

Temporary Withdrawal

A student, if he/she applies, may be allowed to withdraw temporarily from the program, subject to the approval of academic council of MIST, but he/she has to complete the whole program within 06 (six) academic years from the date of his/her registration.

CHAPTER 2

THE DEPARTMENT OF COMPUTERSCIENCE AND ENGINEERING

2.1 Introduction

Computer plays vital and in fact indispensable role in all fields of modern human activities. Consequently, Computer Science and Engineering has established itself as one of the most important branches of engineering. Recent development in computer has a considerable impact on society. It has already expanded to all fields of study starting from genetic engineering to space technology. Recent development in Artificial Intelligence has taken the human history a long way. That day is not very far when man can make machine like him.

The Department of Computer Science and Engineering is one of the pioneer Departments of this Institute providing top-quality education in Computer Science and Engineering (CSE) at its undergraduate program. ICT is the leading booming sector in present day. It is already declared as a thrust sector in Bangladesh. Keeping this in mind the department offers CSE course to produce computer specialist.

In addition to the above, Department of Computer Science and Engineering is going to begin M.Sc. (Engg)/M.Engg programs in October, 2014. In future there will be opportunity for postgraduate studies and research leading to higher degrees i.e. Ph.D. There are financial assistance program for the poor and meritorious students too.

2.2 Historical Background

Department of Computer Science and Engineering began its journey from the academic session in 2000-2001 as Department of CSIT with military students only. Later, civil students were inducted in the next session. The department was renamed as Department of CSE in January 2003. This year (2013), the 13th batch has begun their classes in Level-1. Over the years, this ever-flourishing department has been providing the technological foundation on ICT, scholarly guidance and leadership skills to the students that have contributed to produce 381 highly qualified and skilled CSE graduates. Our graduates are working proudly both at home and abroad. Besides, a good number of graduates are pursuing higher studies abroad with scholarship. Moreover, our CSE students actively participate in various events like national and international computer programming competition, Software development competitions, Gaming and Robotic contest, Mobile Apps development, Debate and English speaking competition, national and international seminar and workshops on ICT and exhibit brilliant performances. With the relentless effort of the qualified, sincere and enthusiastic faculty and able guidance of the respected Commandant and Dean of MIST, the department has become a unique one of its field. With its excellent professional competence, expert teaching viewpoints and capabilities of training, B.Sc. in Computer Science and Engineering (B.Sc. CSE) degree program has achieved accreditation from BAETE (IEB) on 10 July 2013 with a grade as "Good". The dept has started its 2nd section with 55 students with effect from academic session 2014.

2.3 Study Programs

The Department of Computer Science and Engineering offers the degree of B. Sc. Engg. The courses and syllabus followed by this department for the above degree is the most modern ones like that of advanced countries as well as appropriate to the local needs. The syllabus is designed as to contain all the necessary study materials so that a graduate can face the engineering problems readily after graduation. Also, the syllabus is reviewed and necessary changes are made in every three years by a “committee of courses” comprising the best academicians and experts of the field of Computer Science and Engineering coming from MIST and other leading Universities and Organizations.

2.4 Laboratory Facilities of the Department

The department endeavors to provide its faculty members and students adequate laboratory, library and other facilities. Departmental undergraduate courses are well supported by the following laboratories:

Software Engineering Lab: This department has a software engineering lab consisting of 60 computers as workstations. With co-located Artificial Intelligence and VLSI lab, class can be conducted for 70 students at a time providing each one PC.

Digital Lab: This department has a digital lab where sessional classes of different courses on digital electronics can be conducted. This lab is enriched with modern electronic equipment and facilities.

Multimedia Lab: This department has a multimedia lab with modern HP color laser printers, multimedia projector, scanner and document cameras. Student would be highly benefited through this lab in their project works.

Artificial Intelligence and VLSI Lab: There is an Artificial Intelligence and VLSI lab consisting of 70 computers as workstations in this department. With co-located software engineering lab, classes can be conducted for 70 students at a time providing each one PC and other equipment.

Network and Internet Lab: This department has a Network and Internet lab of 70 computers as workstations. All necessary network equipment and accessories are available in the lab for conducting sessional classes.

Microprocessor and Microcontroller Lab: This department has a Microprocessor and Microcontroller lab enriched with latest Micro kits.

Interfacing Lab: This department has an interfacing lab where sessional classes of different course on computer interfacing can be conducted. Moreover, students undertaking different interfacing project also are assisted by all required accessories and components. Regular project showcase are held in this lab.

Graphics and Multimedia Lab: This department has a Graphics and Multimedia lab where sessional classes of different course on computer graphics and multimedia theory can be conducted. This lab has 70 computers donated by Indian government in 2013. Moreover,

students undertaking different graphics design project also are assisted by all required accessories and components. Regular project showcase are held in this lab.

Image Processing Lab: This department has an Image processing lab of 30 computers donated by Indian government in 2013 as workstations. All necessary image processing equipment and accessories are available in the lab for conducting sessional classes.

Teacher's PC Lab. This department has an additional lab for the teachers, who will be mostly helping the students for thesis and/or project work.

Other Computing Resources: This department has IBM and HP servers connecting all the PCs of MIST by Intranet, providing internet and other services. It has all the necessary equipment for multimedia lab. We have 24 hours Internet facilities including Wi-Fi.

Labs Planned for Future Expansion: This department will have following labs in future:

- (1) Hardware Training Lab
- (2) Hardware Maintenance Lab
- (3) Mobile Computing lab

Note: The laboratories of CSE Department are also being utilized by the students of other departments for sessional classes and research work of relevant subject/courses.

2.5 Research Activities

The research work undertaken by the teachers and students of this department in the last few years is diversified in nature. The faculty members have a good number of publications in different national and international conferences and journals. MIST also regularly publishes an annual technical journal, MIST Journal, where faculties and students of CSE department put their contributions.

2.6 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. Besides, students take part and show significant performance in debate, sports and cultural programs.

2.6.1 Programming Contests

CSE department programming team has been participating and in various national and international programming contests regularly and performing well. The Department team has been regularly participating in the Dhaka Regional final of ACM (Association for Computing Machinery) International Collegiate Programming Contest (ACM-ICPC). In ACM-ICPC Dhaka Regional 2008, MIST team achieved 7th position and ACM-ICPC Dhaka Regional 2009, MIST team placed 8th position.

2.6.2 Software and Hardware Project Competitions

CSE department students regularly participate in different software and hardware project competitions and perform well. Notably, in 2011, software named “BANGLA TEXT TO BRAILLE TRANSLTOR” was developed by four CSE graduates from MIST (Md. Osman

Gani, F M Mahbub-ul-Islam, Samiul Azam and Ahmad Imtiaz Khan). This software came up as the winner of prestigious “BASIS IT Innovation Search Program 2011” and runner up of “National Digital Innovation Award 2011”.

2.6.3 Sports and Cultural Programs

CSE Department became champion in inter-departmental Programming Contest-2010, Inter-departmental Table Tennis Competition-2011, Inter-departmental Basketball Competition-2011, Inter-departmental Volleyball Competition-2011, Inter-departmental Cultural Competition 2012 and 2013 and runner up in Inter-departmental Sports Competition 2014.

CHAPTER 3

RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAM

3.1 Number of Terms in an Academic Year (Level)

There will be two terms (Term I and Term II) in an academic year. Those who will not be able to clear all the subjects in a particular academic year (Term I and Term II) will require to appear in the referred examination (Re-examination) for fulfilling the condition as per policy to clear the subject(s).

3.2 Duration of Terms

The duration of each of Term will be as follows:

Ser	Events	Durations
1.	Classes before Mid Term	7 weeks
2.	Mid Term Vacation	1 week
3.	Classes after Mid Term	7 weeks
4.	Makeup Classes and Preparatory leave	2 weeks
5.	Term Final Examination	3 weeks
6.	Term End Vacation	2 week
	Total	22 weeks

The duration for Short Term and Re-examination will be as follows:

1.	Short term/ Preparatory Leave	6 weeks
2.	Examination	1 week
	Total	7 Weeks

3.3 Course Pattern and Credit Structure

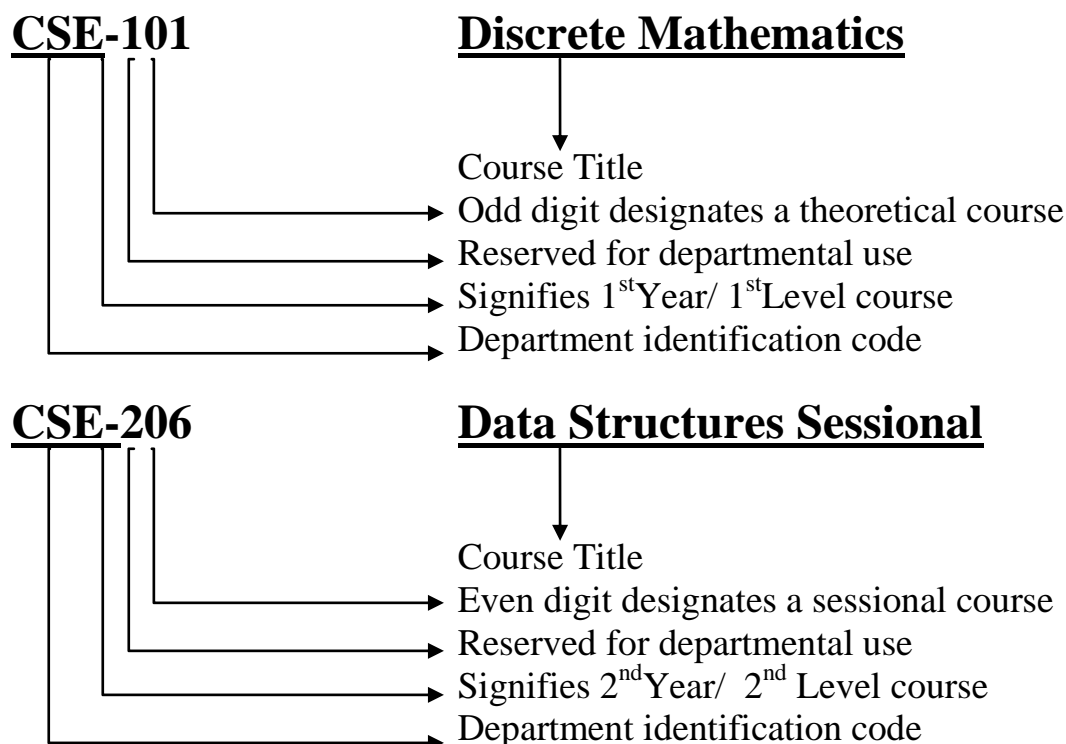
The undergraduate program is covered by a set of theoretical courses along with a set of laboratory (sessional) courses to support them.

3.3.1 Course Designation System

Each course is designated by a maximum of four letter code identifying the department offering the course 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/group of study within the department.
- The last digit is an odd number for theoretical courses and an even number for sessional courses.

The course designation system is illustrated as Follows:



3.3.2 Assignment of Credits

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

1. For Theoretical Courses, one lecture per week per term is equivalent to one credit.
2. For Sessional Courses, one credits for sessional courses is half of the class hours per week per term.
3. 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.

3.3.3 Types of Courses

The 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 of the designated core courses of his discipline.

• Prerequisite Courses

Some of the core courses are identified as prerequisite courses for a specific course. A prerequisite course is one, which is required to be completed before some other course(s) can be taken.

• Optional Courses

Apart from the core courses a required number of optional courses from a specified group have to be chosen.

3.4 The Grading System

3.4.1 The Letter Grade

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 assessments for laboratory courses are made by evaluating performance of the student at work during the class, viva-voce during laboratory hours and quizzes. Besides that, at the end there will be a final lab test. Each course has a certain number of credits, which describes its corresponding weight ages. A student's Performance is measured by the number of credits completed satisfactorily and by the weighted average of the grade points 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 given as follows:

Numerical Markings	Grade	Grade Points
80% and above	A+	4.0
75% to below 80%	A	3.75
70% to below 75%	A-	3.50
65% to below 70%	B+	3.25
60% to below 65%	B	3.00
55% to below 60%	B-	2.75
50% to below 55%	C+	2.50
45% to below 50%	C	2.25
40%to below 45%	D	2.00
below 40%	F*	0.00
Incomplete	I	-
Withdrawal	W	-
Project/ Thesis continuation	X	-

* Subject in which the student gets F grade shall not be regarded as earned credit hours for the calculation of Grade Point Average (GPA).

3.4.2 Distribution of Marks

For Theory Courses

Thirty percent (30%) of marks of theoretical course shall be allotted for continuous assessment, i.e. quizzes, class tests, home assignments, class evaluation and class participation. Illustration of the marks will be allotted to the Term Final Examination that is conducted centrally by the Bangladesh University of Professionals. There are internal and external examiners for each course in the Term Final Examination of 3-hour duration. Distribution of marks for a given course is as follows.

Category	Marks %
Class Participation/ Observation	5
Class Attendance	5
Homework assignment and quizzes/class tests	20
Final Examination (3 hours)	70
Total	100

The number of quizzes/ class tests of a course shall be $n+1$ where n is the number of credits of the course. Evaluation of performance in quizzes/ class tests 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 as course outline on the first day of the term.

For Sessional Courses

The marks for the sessional courses will be distributed according to the type of the sessional course. The distribution of marks for three types of sessional is given below:

Marks distribution of lab based sessionals

Category	Marks %
Lab test	40
Quiz	20
Viva	10
Attendance	10
Home assignment / report	10
Class Performance / Observation	10
Total	100

Marks distribution of project based sessionals

Category	Marks %
Project	40
Quiz	10
Viva / Presentation	20
Attendance	10
Home assignment / report	10
Class Performance / Observation	10
Total	100

Marks distribution of programming based sessionals

Category	Marks %
Online – 1	25
Online – 2	25
Viva	10
Attendance	10
Observation	10
Class Performance	20
Total	100

Basis for awarding marks for class attendance for both theory and sessional courses will be as follows:

Attendance	Marks
90% and above	100%
85% to less than 90%	90%
80% to less than 85%	80%
75% to less than 80%	70%
70% to less than 75%	60%
65% to less than 70%	50%
60% to less than 65%	40%
Below 60%	0%

3.4.3 Calculation of CGPA

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, \dots, C_n and his grade points in these courses are G_1, G_2, \dots, G_n respectively, then

$$\begin{aligned} GPA &= \frac{\text{Grade points earned in the semester}}{\text{Credits completed in the semester}} \\ &= \frac{\text{Summation of (Credit hours in a course} \times \text{Grade point earned in that course)}}{\text{Total number of credit hours completed}} \\ &= \frac{\sum_{i=1}^n C_i * G_i}{\sum_{i=1}^n C_i} \end{aligned}$$

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, \dots, TC_n and his GPA in these terms are $GPA_1, GPA_2, \dots, GPA_n$, respectively then

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

Numerical Example

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

Course	Credit C_i	Grade Points	G_i	$C_i * G_i$
EECE-163	3.00	A	3.75	11.25
EECE-164	0.75	A+	4.00	3.00
MATH-141	3.00	A-	3.50	10.5
PHY-103	3.00	B+	3.25	9.75
HUM-101	3.00	A	3.75	11.25
HUM-102	1.50	A	3.75	5.625
CSE-101	3.00	A	3.75	11.25
CSE-103	3.00	A-	3.50	10.5
CSE-104	1.5	B+	3.25	4.875
Total	21.75			78

$$GPA = \frac{78}{21.75} = 3.586$$

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

Level	Term	Earned Credit Hours	Earned GPA	$TC_i * GPA_i$
		TC_i	GPA_i	
1	I	21.75	3.75	81.5625
1	II	20.75	3.61	74.9075
2	I	19.50	3.21	62.595
2	II	21.00	2.98	62.58
Total		83		281.645

$$CGPA = \frac{281.645}{83} = 3.39$$

3.4.4 Minimum Earned Credit and GPA Requirement for Obtaining Degree

Minimum credit hour requirements for the award of bachelor's degree in engineering (B.Sc. Engineering) and other discipline will be decided as per existing rules. The minimum GPA requirement for obtaining a Bachelor's degree in engineering is 2.20.

3.5 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 75% of all classes held in any course.

3.6 Teacher-Student Interaction

The academic system in MIST encourages students to come in close contact with the teachers. For promotion of high level of teacher-student's interaction, a course coordinator (CC) is assigned to each course. Students are free to discuss with CC about all academic matters. Students are also encouraged to meet other teachers any time for help and guidance for academic matters. Heads of the departments, Director of Administration, Director of Students' Welfare (DSW), Dean and Commandant address the students at some intervals. More so, monthly Commandant's Parade is organized in MIST where all faculty members, staff and students are formed up, thereby increasing teacher-student interaction.

3.7 Conduct and Discipline

During their stay in MIST all students are required to abide by the existing rules, regulations and code of conduct. Students are strictly forbidden to form or be members of student organization or political party, club, society etc., other than those set up by MIST authority in order to enhance student's physical, intellectual, moral and ethical development. Zero tolerance in regards of sexual abuse and harassment in any forms and drug abuse and addiction are strictly observed in the campus.

3.8 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 competent authority (e.g. CMH).

3.9 Recognition of Performance

As recognition of performance and ensure continued studies MIST awards following medals, scholarships and stipends.

Osmany Memorial Gold Medal

Osmany Memorial Gold Medal is awarded to the best student amongst all the MIST Medal holders.

MIST Medal

MIST Medal is awarded to all students earning CGPA 4 at the end of the entire program and the first position holder in each dept earning a minimum CGPA of 3.8.

Commandant's List

Commandant's List is awarded to all students earning $CGPA \geq 3.8$ at the end of each academic level for level 1, 2 and 3 and all graduating students earning $CGPA \geq 3.8$ considering results of entire program (level 1 to 4).

Dean's List

Dean's List is awarded to all students earning $3.7 \leq CGPA < 3.8$ at the end of each academic level for level 1, 2 and 3 and all graduating students earning $3.7 \leq CGPA < 3.8$ considering results of entire program (level 1 to 4).

Other Scholarships and Stipends

There are many other Scholarships and Stipends from BUP and MIST are available for the students. A list is given below:

- Chancellor's (BUP) Scholarship.
- Vice Chancellor's (BUP) Scholarship/Stipend.
- MIST Scholarship.
- MIST Stipends.
- Osmany Memorial Trust Scholarship.
- Buro Bangladesh Stipend.
- Chief of Army Staff Scholarship.
- Chief of Army Staff Stipend.
- Chief of Naval Staff Scholarship.
- Chief of Air Staff Scholarship.
- Brig Gen Kamal Scholarship.

CHAPTER 4

COURSE REQUIREMENTS FOR UNDERGRADUATE COMPUTER SCIENCE AND ENGINEERING STUDENTS

Undergraduate students of the Department of Computer Science and Engineering (CSE) have to follow a particular course schedule, the term-wise distributions of which are given below:

LEVEL-1 TERM-I

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
1	CSE-100	Introduction to Computer Systems Sessional	-	3.00	1.50		
2	EECE-163	Electrical Circuit Analysis	3.00	-	3.00		
3	EECE-164	Electrical Circuit Analysis Sessional	-	3.00	1.50		
4	ME-181	Basic Mechanical Engineering	2.00	-	2.00		
5	MATH-141	Mathematics-I (Differential Calculus and Integral Calculus)	3.00	-	3.00		
6	PHY-103	Physics	3.00	-	3.00		
7	PHY-104	Physics Sessional	-	1.50	0.75		
8	HUM-101	English	2.00	-	2.00		
9	Shop-140	Workshop Practice Sessional	-	1.50	0.75		
	Total		13.00	9.00	17.50		

LEVEL-1 TERM-II

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
1	CSE-101	Discrete Mathematics	3.00	-	3.00		
2	CSE-105	Structured Programming Language	3.00	-	3.00	CSE-100	
3	CSE-106	Structured Programming Language Sessional	-	3.00	1.50		
4	EECE-169	Electronic Devices and Circuits	3.00	-	3.00	EECE-163	
5	EECE-170	Electronic Devices and Circuits Sessional	-	3.00	1.50		
6	CE-150	Engineering Drawing & CAD Sessional	-	3.00	1.50		
7	CHEM-101	Chemistry	3.00	-	3.00		
8	MATH-143	Mathematics-II (Ordinary and Partial Differential Equations and Coordinate Geometry)	3.00	-	3.00		
	Total		15.00	9.00	19.50		

LEVEL-2 TERM-I

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
1	CSE-201	Digital Logic Design	3.00	-	3.00		
2	CSE-202	Digital Logic Design Sessional	-	3.00	1.50		
3	CSE-203	Data Structures	3.00	-	3.00	CSE-105	
4	CSE-204	Data Structures Sessional	-	3.00	1.50		
5	CSE-205	Object Oriented Programming Language	3.00	-	3.00	CSE-105	
6	CSE-206	Object Oriented Programming Language Sessional	-	3.00	1.50		
7	EECE-269	Electrical Drives and Instrumentation	3.00	-	3.00	EECE-169	
8	EECE-270	Electrical Drives and Instrumentation Sessional	-	1.50	0.75		
9	MATH-245	Mathematics-III (Vector Analysis, Matrices and Fourier Analysis)	3.00	-	3.00		
	Total		15.00	10.50	20.25		

LEVEL-2 TERM-II

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
1	CSE-210	Assembly Language Programming Sessional	-	3.00	1.50		
2	CSE-211	Digital Electronics and Pulse Technique	3.00	-	3.00	EECE-169	
3	CSE-212	Digital Electronics and Pulse Technique Sessional	-	1.50	0.75		
4	CSE-213	Computer Architecture	3.00	-	3.00	CSE-201	
5	CSE-215	Algorithms	3.00	-	3.00	CSE-101, CSE-203	
6	CSE-216	Algorithms Sessional	-	3.00	1.50		
7	CSE-217	Theory of Computation	3.00	-	3.00		
8	CSE-220	Object Oriented Programming language Sessional-II	-	1.50	0.75		
9	MATH-247	Mathematics-IV (Complex Variable and Laplace Transform)	3.00	-	3.00		
10	HUM-215	Engineering Ethics	2.00	-	2.00		
	Total		17.00	9.00	21.50		

LEVEL-3 TERM-I

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
1	CSE-301	Database Management Systems	3.00	-	3.00		
2	CSE-302	Database Management Systems Sessional	-	3.00	1.50		
3	CSE-303	Compiler	3.00	-	3.00	CSE-217	
4	CSE-304	Compiler Sessional	-	1.50	0.75		
5	CSE-305	Microprocessors and Micro-controller	3.00	-	3.00	CSE-201	
6	CSE-306	Microprocessors and Micro-controller Sessional	-	1.50	0.75		
7	CSE-307	Operating System	3.00	-	3.00		
8	CSE-308	Operating System Sessional	-	1.50	0.75		
9	CSE-309	Computer Network	3.00	-	3.00		
10	CSE-310	Computer Network Sessional	-	3.00	1.50		
	Total		15.00	10.50	20.25		

LEVEL-3 TERM-II

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
1	CSE-311	Numerical Analysis	3.00	-	3.00		
2	CSE-313	Mathematical Analysis for Computer Science	3.00	-	3.00		
3	CSE-315	Digital System Design	3.00	-	3.00	CSE-305	
4	CSE-316	Digital System Design Sessional	-	1.50	0.75		
5	CSE-317	Data Communication	3.00	-	3.00		
6	CSE-318	Data Communication Sessional	-	1.50	0.75		
7	CSE-319	Software Engineering	3.00	-	3.00		
8	CSE-322	Software Development Sessional	-	3.00	1.50		
9	HUM-315	Engineering Economics	2.00	-	2.00		
10	HUM-312	English Sessional	-	3.00	1.50		
	Total		17.00	9.00	21.50		

*LEVEL-3 INDUSTRIAL TRAINING

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
	CSE-350	Industrial Training	-	4 Weeks	1.00		

***Note:** This course is mandatory. Evaluation report from industry is to be submitted at the end of the training and accordingly to be incorporated in the tabulation sheet.

LEVEL-4 TERM-I

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
1	CSE-400	Project and Thesis	-	6.00	3.00		
2	CSE-401	System Analysis, Design and Development	3.00	-	3.00		
3	CSE-402	System Analysis, Design and Development Sessional	-	1.50	0.75		
4	CSE-403	Artificial Intelligence	3.00	-	3.00		
5	CSE-404	Artificial Intelligence Sessional	-	1.50	0.75		
6	CSE-405	Computer Interfacing	3.00	-	3.00		
7	CSE-406	Computer Interfacing Sessional	-	1.50	0.75		
8	CSE-407	Applied Statistics and Queuing Theory	3.00	-	3.00		
9	CSE-4XO	Option-I	3.00	-	3.00		
	Total		15.00	10.50	20.25		

Option-I

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
1	CSE-419	Advanced Algorithms	3.00	-	3.00		
2	CSE-421	Basic Graph Theory	3.00	-	3.00		
3	CSE-423	Fault Tolerant System	3.00	-	3.00		
4	CSE-425	Basic Multimedia Theory	3.00	-	3.00		
5	CSE-427	Digital Image Processing	3.00	-	3.00		
6	CSE-429	Data and Network Security	3.00	-	3.00		
7	CSE-431	Object Oriented Software Engineering	3.00	-	3.00		
8	CSE-433	Artificial Neural Networks and Fuzzy Systems	3.00	-	3.00		
9	CSE-435	Distributed Algorithms	3.00	-	3.00		
10	CSE-437	Bioinformatics	3.00	-	3.00		
11	CSE-439	Robotics	3.00	-	3.00		
12	CSE-441	Machine Learning	3.00	-	3.00		

LEVEL-4 TERM-II

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
1	CSE-400	Project and Thesis*	-	6.00	3.00		
2	CSE-411	VLSI Design	3.00	-	3.00		
3	CSE- 410	Software Development for Web Apps		1.50	0.75		
4	CSE-413	Computer Graphics	3.00	-	3.00		
5	CSE-414	Computer Graphics Sessional	-	1.50	0.75		
6	HUM-415	Financial and managerial Accounting	2.00	-	2.00		
7	CSE-417	Engineering Management	3.00	-	3.00		
8	CSE-4XO	Option-II	3.00	-	3.00		
9	CSE-4XE	Option-II Sessional	-	1.50	0.75		
	Total		14.00	10.50	19.25		

Option-II

	Course No	Course Title	Hours/Week		Credits	Pre-requisite	Page No
			Theory	Sessional			
1	CSE-443	Pattern Recognition	3.00	-	3.00		
2	CSE-444	Pattern Recognition Sessional	-	1.50	0.75		
3	CSE-445	Digital Signal Processing	3.00	-	3.00		
4	CSE-446	Digital Signal Processing Sessional	-	1.50	0.75		
5	CSE- 447	Telecommunication Engineering	3.00	-	3.00		
6	CSE- 448	Telecommunication Engineering Sessional	-	1.50	0.75		
7	CSE-449	Mobile and Ubiquitous Computing	3.00	-	3.00		
8	CSE-450	Mobile and Ubiquitous Computing Sessional	-	1.50	0.75		
9	CSE- 451	Simulation and Modeling	3.00	-	3.00		
10	CSE- 452	Simulation and Modeling Sessional	-	1.50	0.75		
11	CSE-453	Data Ware-housing and Data Mining	3.00	-	3.00		
12	CSE-454	Data Ware-housing and Data Mining Sessional	-	1.50	0.75		

Summary

Level and Term	Hours/Week		Credits	No of Theory Courses
	Theory	Sessional		
Level-1 Term-I	13.00	9.00	17.50	5
Level-1 Term-II	15.00	9.00	19.50	5
Level-2 Term-I	15.00	10.50	20.25	5
Level-2 Term-II	17.00	9.00	21.50	6
Level-3 Term-I	15.00	10.50	20.25	5
Level-3 Term-II	17.00	9.00	22.50	6
Level-4 Term-I	15.00	10.50	20.25	5
Level-4 Term-II	14.00	10.50	19.25	5
Grand Total	121.00	78.00	161.00	42

CHAPTER 5

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

LEVEL-1 TERM-I

CSE-100

3 hours in a week, 1.50 Cr.

Introduction to Computer Systems Sessional

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

Reference Book(s):

1. Computer Fundamentals – Peter Norton.
2. The Complete PC Upgrade and Maintenance Guide – Mark Minasi.

EECE-163

3 hours in a week, 3.00 Cr.

Electrical Circuit Analysis

Fundamental electrical concepts and measuring units; Direct current (dc): Current, voltage, resistance, power and energy; Series/Parallel Circuits; Methods of network analysis and Network Theorems; Capacitors, Inductors and introduction to magnetic circuits. Alternating current (ac): Instantaneous current, voltage and power for various combinations of R, L and C circuits; Effective current and voltage, average power; Phasor representation of sinusoidal quantities; Sinusoidal Single-Phase Circuit Analysis; Introduction to three phase circuits; Power factor and power equation (Δ and Y circuits).

Reference Book(s):

1. Introductory Circuit Analysis - Robert L. Boylestad.
2. Alternating Current Circuits - Russel M Kerchner and George F Corcoran.
3. Fundamentals of Electric Circuits - Charles K Alexander, Mathew N O Sadiku.
4. Introduction to Electric Circuits - Richard C. Dorf, James A. Svoboda.

EECE-164

3 hours in a week, 1.50 Cr.

Electrical Circuit Analysis Sessional

Laboratory works based on EECE-163

ME-181**2 hours in a week, 2.00 Cr.****Basic Mechanical Engineering**

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.

Reference Book(s):

1. A Textbook Of Thermal Engineering - R S Khurmi
2. Introduction to Thermal Engineering- J. P. Vasandani
3. Refrigeration And Air Conditioning- Ahmadul Ameen

3 hours in a week, 3.00 Cr.**MATH-141****Mathematics-I (Differential Calculus and Integral Calculus)****DIFFERENTIAL CALCULUS**

Limit, continuity and differentiability, successive differentiation of various types of functions, Leibnit's theorem, Rolle's theorem, Mean Value theorem, expansion in finite and infinite forms, Lagrange's form of remainder, Cauchy's form of remainder (expansion of remainder), expansions of functions differentiation and integration, indeterminate form, partial differentiation, Euler's theorem, tangent and normal, sub tangent and subnormal in Cartesian and polar coordinates, maxima and minima of functions of single variables, curvature, asymptotes.

INTEGRAL CALCULUS

Definition of integrations, integration by the method of substitution, integration by parts, standard integrals, integration by the method of successive reduction, definite integrals, definite integral properties and its use in summing series, Walli's formula, improper integrals, Beta function and Gamma function, multiple integral and its application, area, volume of solid of revolution, area under a plane curve in Cartesian and polar coordinates, area of the region enclosed by two curves in Cartesian and polar coordinate, arc lengths of curves in Cartesian and polar coordinates.

Reference Book(s):

1. A text Book of Differential Calculus – Rahman and Bhattachrjee.
2. Differential Calculus – Shanti Narayan.
3. Differential Calculus – Dr. B. D. Sharma.
4. Differential Calculus – Das and Mukhaje.
5. Integral Calculus – Rahman and Bhattacharjee.
6. Integral Calculus – Abu Eusuf.
7. Integral Calculus – Das and Mukhaje.

PHY-103

Physics

3 hours in a week, 3.00 Cr.

Waves-Oscillations & Wave mechanics

Oscillations: Differential equation of simple harmonic oscillator, total energy and average energy, Combination of simple harmonic oscillations, spring-mass system, damped oscillation, forced oscillation, resonance, stationary wave, phase velocity, group velocity. Wave mechanics: Fundamental postulates of wave mechanics, Schrodinger's equation (time dependent and time independent), Operators, Uncertainty principle, energy of a free particle.

Optics and Laser

Theories of light: Interference of light, Young's double slit experiment, Fresnel's bi-prism. Interference in thin films, Newton's rings, Interferometers, Diffraction of light: Fresnel and Fraunhofer diffractions, Diffraction by single slit, diffraction by double slits, diffraction gratings, Resolving power of optical instruments, Polarization of light: production and analysis of polarized light, polarization by double refraction, Brewster's law, Malus law, Nicol prism, optical activity and polarimeter. Laser, spontaneous and stimulated emission, Helium-Neon laser, laser applications, Fiber optics.

Structure of Matter and Electricity: Crystalline & non-crystalline solids, single crystal and polycrystalline solids, crystal system, co-ordination number, packing factor, Miller indices, defects in solids, Bragg's law, Bonds in solids, Introduction to energy band, distinction between metal, insulator and semiconductor. Electricity: Coulomb's law, electric field, Gauss' law and its application, electric potential, capacitors and capacitance, dielectrics on atomic view, dielectric and Gauss's law, Ohm's law, resistivity -an atomic view, current density and drift velocity, Ampere's law, Faraday's law; Lenz's law, self-inductance and mutual inductance.

Reference Book(s):

1. A Text Book of Optics - Brijlal and Subramanyam
2. Fundamentals of optics - Francis and harvey
3. Waves and oscillation - Brijlal and Subramanyam
4. Physics part-I - Resnick and Haliday
5. Physics part-II - Resnick and Haliday
6. Fundamentals of Physcs - Haliday, Resnick and Walker
7. Electricity & Magnetism - K.K Tewari
8. Elementary Solid State Physics -M Ali Omar

PHY-104

Physics Sessional

3 hours in alternative week 0.75 Cr.

Laboratory works based on PHY-103

Reference Book(s):

1. Practical Physics –Dr. Giasuddin.
2. Practical Physics –C.L Arora.
- 3.

HUM-101

English

2 hours in a week, 2.00 Cr.

English Phonetics, Vocabulary, English Grammar-determiners, modifiers, affixes, root word, head word, types of verbs, different types of Clauses, Sentence construction and different types of sentences, synthesis of sentences, Grammatical Correction; Comprehension, Business Communication, Quotation and Tenders, Job Letters.

Paragraph writing, Precise writing, Amplification, Report writing, Situational writing- posters and advertisements, notice and memorandum, message writing, Communication Today; Short stories and Literary articles written by some prominent writers, Research Study, research methodology.

Reference Book(s):

1. Prose of Our Time – Ahsanul Haque, Sirajul Islam Chawdhury and M. Shamsuddoha.

Shop-140

Workshop Practice Sessional

3 hours in a week, 1.50 Cr.

Foundry: Introduction to foundry, tools and equipment; Patterns: function, pattern making; Molding: molding materials sand preparation, types of mold, procedure; Cores: types, core making materials; Metal melting and casting; Inspection of casting and casting defects.

Welding: Metal joints, riveting, grooving, soldering, welding; Welding practice: electric arc steel, aluminium; Types of electrode; Welding defects: visual, destructive and non-destructive tests of welding. Gas welding and equipment; Types of flame; Welding of different types of material; Gas welding defects; Test of gas welding.

Carpentry: Wood working tools, Wood working machine, Band Saw, Scroll Saw, Circular Saw, Jointer, Thickness Planner, Disc Sander, Wood Lathe, Types of Sawing, Common Cuts I Wood Works, Types of Joint, Defects of Timber, Natural Defects and Artificial Defects, Seasoning, Preservation, Substitute of Timber, Commercial Forms of Timber, Characteristics of Good Timber, Use of Fastening, Shop Practice, Practical Job, Planning and Estimating of a given Job.

Machine: Kinds of tools, Common bench and hand tools, Marking and layout tools, Measuring tools, Cutting tools, Bench work with job, Drilling, Sharper, Lathe and Milling Machines: Introduction, Type, size and capacity, uses and applications.

Reference Book(s):

1. Building Materials – Gurcharan Singh
2. Engineering Materials – M. A. Aziz
3. Machine Shop Practice – James Anderson, W. A. Chapman
4. Shop Theory – Anderson and Tatro.

LEVEL-1 TERM-II

CSE-101

3 hours in a week, 3.00 Cr.

Discrete Mathematics

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

Reference Book(s):

1. Discrete Mathematics & Its Applications- Kenneth H Rosen
2. Discrete Mathematics with Applications (Elsevier, 2004) -Thomas Koshy.

CSE-105

3 hours in a week, 3.00 Cr.

Structured Programming Language

Programming concepts; Program development stages; Flow charts; Structured programming language: data types, operators, expressions, control structures; Functions and program structure: Function basics, 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; Pointer and its uses; Command line parameters; Error Handling; Graphics; Linking; Library functions.

Reference Book(s):

1. Teach Yourself C - Herbert Schildt
2. C: The Complete Reference - Herbert Schildt
3. C Programming Language – Dennis M. Ritchie

CSE-106

3 hours in a week, 1.50 Cr.

Structured Programming Language Sessional

Laboratory works based on CSE-105

EECE-169
Electronic Devices and Circuits

3 hours in a week, 3.00 Cr.

Introduction to semiconductors, p-n junction diode, I-V characteristics; Diode applications: half and full wave rectifiers, clipping and clamping circuits, regulated power supply; Bipolar Junction Transistor (BJT): principle of operation, Transistor circuit configurations (CE, CB, CC), BJT biasing, BJT Transistor modeling, 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 MOSFETs, Switching circuits using FETs, CMOS, biasing of FETs, FET small signal analysis, Low and high frequency response of FETs; Operational amplifiers and its applications; Feedback and oscillators circuits; Operation, characteristics and application of SCR, TRIAC, DIAC and UJT; Introduction to IC fabrication processes.

Reference Book(s):

1. Electronic Devices and Circuit Theory -Robert L. Boylestad and Louis Nashelsky
2. Electronic Principles – Albert P. Malvino.

EECE-170
Electronic Devices and Circuits Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on EECE-169

CE-150
Engineering Drawing & CAD Sessional

3 hours in a week, 1.50 Cr.

Introduction: Lettering, numbering and heading, instrument and their use, sectional views and isometric views of solid geometrical figures; Plan, elevation and section of multistoried buildings; Building services drawings, detailed drawing of lattice towers; Use of AutoCAD software.

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 mono component system; Properties of dilute solution; Thermo chemistry, chemical kinetics, chemical equilibrium; ionization of water and pi concept; Electrical properties of Solution.

Reference Book(s):

1. Chemistry of Engineering Material - Mominul Haque

MATH-143**3 hours in a week, 3.00 Cr.****Mathematics-II (Ordinary and Partial Differential Equations and Coordinate Geometry)****ORDINARY DIFFERENTIAL EQUATIONS:**

Formulation of Differential Equations; Solution of first order differential equations by various methods, Solution of differential equation of first order but higher degrees; Solution of general linear equations of second and higher orders with constant co-efficient, Solution of Euler's Homogeneous linear differential equations.

PARTIAL DIFFERENTIAL EQUATIONS:

Introduction, Linear and non linear first order differential equations; Standard forms; linear equations of higher order; Equation of second order with variable coefficients;

COORDINATE GEOMETRY:

Transformation of coordinates, axes and its uses; Equation of conies and its reduction to standard forms; Pair of straight lines; Homogeneous equations of second degree; Angle between the 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.

Reference Book(s):

1. Ordinary and Partial differential Equations – M. D. Raisinghani.
2. Differential Equations – M. L. Khanna.
3. Differential Equations – B. D. Sharma.
4. Differential Equations – P. N. Chatterjee.
5. A text book on coordinate geometry with vector analysis-Rahman and Bhattacharjee

LEVEL-2 TERM-I**CSE-201****3 hours in a week, 3.00 Cr.****Digital Logic Design**

Number systems and codes; 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 de-multiplexers; Flip-flops, race around problems; Counters; asynchronous counters, synchronous counters and their applications; Registers and basic memory unit; Synchronous and asynchronous logic design; Design of sequential

circuit: State diagram; State minimizations and assignments; Pulse mode logic; Fundamental mode design; PLA design.

Reference Book(s):

1. Digital Logic and Computer Design-M. Morris Manno.
2. Digital Computer Electronics - Albert P. Malvino, Jerald A Brown

CSE-202

3 hours in a week, 1.50 Cr.

Digital Logic Design Sessional

Laboratory works based on CSE-201

CSE-203

3 hours in a week, 3.00 Cr.

Data Structures

Internal data representation; Abstract data types; Algorithm performance and elementary asymptotic analysis (Introduction to Big-O notation); Elementary data structures: array, linked list, stack, queue, tree and tree traversal, graphs and graph representation, heap, binary search tree; Sorting algorithms; Searching: linear search and binary search; Advanced data Structures: balanced binary search trees, skip list, advanced heaps; Hashing.

Reference Book(s):

1. Introduction to Algorithms – Thomas H Cormen
2. Data Structures - Reingold and Hansen
3. Data structures and algorithm – Hopcroft, Ullman
4. Michael T. Goodrich, Roberto Tamassia, Data Structures and Algorithms in Java 5th Edition, Wiley, 2010
5. Classic Data Structures –DebasisSamanta

CSE-204

3 hours in a week, 1.50 Cr.

Data Structures Sessional

Laboratory works based on CSE-203

CSE-205

3 hours in a week, 3.00 Cr.

Object Oriented Programming Language

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, In-line functions, friend functions, reference; Inheritance: single and multiple inheritance; Polymorphism: overloading, abstract classes, virtual functions and overriding; Exceptions; Object Oriented I/O, inserter, extractor; Template functions and classes; namespaces, overview of Standard Template Library; Multi-threaded Programming.

Reference Book(s):

1. Teach Yourself C++ - Herbert Schildt
2. Turbo C/C++ Complete Reference - Herbert Schildt
3. JAVA – How to Program – Deitel&Deitel
4. The Complete Reference Java – Herbert Schildt

CSE-206**3 hours in a week, 1.50 Cr.****Object Oriented Programming Language Sessional**

Laboratory works based on CSE-205 (C++)

EECE-269**3 hours in a week, 3.00 Cr.****Electrical Drives and Instrumentation**

Transformers: Transformation ratio equations, Losses, Ideal Transformer, Voltage regulation, Matching Transformer; Alternators: Faradays Law, Dynamo, Generated voltage equation, Voltage regulation, DC Generator; Synchronous motor and Induction motor; DC motor; 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: Types, principles and application of photovoltaic, piezoelectric, thermoelectric, variable reactance and opto-electronic transducers; Noise reduction in instrumentation.

Reference Book(s):

1. A Text Book of Electrical technology - B.L Theraja
2. Electrical Machinery and Transformers - Irving L. Kossow
3. A Course in Electrical and Electronic Measurements and Instrumentation - A.K. Sawhney
4. Electronic Instrumentation and Measurements - David A. Bell

EECE-270**3 hours in alternative week, 0.75 Cr.****Electrical Drives and Instrumentation Sessional**

Laboratory works based on EECE-269

MATH-245**3 hours in a week, 3.00 Cr.****Mathematics-III (Vector Analysis, Matrices and Fourier Analysis)****VECTOR ANALYSIS**

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. 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.

MATRICES AND FOURIER ANALYSIS

a. **Matrices:** Definition of matrix; Algebra of matrices; multiplication of matrices, transpose of a matrix, inverse of matrix; rank and elementary transformations of matrices; Solution of linear equations; linear dependence and independence of vectors. quadratic forms, matrix polynomials, determination of characteristic root and vectors, null space and nullity of matrix, characteristic subspace of matrix.

b. **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.

Reference Book(s):

1. Vector Analysis – Dr. Muhammad Abdus Sattar.
2. Vector Analysis – M. D. Raisinghanian.
3. Matrices and Linear Transformations – Mohammad Iman Ali.
4. An Introduction to Matrices – S. C. Gupta.
5. Matrices – Frank Asyres, JR.

LEVEL-2 TERM-II

CSE-210

3 hours in a week, 1.50 Cr.

Assembly Language Programming Sessional

System Architecture for Assembly language; Assembly programming basics; Assembly instruction types and their formats: Arithmetic, Logical, Transfer control and conditional processing, Stacks, branches, String processing, subroutine and parameter passing, macros, Input/Output; Interrupts; Procedures, file system and file I/O handling.

CSE-211

3 hours in a week, 3.00 Cr.

Digital Electronics and Pulse Technique

Diode Logic Gates, Transistor Switches, Transistor Gates, Open Collector and High Impedance Gates, MOS Gates; Digital Logic Families: TTL, ECL, IIL and CMOS Logic with Operation Details; Characteristics of Digital ICs: Propagation delay, Power dissipation, Figure of Merit, Fan out, and Noise immunity; Electronic Circuits for Flip Flops, Counters and Register, Memory Systems, PLAs; S/H circuits, A/D and D/A Converters with Applications; Linear Wave Shaping, Diode Wave Shaping Techniques, Comparator Circuits, Switching Circuits; Pulse Transformers, Pulse Transmission, Pulse Generation; Monostable, Bi-stable and Astable Multivibrator; Schmitt Trigger; Optically Coupled Oscillators; Blocking Oscillators and Time-base Circuit; Timing circuits; Simple voltage sweeps, linear current sweeps.

Reference Book(s):

1. Pulse, Digital and Switching waveforms- Jacob Millman and Herbert Taub.
2. Microelectronics: Digital and Analog Circuits and Systems- Jacob Millman.
3. Operational Amplifier and Linear Integrated Circuits- Robert Coughlin

CSE-212 **3 hours in alternative week, 0.75 Cr.**
Digital Electronics and Pulse Technique Sessional

Laboratory works based on CSE-211

CSE-213 **3 hours in a week, 3.00 Cr.**
Computer Architecture

Fundamentals of computer Design; Processor Design; Datapaths Design : single cycle and multi cycle implementations; Control Unit design : hardware and micro programmed; Hazards; Exceptions; Fixed Point Arithmetic; Arithmetic Logic Unit (ALU) Design; System organization; Parallel Processing; Pipeline: pipelined datapath and control, superscalar and dynamic pipelining, Pipeline structure vector supercomputers; RISC Processor; Memory organization.

Reference Book(s):

1. Computer Organization and Design- David A Patterson
2. Computer Organization and Architecture- William Stalling

CSE-215 **3 hours in a week, 3.00 Cr.**
Algorithms

Introduction to algorithms; Correctness proof and techniques for analysis of algorithms; Master Theorem; Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic programming; Graph algorithms: Basic search and traversal techniques, Topological sorting, Connected components, Spanning trees, Shortest paths, Flow algorithms; Lower bound theory; NP-completeness, NP-hard and NP-complete problems; Coping with Hardness: backtracking, branch and bound, approximation algorithms.

Reference Book(s):

1. Algorithm Design, Wiley, 2002 - Michael T. Goodrich and Roberto Tamassia
2. Algorithms, McGraw-Hill, 2006 - Sanjoy Dasgupta, Christos H. Papadimitriou, Umesh Vazirani.
3. Algorithm Design, Addison-Wesley, 2005 - Jon Kleinberg and Éva Tardos.
4. Introduction to Algorithms – Thomas H Corman

CSE-216 **3 hours in a week, 1.50 Cr.**
Algorithms Sessional

Laboratory works based on CSE-215

CSE-217
Theory of Computation

3 hours in a week, 3.00 Cr.

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; Pushdown automata; Regular languages: regular expressions, nonregular languages, the pumping lemma; Turing Machines: basic machines, configuration, computing with Turing machines, combining Turing machines; Undecidability.

Reference Book(s):

1. Introduction to the Theory of Computation. CENGAGE Learning, 3rd ed., 2012 - M. Sipser.
2. Introduction to Automata Theory, Languages, and Computation. Addison-Wesley Longman Publishing Co., Inc., 3rd ed., 2006 - J. E. Hopcroft, R. Motwani, and J. D. Ullman.
3. Elements of the Theory of Computation. Upper Saddle River, NJ, USA: Prentice Hall PTR, 2nd ed., 1997 - H. R. Lewis and C. H. Papadimitriou.

CSE-220
Object Oriented Programming Language Sessional-II

3 hours in alternative week, 0.75 Cr.

Laboratory works based on CSE-205 (JAVA)

MATH-247
Mathematics-IV (Complex Variable and Laplace Transform)

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 function, differentiation and the Cauchy-Riemann Equations. Line integral of a complex function, Cauchy's Integral Formula, Liouville's Theorem, Taylor's and Laurent's Theorem, Singular Residues, Cauchy's Residue Theorem.

LAPLACE TRANSFORM

Definition. Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transform. Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic function, some special theorems on Laplace transform, Partial fraction. Solutions of differential equations by Laplace transform. Evaluation of improper integral.

Reference Book(s):

1. Theory and Problems of Complex Variables – Murray R Sprigel.
2. Theory and functions of Complex Variables – Shanti Narayan.

HUM-215
Engineering Ethics

2 hours in a week, 2.00 Cr.

Historical and philosophical background of patents and other intellectual property, The U.S. Patent System: the Constitution, Congress, Patent Office (PTO), and courts, Analyzing and understanding judicial opinions, Legal fundamentals of patent protection for useful inventions, Design and plant patents, Legal fundamentals of copyright protection, Similarity and access, Expression vs. ideas and information, merger, Fair use of copyrighted works, Contributory copyright infringement, Critical

differences between patent and copyright protection, Copyright infringement distinguished from plagiarism, Legal fundamentals of trade-secret and trademark protection, Requirements and limitations of patentability, The process of applying for a patent, Actions for patent infringement, Patent licensing, Non-competition agreements, Rights and obligations among co-inventors, co-authors, employers, and licensees.

Definition and scopes of Ethics. Different branches of ethics. Social change and the emergence of new technologies. History and development of engineering ethics. Science and technology necessity and application. Study of ethics in engineering. Applied ethics in engineering. Human qualities of an engineer. Obligation of an engineer to the clients .Attitude of an engineer to other engineers. Measures to be taken in order to improve the quality of engineering profession. Ethical expectation: Employers and employees, inter-professional relationship, Professional Organization – maintaining a commitment of ethical standards. Desired characteristics of a professional code. Institutionalization of ethical conduct. Case studies.

Reference Book(s):

1. Create or Perish: The Case for Inventions and Patents - Robert HRines
2. Engineering Ethics – Carles E Haris

LEVEL-3 TERM-I

CSE-301

3 hours in a week, 3.00 Cr.

Database Management Systems

Introduction of database systems; Models: Entity-Relationship model, Relational model; Relational algebra; SQL; Advanced SQL; Some applications using SQL. Integrity constraint; Relational database design; File organization and retrieval, file indexing and hashing; Transaction manager; Concurrency controller; Recovery manager; Security system; Database administration; Introduction to advanced database management systems: distributed database, parallel database, data mining and warehousing, multimedia, object-oriented, object-relational, real-time database.

Reference Book(s):

1. Database System Concepts- Abraham Silbeschatz, Henry F. Korth, S. Sundarshan
2. Files and Databases- An Introduction, Peter D. Smith and G.M. Barnes, Addison-Wesley

CSE-302

3 hours in a week, 1.50 Cr.

Database Management Systems Sessional

Laboratory works based on CSE-301.

CSE-303**3 hours in a week, 3.00 Cr.****Compiler**

Introduction to compiling; Basic issues; Lexical analysis and Scanning; Syntax analysis; Syntax-directed translation; Attribute Grammars and Semantic Analysis Semantic analysis; type-checking; issues with run-time environments – source language issues; Issues in the design of code generation, Intermediate code generation; Error management; Storage organization-storage allocation strategies, target machine run-time storage management; Code optimization: The principle sources of optimization, Peephole optimization, Optimization of basic blocks-Loops in flow graphs; Introduction to global data-flow analysis-Code improving transformations.

Reference Book(s):

1. Compilers Principles, Techniques and Tools -- Alfred V. Aho, Jeffrey D. Ullman

CSE-304**3 hours in alternative week, 0.75 Cr.****Compiler Sessional**

Laboratory works based on CSE-303.

CSE-305**3 hours in a week, 3.00 Cr.****Microprocessors & Micro controllers**

Architectural overview of Intel Family, Microprocessor and its operation, Common instruction types, addressing modes, timings, interrupts controllers and DMA interfacing ICs; Intel 8086 Microprocessor : Internal architecture, register structure, programming model, addressing modes, instruction set; I/O Pin diagram and Control signals; I/O port organization and accessing; Cache Memory, TLB Structure; Memory Management in Intel 80X86 Family; segmentation and Real Mode Memory Management. Intel 80386 and 80486 segment register formats, Paged memory operation, Linear to physical address translation; Interrupts and Exception in Intel 80X86 families of processors, type of Interrupts, Interrupts in real mode and protected mode, Interrupt descriptor tables, Interrupts Priorities; Input and Output : IO address spaces, Port organization, Memory mapped IO, Hand-shaking IO instruction, Protection issues in Intel 80X86 family-privilege levels; An overview of Pentium and alpha RISC processors.

Reference Book(s):

1. The Intel Microprocessors - Barry B Brey
2. Microprocessors and Interfacing - Douglas V. Hall
3. Microprocessors and Microcomputer- based system design -Mohamed Rafiquzzaman.

CSE-306**3 hours in alternative week, 0.75 Cr.****Microprocessors & Micro controllers Sessional**

Laboratory works based on CSE-305.

CSE-307

Operating System

3 hours in a week, 3.00 Cr.

Introduction of Operating System, types of OS; Process: process managements, process states, job and process scheduling, CPU scheduling algorithms, process coordination, critical section problems, semaphores, Inter-Process Communication (IPC), classical IPC problems, multiprocessing and timesharing, message and mailbox etc.; Memory management: swapping, memory allocation schemes, Paging and segmentation, virtual memory, page replacement strategies, working sets, demand paging; Input/output: hardware/software, disk, disk scheduling algorithms, Secondary storage management, terminals, clocks; Deadlock: resource allocation, detection, prevention, avoidance and recovery; File management; Operating system security; Main Features of Windows, UNIX, LINUX; Introduction to distributed operating systems.

Reference Book(s):

1. Modern Operating System- Andrew S. Tanenbaum
2. Operating Systems – William Stallings

CSE-308

Operating System Sessional

3 hours in alternative week, 0.75 Cr.

Laboratory works based on CSE-307.

CSE-309

Computer Networks

3 hours in a week, 3.00 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; 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; wireless networks, mobile computing, and high speed networks; Gigabit Ethernet; Domain Name System: Name servers; Email and Its privacy; SNMP; HTTP; World Wide Web; Network security: Cryptography, DES, IDEA, public key algorithm; Authentication; Digital signatures, Principles of Reliable Data Transfer,FTP.

Reference Book(s):

1. Computer Networks - Andrew S. Tanenbaum
2. Computer Networks: Protocols, Standards, and Interfaces - Uyless Black
3. Internetworking with TCP/IP: Principles, Protocols, Architecture - D. E. Comer
4. TCP/IP Illustrated Vol. I - W. R. Stevens
1. Complete Networking : A Top Down Approach Featuring the Internet – 3rd edition , James F. Kurose, Keith W. Ross

CSE-310
Computer Networks Sessional

3 hours in a week, 1.50 Cr.

Laboratory works based on CSE-309.

LEVEL-3 TERM-II

CSE-311
Numerical Analysis

3 hours in a week, 3.00 Cr.

Introduction; Solution of algebraic and transcendental equations: method of iteration, False Position method, Newton-Raphson 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; Integration: Gauss quadrature formula, Trapezoidal rule, Simpson's rule, Weddle's rule; 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.

Reference Book(s):

1. Numerical Methods for Engineers – Steven C Chapra, Raymond P Canale
2. Numerical Methods – E Balagurusamy
3. Numerical Methods -- S. Balachandra Rao, C.K. Shantha
4. Numerical Methods for Scientific and Engineering Computation -- M.K. Jain, Iyengar, R.K. Jain

CSE-313
Mathematical Analysis for Computer Science

3 hours in a week, 3.00 Cr.

Recurrent problems; Manipulation of sums; Number theory; Special numbers; generating functions; Probability Distributions and Expectations: total probability and Bayes' rule, discrete probability distributions, continuous probability distributions; Random variables; stochastic process; Markov chains (discrete parameter, continuous parameter, birth-death process); Queuing models (birth-death model, Monrovia model), open and closed queuing network; Application of queuing models.

Reference Book(s):

1. Concrete Mathematics - Knuth.
2. Introduction to Probability Models- Sheldon M. Ross.

CSE-315**3 hours in a week, 3.00 Cr.****Digital System Design**

Digital system design Hierarchy; ASM charts; Hardware description language; Design using MSI and LSI components; Combinational and sequential circuit design with PLD's, Introduction to CPLD's & FPGA's; 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 using special purpose controllers.

Introduction to Embedded Systems; Product design; Product development process; Modularity in Design Research Directions: Architecture innovations; Application domains; User interfaces Case Studies;

Reference Book(s):

1. Digital Systems Design with FPGAs and CPLDs - Ian Grout
2. Digital Systems Design Using VHDL - Jr. Charles H. Roth, Lizy K. John
3. Digital Design and Computer Architecture - David Harris and Sarah Harris
4. High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices - Stephen H. Hall, , Garrett W. Hall, James A. McCall
5. Digital Computer Architecture – Malvino, Brown

CSE-316**3 hours in alternative week, 0.75 Cr.****Digital System Design Sessional**

Laboratory works based on CSE-315.

CSE-317**3 hours in a week, 3.00 Cr.****Data Communication**

Introduction: Communication models, data communication tasks, data communication network standards and organization introduction to TCP/IP models. Data Transmission basics: Analog and digital data, spectrum and bandwidth, Transmission impairments, data rate, and channel capacity. Data Encoding, NRZI Manchester and Differential Manchester encoding, ASK, FSK, PSK, QPSK, QAM encoding, spread spectrum technique, Sampling theorem and pulse code modulation techniques and speech digitization. Data Transmission: Asynchronous and synchronous data transmission techniques, error, detection techniques, parity checks and CRC error correction and hamming code interfacing and EIA 232D or RS 232c. DSL technology: Data Link Control: Line configurations. Multiplexing: Frequency division multiplexing, international FDM carrier standards, Synchronous time division multiplexing, international TDM carrier standards, statistical time division multiplexing, SONET and SDH.

Reference Book(s):

1. Data Communication and Networking - Behrouz A Forouzan
2. Data and Computer Communication - William Stallings
3. Data Communication & Networks – R L Brewster

CSE-318**3 hours in alternative week, 0.75 Cr.****Data Communication Sessional**

Laboratory works based on CSE-317.

CSE-319**3 hours in a week, 3.00 Cr.****Software Engineering**

Concepts of software engineering; Software engineering paradigms: Different phases of software; Synthesis vs. iterative design; Top-down and bottom-up design; Different design tools; Structured and non-Structured programming; Data-directed design techniques: Modular design; Design of automatic, redundant and defensive program; COCOMO model; Tree model; PNR curve; Statistical model; Zips laws and their application in computer languages; Halstead program length formula; Graphical analysis for complexity measures, Memory requirements analysis; Processing time analysis: Processing time analysis Testing philosophy; Test methods; Debugging; Verification, validation and certification; Choice of test data; Simulator; Arthur Laemmel's scheme; Concepts of software reliability and availability; Software repair, downtime, error and faults, specification and correction; New error generation hypothesis; Estimating number of bugs in a computer program; Reliability. Models; Availability models; Quality assurance; Quality measures; Different cost estimation models and their comparisons; Software maintenance; Maintenance-cost models: Growth dynamic models; Documentation; Software project organization; Management and communication skills.

Reference Book(s):

1. Software Engineering A Practical Approach - Rogers Pressman
2. Software Engineering – Ian Somerville
3. Software Engineering Fundamental - Ali Behforooz & Fredrick J. Hudson

CSE-322**3 hours in a week, 1. 50 Cr.****Software Development Sessional**

Students will develop complete software in group/individually using an object oriented programming language. Theoretical concept will be taken from CSE-205.

HUM-312**3 hours in a week, 1.50 Cr.****English Sessional**

Laboratory works based on HUM101

HUM-315**2 hours in a week, 2 Cr.****Engineering Economics**

Microeconomics: Definition of economics; Fundamentals of economics; Market and government in a modern economy; Basic elements of supply and demand; Choice and utility; indifference curve

technique; Analysis of cost; Short run long run theory of production.

Macroeconomics: Key concept of macroeconomics; Saving, consumption, investment; National income analysis; Inflation, Unemployment.

Development: Theories of developments; Banking system of Bangladesh, National Budget, Development partners(World Bank, Asian Development Bank, World Trade Organization, International Monetary Fund)

Reference Book(s):

1. Economics by Samuelson
2. Economics by John Sloman
3. Economic Development by Michael Todaro
4. Money and Banking by Dudley G. Lockett

CSE-350

4 weeks, 1.00 Cr.

Industrial Training

This course is mandatory. Evaluation report from industry is to be submitted at the end of the training, and accordingly to be incorporated in the tabulation sheet.

LEVEL-4 TERM-I

CSE-400

3 hours in a week, 3.00 Cr.

Project or Thesis

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

CSE-401

3 hours in a week, 3.00 Cr.

System Analysis, Design and Development

Different types of information; Qualities of information; Analysis of Information requirements for modern organizations; Role, tasks and attributes of a Systems Analyst; Sources of information; Information gathering techniques; Editing; Handling of missing information; Requirements specifications; Steps of systems analysis; Concepts of feasibility analysis: Analysis of technical facilities; Cost-benefit analysis; Design of an information system; Network models for project time estimation: Estimation of confidence level: Simplex method for minimization of project time; Project effort analysis methods; Designing of inputs and outputs; Hardware and software analysis; Project team organization; Database Normalization; Ethics and privacy: Control and security.

Reference Book(s):

1. System Analysis and Design – Elias M. Awad

2. System Analysis and Design - Raja Raman
3. System Analysis and Design Methods– Jeffery L. Whitten
4. System Analysis and Design -- Kendel & Kendel

CSE-402 **3 hours in alternative week, 0.75 Cr.**
System Analysis, Design and Development Sessional

Laboratory works based on CSE-401.

CSE-403 **3 hours in a week, 3.00 Cr.**
Artificial Intelligence

Overview of AI, Knowledge representation, LISP and other AI programming languages; Review of Un-Informed Search Strategies and game playing; Informed search Strategies: A*, Heuristic functions, Memory Bounded Search (IDA*, SMA*); Iterative improvement Search (Hill Climbing, Simulated Annealing), constraint satisfaction problems. Review of Propositional logic, first order Logic, Introduction to Planning, Partial Order Planning. Bayesian Rule and its use in probabilistic reasoning; Belief Networks and Decision Networks; Learning Decision Trees; Learning General Logical descriptions-Hypothesis, Examples, Current Best Hypothesis Search, Least Commitment Search; Learning Neural and Belief Networks ANN, Perceptions, MFFN (Back propagation, Applications of Neural Networks, Bayesian Methods for learning Belief Networks, Generic Algorithm, Reinforced learning. Introduction to Natural Language Processing.

Reference Book(s):

2. Artificial Intelligence: a modern approach - Stuart Jonathan Russell, Peter Norvig
3. Artificial Intelligence: a new synthesis - Nils J. Nilsson

CSE-404 **3 hours in a week, 1.50 Cr.**
Artificial Intelligence Sessional

Laboratory works based on CSE-403.

CSE-405 **3 hours in a week, 3.00 Cr.**
Computer Interfacing

I/O system; I/O devices, designing I/O systems; Programmable peripheral interface (interface to A/D and D/A converter); keyboard/display interface; Programmable timer; Programmable interrupt controller, DMA controller; floppy and hard-disk controller; serial communication interface; Barcode reader; Sound card; MIDI interface; Printer interlace; ISA. PCI, AGP, PS/2 and USB interfaces; Interfacing with power circuits, stepper motors, opto-isolation; controlling semiconductor power switches MOSFET, BJT. SCR. Triac and Solenoids.

Reference Book(s):

1. The Intel Microprocessors 8086/8088, 80186 Pentium-4 architecture, Programming and Interfacing -- Barry B Brey
2. Microprocessors and Interfacing -- Douglas V Hall

CSE-406
Computer Interfacing Sessional

3 hours in alternative week, 0.75 Cr.

Laboratory works based on CSE-405.

CSE-407
Applied Statistics and Queuing Theory

3 hours in a week, 3.00 Cr.

Applied Statistics:

Introduction; Frequency distribution, Mean, median, Mode and other measure of central tendency standard deviation and other measure of dispersion, Moments, Skewness and kurtosis, Elementary probability theory, Characteristics of distributions, elementary sampling theory, Estimation, Hypothesis testing and regression analysis. Probability distribution and expectations, discontinuous probability distribution, e.g. binomial, poisson and negative binomial. Continuous probability distributions, e.g. normal and exponential.

Queuing Theory:

Stochastic processes, Discrete time Markov chain and continuous time Markov Chain. birth-death process in queuing.

Queuing models: M/M/1, M/M/C, M/G/1, M/D/1, G/M/1 solution of network of queue-closed queuing models and approximate models. Application of queuing models in Computer Science.

Reference Book(s):

1. Applied Statistics - Rebecca (Becky) M. (Margaret) Warner
2. Applied Statistics for Engineers and Scientists - Jay L. Devore and Nicholas R. Farnum
3. An Introduction to Queuing Theory - U. Narayan Bhat
4. Probability, Markov Chains, Queues, and Simulation: The Mathematical Basis of Performance Modeling - William J. Stewart

CSE-4XO
Option-I

3 hours in a week, 3 Cr.

LEVEL-4 TERM-II

CSE-400
Project or Thesis

3 hours in a week, 3.00 Cr.

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

CSE-410
Software Development for Web Apps

3 hours in alternate week, 0.75 Cr.

Introduction: internet, history of the TCT/IP protocol, worldwide web; web servers: case of Apache, other web servers; webpage design: HTML, JavaScript; XML Schemas, their validation and transformation; dynamic webpages with CGI, PHP or JSP and database access; Webservices:

SOAP, WSDL (Web Service Description Language), XML-RPC protocol; configuration, maintenance, monitoring and security.

Reference Book(s):

1. Learning Web App Development - Purewal, Semmy

**CSE-411
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; CMOS Fabrication Process and Layout; CMOS Circuit Characteristics and Performance Estimation; Buffer Circuit Design; Introduction Bi-CMOS Circuits; Complex CMOS Gates; CMOS Building Blocks - Adder, Comparator, Multiplier, Counter, and Shifter; Data Path and Memory structures.

Design Methodology and Tools; Hardware modeling - Hardware Modeling Languages, Logic Networks, State Diagrams, Data-flow and Sequencing Graphs, Behavioral Optimization; Floor Planning and Architecture Design; ASIC design using FPGA and PLDs.

Reference Book(s):

1. Modern VLSI Design – System-on-Chip Design - Wayne Wolf.
2. CMOS VLSI Design- A Circuit and System Perspective - Neil H.E. Weste, David Harris, and Ayan Banerjee.

**CSE-413
Computer Graphics**

3 hours in a week, 3.00 Cr.

Standard graphics primitives; Graphics hardware; Graphics pipeline; Coordinate convention; Scan conversion; Clipping; Modeling transformation; Viewing transformation; Projection transformation; Polygons and polygon meshes; Curves and surfaces; Hidden lines and surface removal; Fractals; Ray tracing; Light models; Color models; Graphics programming.

Reference Book(s):

1. Computer Graphics Principle and Practice -- James D Foley, Van Dam
2. Computer Graphics Using Open GL – F S Hill J R
3. OpenGL programming Guide-(Official guide to learning opengl)

**CSE414
Computer Graphics Sessional**

3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE-413.

CSE417
Engineering Management

3 hours in a week, 3.00 Cr.

Principles of Management; Financial Principles; Management of Innovation; Technology Strategy; Best Management Practices; Sales and Marketing; Ratio Analysis; Prelude Lobster; Designing and Building Yachts; Commoditization vs. Differentiation; Total Quality Management; Entrepreneurship; Strategic Planning and Management of Technology; Teradyne Business Plan; MIS: Introduction, Decision Support Systems, MIS in decision making, Development of communication skills.

Reference Book(s):

1. System Safety Engineering and Management - Harold E. Roland , Brian Moriarty
2. Project Management, Planning and Control - Albert Lester
3. Management for Engineers, Scientists and Technologists - John V. Chelsom, Andrew C. Payne, Lawrence R. P. Reavill
4. Management Information Systems – A Managerial Perspective - Uma G. Gupta

HUM 415
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 applications in accounting. Recording system, double entry mechanism; account 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 recover method/rate; Job order costing: preparation of job cost sheet and question price, Inventory valuation: absorption costing and marginal/variable costing technique; Cost-Volume-Pro fit analysis: meaning, breakeven analysis, contribution margin analysis sensitivity analysis. Short-term investment decisions; relevant and differential cost analysis. Long-term investment decisions: capital budgeting, various techniques of evaluation of investments.

Reference Book(s):

1. Managerial Accounting – Garrison
2. Accounting Principle – Kieso

CSE4XO
Option-II

3 hours in a week, 3 Cr.

CSE4XE
Cr.
Option-II Sessional

3 hours in alternative week, 0.75

Option-I

CSE-419

3 hours in a week, 3.00 Cr.

Advanced Algorithms

Randomized Algorithms: Las Vegas and Monte Carlo Algorithms; Randomized Data Structures: Skip Lists; Amortized Analysis: Different methods, Applications in Fibonacci Heaps; Lower Bounds: Decision Trees, Information Theoretic Lower Bounds, Adversary Arguments; Approximation Algorithms: Approximation Schemes, Hardness of Approximation; Fixed Parameter Tractability: Parameterized Complexity, Techniques of designing Fixed Parameter Algorithms, Examples; Online Algorithms: Competitive Analysis, Online Paging Problem, k-server Problem; External Memory Algorithms; Advanced Data Structures: Linear and Non-linear Methods

Reference Book(s):

1. An Introduction to Computational Learning Theory - Michael J. Kearns , Umesh Vazirani
2. Algorithm Design - Jon Kleinberg , Éva Tardos
3. An Introduction to Computational Learning Theory - Michael J. Kearns , Umesh Vazirani
4. Randomized Algorithms - Rajeev Motwani , Prabhakar Raghavan
5. Probability and Computing: Randomized Algorithms and Probabilistic Analysis - Michael Mitzenmacher , Eli Upfal
6. Approximation Algorithms - Vijay V. Vazirani

CSE-421

3 hours in a week, 3.00 Cr.

Basic Graph Theory

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

Reference Book(s):

1. Introduction to graph theory - Douglas B West.
2. Introduction to Graph Theory, 4th Edition, Pearson Education Asia, 1995 - Robin J. Wilson

CSE-423

3 hours in a week, 3.00 Cr.

Fault Tolerant System

Introduction of Fault Tolerant Systems and architectures; Goal and Application of Fault Tolerant computing, Fundamental Definitions, Design techniques to achieve fault Tolerance, 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.

Reference Book(s):

1. Design and Analysis of Fault Tolerant Digital System - Barry W. Johnson
2. Fault-Tolerant Systems - Israel Koren, C. Mani Krishna

CSE-425**3 hours in a week, 3.00 Cr.****Basic Multimedia Theory**

Multimedia system-introduction; Coding and compression standards; Architecture issue 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 multimedia document; Networking issues in multimedia - Quality-of service guarantees, resource reservation traffic specification, happing, and monitoring, admission control; Multicasting issues; Session directories; Protocols for controlling sessions; Security issues in multimedia -digital water – making partial encryption schemes for video streams; multimedia applications – audio and video conferencing, video on demand, voice over IP.

Reference Book(s):

1. Multimedia: Computing, Communications & Applications - Steinmetz R., Nahrstadt K

CSE-427**3 hours in a week, 3.00 Cr.****Digital Image Processing**

Digital image fundamentals: visual perception, Light and Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic relationships between pixels, Linear and Nonlinear operations; image transforms: First Fourier Transform (FFT), Discrete Cosine Transform (DCT), Karhunen and Loeve Transform (KLT), Wavelet transform and sub-band decomposition; image enhancement in the frequency domain and image restoration techniques, image compression techniques, image compression standards: JPEG, MPEG, H.261, and H.263, Image Segmentation.

Reference Book(s):

1. Digital Image Processing. Second Edition. Rafael C. Gonzalez & Richard E.
2. Digital Image Processing (Implementation Using MATLAB) - Ashish Jain

CSE-429**3 hours in a week, 3.00 Cr.****Data and Network Security**

Overview, Symmetric cipher, Classical encryption technique, Block cipher and the data encryption standard (DES), Triple DES, Introduction to finite fields, Advanced Encryption Standard, Contemporary Symmetric Ciphers, confidentiality using symmetric encryption public, Key encryption and Hash functions, Public-key Cryptography, RSA algorithm, Key management, Diffie-Hellman key exchange, Other Public Key Cryptosystem, Message Authentication and Hash function, Hash Algorithm, Digital Signatures and Authentication protocols, Network Security practice, Authentication application, Wireless Network Security, Electrical Mail security, IP security, Web security, System security, Intruders, Malicious software and Firewall, Legal and Ethical Aspects.

Reference Book(s):

1. Cryptography and Network Security – William Stallings
2. Cryptography and Network Security- Behrouz A. Forouzan

CSE-431

Object Oriented Software Engineering

3 hours in a week, 3.00 Cr.

The object-oriented approach within the context of software engineering, the language, basic (procedural) elements of language: what an Eiffel program is, what the instruction set is, and how to declare and use entities (variables) and routines; The concepts underlying the object-oriented approach: modularity, inheritance, and dynamic binding, case study from the management information-system domain; Environment matters: system configuration, interfacing with external software, and garbage collection. Advanced issues involving exception handling, repeated inheritance, typing problems, and parallelism; object-oriented software engineering process, concentrating on specific guidelines facilitate the translation OOAD to a maintainable Addresses verification and validation (V&V) issues of Eiffel software systems built in a software engineering context; Building reusable libraries; The building of a parallel linear algebra library (Paladin).

Reference Book(s):

1. Object-Oriented Software Engineering - Stephen Schach
2. Object Oriented Software Engineering: A Use Case Driven Approach - Ivar Jacobson
3. Object-Oriented Software Engineering: Practical Software Development using UML and Java - Timothy Lethbridge, Robert Laganier, Robert Laganier

CSE-433

Artificial Neural Networks and Fuzzy Systems

3 hours in a week, 3.00 Cr.

Biological nervous system: the brain and neurons, Introduction to artificial neural network and fuzzy systems, Theory and application of Artificial neural networks and fuzzy logic; Multi-layer perception: Back propagation algorithm, Self organization map, Radial basis network, Hop field network, Recurrent network, Fuzzy set theory, Failing Adaptive Linear (ADALINE) and Multiple Adaptive Linear (MADALINE) networks, Generating internal representation, Cascade correlation and counter propagation networks, Higher order and bi-directional associated memory, Lyapunov energy function, attraction basin, Probabilistic updates: simulated annealing, Boltzmann machine, Adaptive Resonance Theory (ART) network. ART1. ART2. Fuzzy ART mapping (ARTMAF) networks. K.ohonen'8 feature .1\ Learning Vector Quantization (LVQ) networks, Logic control: Adaptive fuzzy neural network; Genetic algorithm and evolution compacting, Applications to control; Pattern recognition; Nonlinear system modeling, Speech and image processing.

Reference Book(s):

1. Introduction to Artificial Neural Systems, Jacek M. Zurada
2. Artificial neural systems: foundations, paradigms, applications, and implementations, Patrick K. Simpson

CSE-435

Distributed Algorithm

3 hours in a week, 3.00 Cr.

Models of distributed computing, Synchrony, communication and failure concerns, Synchronous message-passing distributed systems, Algorithms in systems with no failures - Leader Election and Breadth-First Search algorithms, The atomic commit problem, Consensus problems - the Byzantine Generals Problem, Asynchronous message-passing distributed systems, Failure detectors, Logical time and vector clocks, Routing algorithms.

Reference Book(s):

1. Distributed Systems. S. Mullender (ed.). Addison-Wesley, 1993.
2. Introduction to Distributed Algorithms. G. Tel. Cambridge Univ. Press, 2000.

CSE-437

3 hours in a week, 3.00 Cr.

Bioinformatics

Sequence similarity, homology, and alignment. Pairwise alignment: scoring model, dynamic programming algorithms, heuristic alignment, and pairwise alignment using Hidden Markov Models. Multiple alignment: scoring model, local alignment gapped and ungapped global alignment. Motif finding: motif models, finding occurrence of known sites, discovering new sites. Gene Finding: predicting reading frames, maximal dependence decomposition. Analysis of DNA microarray data using hierarchical clustering, model-based clustering, expectation-maximization clustering, Bayesian model selection.

Reference Book(s):

1. An Introduction to Bioinformatics Algorithm - Neil C. Jones, Pavel A. Pevzner

CSE-439

3 hours in a week, 3.00 Cr.

Robotics

Introduction to robotics, overview of robot mechanisms, dynamics, and intelligent controls, planar and spatial kinematics, and motion planning; mechanism design for manipulators and mobile robots, multi-rigid-body dynamics, 3D graphic simulation; control design, actuators, and sensors; wireless networking, task modeling, human-machine interface, and embedded software mechanical design, rigid body velocity, Jacobean, inverse kinematics, redundant and parallel robots, trajectory control, face control and haptic, Micro and Nan-robotics, mobile robots.

Reference Book(s):

1. Introduction to Robotics: Analysis, Control, Applications - Saeed B. Niku
2. Introduction to Robotics: Mechanics and Control - John J. Craig

CSE-441

3 hours in a week, 3.00 Cr.

Machine Learning

Introduction to machine learning, Supervised, unsupervised and reinforcement learning, Unsupervised learning algorithms, Concept Learning, Decision Tree Learning, Attribute based and relational supervised learning algorithms, Artificial Neural network based learning algorithms, Bayesian Learning, Evaluating Hypothesis, Genetic algorithm and genetic programming, Reinforcement learning algorithms, Computational learning theory.

Reference Book(s):

1. Machine Learning, Tom Michael Mitchell
2. Introduction to Machine Learning, Ethem Alpaydin

Option-II

CSE-443**3 hours in a week, 3.00 Cr.****Pattern Recognition**

Pattern Recognition: introduction, importance, Statistical and Neural Pattern Recognition: Bayesian classifier, Bayes decision theory, discriminate functions and decision surfaces, Bayesian classifier for normal distribution, Linear classifiers: discriminate functions and decision hyper planes, perception algorithm, least squares methods; Kessler's construction, Nonlinear classifiers: two and three layer perceptions, back propagation algorithm; Template matching: optimal path searching techniques. Dynamic programming methods, Correlation methods; Context dependent classification: observable and hidden Markov models and Viterbi algorithm. Three problems of HMM and their application in Speech Recognition, Syntactic Pattern Recognition, Clustering algorithms.

Reference Book(s):

1. Pattern recognition - Sergios Theodoridis, Konstantinos Koutroumbas
2. Pattern Recognition - William Gibson

CSE-444**3 hours in alternate week, 0.75 Cr.****Pattern Recognition Sessional**

Laboratory works based on CSE-443.

CSE-445**3 hours in a week, 3.00 Cr.****Digital Signal Processing**

Introduction to speech, image & data processing; Discrete time signals, sequences; Linear Constant Coefficient difference equation; Sampling continuous time signals; Two dimensional sequences and systems; Z-transform, Inverse Z-transform, H-transform; Frequency domain representation, discrete time systems and signals; Fourier series and Fourier Transform; Parseval's theorem; Equivalent noise definition of bandwidth; Convolution, Correlation and method of numerical integration; Computation of the DFT: Goertzel FFT, Chirp Z-transform algorithms.

Reference Book(s):

1. Digital Signal Processing - John G. Proakis & Dimitris Manolakis
2. Discrete-Time Signal processing - Allan Oppenheim & Ronald Schaffer
3. Digital Signal Processing-A practical approach - Emmanuel C. Ifeachor Barrie W. Jervis
4. Signals and Systems - Rodger Ziemer & William Tranter, D

CSE-446
Digital Signal Processing Sessional

3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE-445.

CSE-447
Simulation and Modeling

3 hours in a week, 3.00 Cr.

Simulation modeling basics: systems, models and simulation; Classification of simulation model; 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 discrete-continuous models; Monte Carlo simulation; Simulation of queuing systems. Building valid and credible simulation models: validation principles and techniques, statistical procedures (or comparing real-world observations and simulation outputs, input modeling; Generating random numbers and random variants; Output analysis. Simulation languages; Analysis and modeling of some practical systems , Random Number Generator, Random Variables, Probability Distribution.

Reference Book(s):

1. Simulation Modeling and Analysis - Law A. M., Kelton W. D.
2. Computer Aided Modeling & simulation - J. A. Spriet
3. Computer Simulation and Modeling - R. S. Lehman
4. System Simulation - G. Cordon

CSE-448
Simulation and Modeling Sessional

3 hours in alternate week, 0.75 Cr.

Laboratory works based on CSE-447.

CSE-449
Mobile and Ubiquitous Computing

3 hours in a week, 3.00 Cr.

Network and Transport Protocol for Wireless Networks, Mobile IP and Variants of TCP; Distributed Systems platforms for Mobile Computing, Proxy Based Architectures, Service Discovery, Interaction Platforms; Local and Wide area Technologies (Bluetooth, 802.11, GSM); File System support for Mobile Computing; Development in Context-aware and Ubiquitous computing; Smart Embedded devices, Information Appliance and Wearable computers; Sensing and Context Acquisition in Ubiquitous Computing; New Trends in Networking and Communication, Proximity-based Networking, Communication protocol for Wireless Sensor Networks; Human Interaction in Ubiquitous Computing Environments, Tangible User Interfaces, Privacy and Security. Technological Component of Location Based Service (LBS)-WAP, GPS, Cell Based Location, 3G wireless, VXML, SMS-MMS, Personal Area Networks (802.11, Bluetooth, IRFIDs), Micro-Electro-Mechanical System (MEMES), Recommender systems (Collaborative Filtering, Intelligent Agents).

Reference Book(s):

1. Context-Aware Mobile and Ubiquitous Computing for Enhanced Usability: Adaptive Technologies and Applications - Dragan Stojanovic

2. Information Security Theory and Practices. Smart Cards, Mobile and Ubiquitous Computing Systems - Damien Sauveron, Konstantinos Markantonakis, Angelos Bilas and Jean-Jacques Quisquater.
3. Handbook on Mobile and Ubiquitous Computing: Status and Perspective - Laurence T. Yang, Evi Syukur and Seng W. Loke

CSE-450 **3 hours in alternate week, 0.75 Cr.**
Mobile and Ubiquitous Computing Sessional

Laboratory works based on CSE-449.

CSE-451 **3 hours in a week, 3.00 Cr.**
Telecommunication Engineering

Overview of telecommunication: history, evolution, convergence of telecommunication and data networks; Transmission media: Characteristics and applications of twisted pairs, coaxial cables and optical fibers, Terrestrial and satellite microwave, radio waves, VSAT; Telephone operating principles: telephone equipment, description of the modern phone; Telephone switching systems: PSTN, PBX, Centrex, standards; Basics of communication systems: modulation, multiplexing; Switching system: circuit switching, packet switching; Voice over Internet Protocol (VoIP), Fax over IP network, voice over frame relay, and ATM, ACDs, call centers, computer integration; Data communication equipment: introduction to terminals, modems, RS-232 and other interfaces, modem types; Tele-Traffic analysis; Cellular telephony: Frequency reuse, frequency management, channel alignment, handoff strategies, FDMA, TDMA, CDMA and GSM, Introduction to satellite communication, Optical fiber communication, Submarine cables, Digital Radio Microwave, etc.

Reference Book(s):

1. Introduction to Telecommunication – Cole
2. Optical Fiber Communication Principles and Practice – John M Senior
3. Modern Digital and Analog Communication System – B P Lathi

CSE-452 **3 hours in alternate week, 0.75 Cr.**
Telecommunication Engineering Sessional

Laboratory works based on CSE-451.

CSE-453 **3 hours in a week, 3.00 Cr.**
Data Mining and Data ware-housing

Introduction; Data warehousing and OLAP technology for data mining; Data preprocessing; Data mining primitives, languages and systems; Descriptive data mining: characterization and comparison; Association analysis; Classification and prediction; Cluster analysis; Mining complex types of data; Applications and trends in data mining.

Reference Book(s):

1. Data Mining and Data Warehousing - Bharat Bhushan Agarwal, Sumit Prakash Tayal
2. Data Warehousing, Data Mining, and OLAP - Alex Berson and Stephen J. Smith

CSE-454

3 hours in alternate week, 0.75 Cr.

Data Mining and Data ware-housing Sessional

Laboratory works based on CSE-453.