DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Bulletin
Fall 2011

AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
(Sponsored by the Dhaka Ahsania Mission and Approved by the Government of Bangladesh)
DHAKA, BANGLADESH

CONTENTS

The department of Computer Science and Engineering, abbreviated CSE, is offering an undergraduate engineering degree program since the establishment of the university in the year 1995 to render quality higher education to numerous worthy young fellows as well as to meet the huge demand of highly qualified specialists in the field. The 4-year program is spread over eight semesters with two semesters per academic year. Each semester is of around 20 working weeks containing classes for 15 weeks and preparatory leave with semester final examination for 5 weeks. Apart from the 20 working weeks per semester, the department remains open for clearance/improvement/carryover examinations, result and admission of students in the 1st semester of 1st year and for works related to industrial training etc.

Entry qualification for the program is Higher Secondary Certificate (H.S.C.) with good academic background or A-Level with comparable results or equivalent. Usual intake of students in the department is twice in an academic year. Theory classes are held with approximately 50 students per class and each class is divided into two subsections for practical classes. Students graduated from this department are employed in different prestigious institutions and organizations home and abroad. Some of them have already completed, and some are getting admitted every year to postgraduate studies at well reputed universities all over the world. Also a number of students of the department have taken transfer to foreign universities.

The department has a good number of full-time faculty members with best available exposure to ever-growing horizon of computer science and engineering. Besides, a number of part-time faculties also teach in each semester from other universities, research organizations and industrial establishments for extending experience-rich education.

The program follows an intensive course curriculum containing well-organized courses on basic sciences, computer science, electrical and electronic engineering, computer engineering, management and humanities. Of course, computer science and engineering courses are most emphasized and constitute the bulk of the program (about 70%).

We have seven computer labs and one digital electronics lab equipped with modern personal computers and electronic devices in the department for conducting regular sessional (practical) classes. These labs have been named as Network & Data Communication (NDC) Lab (7B01), Web Application & Multimedia (WAM) Lab (7B03), Data & Knowledge Engineering (DKE) Lab (7B05), Software Engineering (SE) Lab (7B06),

Microprocessor & Interfacing (MI) Lab (7B07), Operating System (OS) Lab (7B08) and Digital Electronics & Design (DED) Lab (7B04) respectively. There is a server center equipped with various PC-server systems for providing network facilities to the labs. The department provides email and internet facilities to teachers and students. It also maintains a web site under the address 'www.aust.edu'.

The department organizes various co-curricular and extra-curricular activities to develop important social and professional faculties in the students. Most common co-curricular activity is the programming contest, which has become regular by this time. The department also organizes chess, football and cricket tournaments among the students. The most common extra-curricular activities are reception parties for welcoming the newly entered students and also for biding farewell to the outgoing students.

In this booklet semester-wise brief and detailed outlines of the departmental and non-departmental courses have been given. A few other courses may also be offered in addition to the courses shown here. Optional courses described here are offered depending on the availability of teachers and the number of students in the class. Requirements of contact hours and credits have also been summarized. A semester-wise list of suggested text & reference books has been added at the end and, besides, a brief description of the up-to-date rules and regulations regarding examinations, grading system and grade points has been incorporated at the beginning.

(1) The performance of a student in a theoretical course of study will be evaluated on the basis of the following criteria:

  (i) Continuous assessment (assessment of class attendance, class performance, quizzes/class tests and/or assignments etc.).

  (ii) Semester Final Examination.

  (iii) Clearance Examination (for clearance of the courses in which the students fail in the Regular Examination, if any).

  (iv) Carry Over Examination (for clearance of back log of the course(s) of previous semester(s), if any).

  (v) Improvement Examination (for improvement of the grade(s) obtained in the Regular Examinations, if any).

(2) Continuous assessment and Semester Final Examination will form the Regular Examination while the Clearance Examination, Carry Over Examination and Improvement Examination will provide additional opportunities to the students.

(3) The distribution of marks after continuous assessment and in the Semester Final/Clearance/Carry Over/Improvement Examination will be as follows:

(i) Class participation (i.e. class attendance, class performance etc.)……10%

(ii) Quizzes/class tests and/or assignments………………………………… 20%

(iii) Semester Final/Clearance/Carry Over/Improvement Examination…... 70%

Total: ………………………………………………………………………100%

(4) The number of quizzes/class tests and/or assignments in a theoretical course of study shall ordinarily be $(n + 1)$, where 'n' is the number of credit hours of the course. Evaluation of the performance will be on the basis of the best 'n' quizzes/class tests and/or assignments.

** These rules are subject to change from semester to semester.

(5) The performance of a student in a sessional/practical course will be evaluated on the basis of class attendance, class performance, quizzes/class tests, assignments, reports, practical examinations, jury viva voce etc. The distribution of marks in the course will be determined by the teachers concerned.

(6) The letter grades and the corresponding grade-points will be awarded for the theoretical courses in the Regular Examination and for the practical/sessional courses in accordance with the provisions shown below:

NUMERICAL GRADE	LETTER GRADE	GRADE POINT
80% or above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00

(7) Apart from the letter grades listed above, the students may be awarded other letter grades for having different status in a course. The letter grade 'W' will be given for the withheld result of a student in a course. Subject to the recommendation of the concerned Head of the Department and the approval of the Vice Chancellor of the University, a student may be awarded the letter grade 'E' for exemption or waiver of a course. The letter grade 'P' will be awarded for course(s) the students have passed in previous semester(s).

COURSE STATUS	LETTER GRADE
Withheld	W
Exempted	E
Passed	P

Grade Point Average (GPA) of a student will be computed without the grades mentioned above.

(8) Every course has a certain number of credit hours which describes its weightage. The credit hours of a theoretical course and the credit hours of a practical/sessional course refer to contact hours per week and half of the contact hours per week of the courses respectively. The number of credit hours a student has completed satisfactorily and the weighted average of the grade points he/she has maintained will help measure the performance of the student. Calculation of Grade Point Average (GPA) can be explained as follows:

$$GPA = \frac{\sum C_i.G_i}{\sum C_t}$$

$$= \frac{\text{Summation of (Credit hours in a course x Grade points earned in that course)}}{\text{Total number of credit hours completed}}$$

Where:

C_i = Credit hours in a course

G_i = Grade points earned in that course

C_t = Total number of credit hours completed

Suppose, a student has completed five courses in a semester and obtained the following grades:

Course	Credit Hour	Grade	Grade Point
Course 1	3	A+	4.00
Course 2	3	B	3.00
Course 3	3	A	3.75
Course 4	2	B+	3.25
Course 5	1	A-	3.50

Then his/her Grade Point Average (GPA) for the semester will be computed as follows:

$$GPA = \frac{3(4.00) + 3(3.00) + 3(3.75) + 2(3.25) + 1(3.50)}{(3+3+3+2+1)}$$

$$= 3.52$$

Department of Computer Science and Engineering

AUST

(9) The total marks assigned to a theoretical/practical course of study is 100 and the duration of Semester Final/ Improvement/Clearance/Carry Over Examination of a theoretical course is 3 hours. The total marks assigned to continuous assessment (obtained on the basis of class participation, quizzes/class tests and/or assignments etc.) and the Semester Final/Clearance/Improvement Examination are 30 & 70 respectively.
However the full marks (100) of a Carry Over course will be allotted to the Carry Over Examination only and the final performance of a student in the Carry Over course be evaluated only on the basis of the marks obtained in the Carry Over Examination.

(10) A student who remains absent in the Semester Final/Clearance/ Improvement/Carry Over Examination of a course of study will be given the grade 'F' for the course. The total marks and the corresponding grade of the students who are absent in the examinations of a course will be entered in the mark sheet of the course considering the mark of the examinations as zero.

(11) The Clearance Examination of a course will be held only for the students obtaining the grade 'F' (failed in the course) in the Regular Examination of the course. The Clearance/Carry Over/Improvement Examination of a semester will be held over a period of 1 to 2 weeks at the end of the Semester Final Examination of the semester.

(12) The Clearance Examination of a course will carry 70% of the total marks assigned to the course; the rest of the mark (30%) will be entered from the record of the continuous assessment secured earlier by the student when he/she attended the classes. Whatever is the total mark obtained by the student, the highest attainable grade with the Clearance Examination is 'C'.
So the grading scale for the students appearing in the Clearance Examination will be as follows:

NUMERICAL GRADE	LETTER GRADE	GRADE POINT
45% or above	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00

(13)   A student obtaining the grade 'F' in a maximum of 2 (two) theoretical courses of a semester will be promoted to the next higher class with carry over in the failed theoretical course(s) if the cumulative number of the courses including the number of carry over courses of the previous semester(s) of the student concerned does not exceed the highest allowable limit of 4 (four). The students can clear the backlog of the carryover course(s) in the Carryover Examinations of the relevant semester. Such examinations will be held in the same manner as the clearance examination.

(14)   If the number of failed courses of a student in a semester exceeds the highest limit of 2 or if the cumulative number of failed courses including the number of carry over courses of the student exceeds the highest limit of 4, the student will not be promoted to the immediate higher class. In such a case, the student must re-register for the course(s) in which he/she failed in the semester and bring down the number of failed courses including the carry over course(s) within the allowable limits of 4 & 2 to be promoted to the next higher semester.

(15)   If the cumulative number of failed courses including the number of carry over courses of a student enrolled in 4th year 2nd semester of 4-year bachelor degree programme or in 5th year 2nd semester of 5-year bachelor degree programme exceeds the highest limit of 4 (four), the student will have to re-register for the courses of the semester in which he/she failed. If the number of failed courses of the final semester of the programs exceeds the highest limit of 2 (two), the student will have to re-register for the courses of the semester in which he/she failed. A student can appear at the Carry Over Examination of the courses in the relevant subsequent semester if the number of failed courses does not exceed the limit of 4 & 2 as specified above.

(16)   For appearing in the Carry Over Examinations, the students are required to apply for enrollment within due time in the prescribed application form available in the office of the Controller of Examinations of the University.

(17)   The students who have not been promoted to the next higher semester can re-register in the subsequent semester for the course(s) (both theoretical & practical) in which they have failed. The grade(s) secured by the students in the re-registered course(s) will be considered for the result and Grade Point Average (GPA) of the students concerned for that semester. However, the grade(s) obtained by the students in the previous semester will also be recorded in the transcript/grade card and tabulation sheet of semester only for chronological sequence. The students are required to apply in the prescribed application form available in the office of the Registrar of the University for re-registration. The duly filled in application form must be submitted within the notified time.

(18)   For the purpose of grade improvement, a student obtaining a passing grade lower than 'B' in the Regular Examination of a theoretical course can appear at the relevant Improvement Examination of the   semester by canceling the passing grade of the course secured by him/her. The highest attainable grade with the Improvement Examination is 'B' and the grade obtained with the Improvement Examination will be considered for the result and GPA of a student. But the grade obtained by the student in the Regular Examination will also be recorded in the tabulation sheet/transcript/grade card only for chronological sequence. The letter grades will be awarded with the Improvement Examinations in accordance with the provision given below:

NUMERICAL GRADE	LETTER GRADE	GRADE POINT
60% or above	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00

(19)   The Improvement Examination of a course will carry 70% of the total mark assigned to the course and like the Semester Final/ Clearance Examinations; the rest of the mark will be entered in the mark sheet of the course from the record of the continuous assessment secured earlier by the student when he/she attended the classes of the semester.

For appearing in the Improvement Examination of a course, the students are required to apply for enrollment in the prescribed application form available in the office of the Controller of Examinations at least four (4) days before the examination date of the course.

(20) A student of a 4-year degree programme can appear in the improvement examination in a maximum of 4 (four) courses while a student of a 5-year degree programme can do the same in a maximum of 5 (five) courses in his/her student career at AUST.

(21) A student failing in any sessional/practical course will have to repeat the semester. But a student failing in the Surveying Practical course may be promoted to the next higher class, if otherwise eligible. A student who remains absent in the classes of the Surveying Practical course due to a reason acceptable to the administration of the University, will get another chance to attend the classes & pass the course along with students of other batches in the next relevant semester.

(22) A student of a semester who fails to submit the report/thesis of the course Project/Thesis during the semester will have to enroll for the course in the subsequent semester of his/her submission of the report/thesis.

(23) Students of all bachelor degree programmes are required to attend at least 60% of the classes held in each course of a semester. The students failing to attend the requisite percentage of classes in any course will not be allowed to appear at the Semester Final/Clearance/Improvement/Carry Over Examinations of the course in the semester. However, the University may condone the shortage of requisite percentage of class attendance on grounds acceptable to the authority.

(24) All 4-year degree programmes at AUST require completion of all degree requirements within a maximum period of 7 years while a 5-year degree programme requires completion of all degree requirements within a maximum period of 8 years. Failure to complete all degree requirements within the given time frame may disqualify a student from continuation of his/her study at AUST.

(25)   GPA Requirements for the Bachelor Degree

(i)   The students securing a CGPA (Cumulative Grade Point Average) of 2.20 or above on a scale of 4.00 will be considered to be making normal progress towards a degree and the students failing to attain the CGPA of 2.20 or above on a scale of 4.00 may be placed on academic probation. A minimum Cumulative GPA (CGPA) of 2.20 on a scale of 4.00 will be required for the award of the degree.

(ii)   The minimum period of probation is one semester but the usual period is one academic year. The probation may be extended for additional semester(s) until the student achieves an overall GPA of 2.20 or better.

(iii)   A student on academic probation failing to maintain at least a CGPA of 2.20 during two consecutive academic years may be suspended from the University. This suspension may be withdrawn by the Head of the Department on receipt of an application from the student and on being satisfied that every effort to improve the grade will be made by him/her. But this can only be done after a full semester of suspension. However, the second suspension will be regarded as final and absolute.

(iv)   Graduating students securing a CGPA of 3.75 or above will be included in the Dean's List of Honor.

(26)   GPA requirements for Tuition Fee Waiver

(i)   **Full Free Tuition Award (FFTA):** As per Private University Act, 5% of the students promoted to every class of a semester will be offered the **Full Free Tuition Award (FFTA)** on the basis of the earned Grade Point Average (GPA) of all courses of the immediate previous semester except the courses Project/Thesis & Surveying Practical. If the grade point averages of more than one student are equal, then the total marks obtained by the students in the courses will be considered for the award. The bonafide students, who are promoted, get admitted and continue their studies at AUST are eligible for FFTA on the basis of merit and other rules and regulations of the University.

(ii)   **Half Free Tuition Award (HFTA):** In addition to the FFTA, AUST also offers **Half Free Tuition Award (HFTA)** to a maximum of another 5% of the students promoted to every class of a semester whose results are considered to be brilliant as those for FFTA. The interested students are required to submit application for HFTA in prescribed form available in the office of the Registrar positively by the date notified. No application/candidature/appeal will be considered after the date notified. The selection for HFTA will be, among other rules and regulations, on the basis of the earned grade point average (GPA) of all courses of the immediate previous semester except the courses Project/Thesis & Surveying Practical. If the grade point averages of more than one student are equal, then the total marks obtained by the students in the courses will be considered for the award.

In addition to the above following criteria will also be considered in   the selection for FFTA and HFTA awards:

   a) To be eligible for the award a student needs to continue his/her study at AUST. The award will be cancelled/forfeited for any discontinuation/interruption of study at AUST;
   b) If any disciplinary action has been taken against a student, he/she is not eligible for FFTA or HFTA;
   c) The students having less than 60% class attendance in the immediate previous semester are not eligible for any award;
   d) Student, already selected for FFTA, is not   eligible for HFTA; and
   e) HFTA will be sanctioned only on the basis of application and rules and regulations and not as a matter of right of the student.

(iii)   There are also provisions for financial help to the distressed students from the Fund for Welfare of the Distressed Students.

(iv)   If two or more students of the same parents study concurrently as regular students in this University, one of them may get Half Free Tuition Award on application as per the rules of the University.

(v)   In addition, 1% of the promoted students are awarded Full Free Tuition Award on the recommendation of the sponsor.

(27)   Updates in Course Codes

Previously, a course code, for example CSE303, standing for the course titled Database included 3 digits following an acronym (CSE) for the department offering the course. The first digit (3) stood for year (third) and the next two digits (03) represented the code for the course. In the proposed syllabus, an extra second digit standing for the semester serial number has been introduced. For example, the above 3rd year 1st semester course has the course code CSE3103 where the first digit (3) stands for year (third), the second digit (1) stands for semester (first) and the next digits (03) represent the code for the course, as before.

IN LABS

IN LIBRARY

BRIEF OUTLINE OF THE UNDERGRADUATE PROGRAM
IN
COMPUTER SCIENCE AND ENGINEERING

YEAR-1, SEMESTER-1

Course no.	Course Title	Hours/Week Theory-Lab	Credits	[1]Prerequisite	Contents on page
HUM1107	Critical Thinking & Communication	3-0	3		41
HUM1108	English Language Sessional	0-3	1.5		41
MATH1115	Mathematics-I	3-0	3		41
PHY1115	Physics	3-0	3		42
PHY1116	Physics Lab	0-3/2	0.75		43
CHEM1115	Chemistry	3-0	3		43
CSE1101	Elementary Structured Programming	3-0	3		21
CSE1102	Elementary Structured Programming Lab	0-3	1.5		21
CSE1108	Introduction to Computer Systems	0-3	1.5		21
	Total:	15-10.5	20.25		

Total Contact Hours (nominal): [2](15+10.5) x 15 = 382.5

YEAR-1, SEMESTER-2

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
MATH1219	Mathematics-II	3-0	3	MATH1115	43
ME1211	Basic Mechanical Engineering	3-0	3		44
ME1214	Engineering Drawing	0-3/2	0.75		44
EEE1241	Basic Electrical Engineering	3-0	3		44
EEE1242	Basic Electrical Engineering Lab	0-3	1.5		44
CSE1200	Software Development-I	0-3	1.5		22
CSE1203	Discrete Mathematics	3-0	3		22
CSE1205	Object Oriented Programming	3-0	3	CSE1101	22
CSE1206	Object Oriented Programming Lab	0-3	1.5		22
	Total:	15-10.5	20.25		

Total Contact Hours (nominal): 382.5

---

[1] Refers to a course that should be offered in an earlier semester

[2] Contact hours per week = 15 + 10.5 = 25.5, nominal semester duration = 15 weeks

YEAR-2, SEMESTER-1

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
HUM2109	Society, Ethics and Technology	3-0	3		45
MATH2101	Mathematics-III	3-0	3	MATH1219	45
EEE2141	Electronic Devices & Circuits	3-0	3	EEE1241	46
EEE2142	Electronic Devices & Circuits Lab	0-3	1.5		46
CSE2100	Software Development-II	0-3/2	0.75		23
CSE2103	Data Structures	3-0	3	CSE1101	23
CSE2104	Data Structures Lab	0-3	1.5		23
CSE2105	Digital Logic Design	3-0	3		23
CSE2106	Digital Logic Design Lab	0-3	1.5		24

Total: 15-10.5   20.25

Total Contact Hours (nominal): 382.5

YEAR-2, SEMESTER-2

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
MATH2203	Mathematics- IV	3-0	3	MATH1115	46
CSE2200	Software Development-III	0-3/2	0.75		24
CSE2201	Numerical Methods	3-0	3		24
CSE2202	Numerical Methods Lab	0-3/2	0.75		24
CSE2207	Algorithms	3-0	3	CSE2103	24
CSE2208	Algorithms Lab	0-3	1.5		25
CSE2209	Digital Electronics and Pulse Techniques	3-0	3	CSE2105, EEE2141	25
CSE2210	Digital Electronics and Pulse Techniques Lab	0-3/2	0.75		25
CSE2213	Computer Architecture	3-0	3		25
CSE2214	Assembly Language Programming	0-3	1.5		25

Total: 15-10.5   20.25

Total Contact Hours (nominal): 382.5

YEAR-3, SEMESTER-1

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
HUM3115	Economics and Accounting	3-0	3		47
CSE3100	Software Development-IV	0-3/2	0.75		26
CSE3101	Mathematical Analysis for Computer Science	3-0	3	CSE1203, MATH2101	26
CSE3103	Database	3-0	3	CSE1203	26
CSE3104	Database Lab	0-3	1.5		27
CSE3107	Microprocessors	3-0	3	CSE2105, CSE2213, CSE2214	27
CSE3108	Microprocessors Lab	0-3/2	0.75		27
CSE3109	Digital System Design	3-0	3	CSE2105, CSE2213	27
CSE3110	Digital System Design Lab	0-3/2	0.75		27

Total: 15-7.5   18.75

Total Contact Hours (nominal): 337.5

YEAR-3, SEMESTER-2

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
HUM3207	Industrial Law and Safety Management	3-0	3		47
CSE3200	Software Development-V	0-3/2	0.75		28
CSE3211	Data Communication	3-0	3	MATH2203	28
CSE3213	Operating System	3-0	3		28
CSE3214	Operating System Lab	0-3	1.5		28
CSE3215	Microcontroller Based System Design	3-0	3	CSE3107	29
CSE3216	Microcontroller Based System Design Lab	0-3/2	0.75		29
CSE3223	Information System Design and Software Engineering	3-0	3	CSE3103	29
CSE3224	Information System Design and Software Engineering Lab	0-3/2	0.75		30

Total: 15-7.5   18.75

Total Contact Hours (nominal): 337.5

Department of Computer Science and Engineering

YEAR-4, SEMESTER-1

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
IPE4111	Industrial Management	3-0	3		48
CSE4100	Project & Thesis-I	0-6	3		30
CSE4101	Computer Networks	3-0	3	CSE3211	30
CSE4102	Computer Networks Lab	0-3	1.5		31
CSE4107	Artificial Intelligence	3-0	3	CSE1203, CSE2207, CSE3101	31
CSE4108	Artificial Intelligence Lab	0-3/2	0.75		31
CSE4125	Distributed Database Systems	3-0	3	CSE3103	31
CSE4126	Distributed Database Systems Lab	0-3/2	0.75		31
CSE4129	Formal Languages & Compilers	3-0	3	CSE1203	32
CSE4130	Formal Languages & Compilers Lab	0-3/2	0.75		32

Total: 15-13.5   21.75

Total Contact Hours (nominal): 427.5

YEAR-4, SEMESTER-2

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
CSE4203	Computer Graphics	3-0	3	MATH2203	32
CSE4204	Computer Graphics Lab	0-3/2	0.75		32
CSE4250	Project and Thesis-II	0-6	3		33
CSE....	Option-I	3-0	3		33-34
CSE....	Option-I Lab	0-3/2	0.75		33-34
CSE....	Option-II	3-0	3		34-36
CSE....	Option-II Lab	0-3/2	0.75		35-36
CSE....	Option-III	3-0	3		36-37
CSE....	Option-III Lab	0-3/2	0.75		37
CSE....	Option-IV	3-0	3		38-40

Total: 15-12   21

Total Contact Hours (nominal): 405

Department of Computer Science and Engineering

OPTIONS AVAILABLE

OPTIONS-I

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
CSE4211	Simulation of Products, Processes & Services	3-0	3	CSE3101, MATH2101	33
CSE4212	Simulation of Products, Processes & Services Lab	0-3/2	0.75		33
CSE4227	Digital Image Processing	3-0	3	CSE4203	34
CSE4228	Digital Image Processing Lab	0-3/2	0.75		34
CSE4283	Advanced Algorithms	3-0	3	CSE2103, CSE2207	34
CSE4284	Advanced Algorithms Lab	0-3/2	0.75		34

OPTIONS-II

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
CSE4225	Network Programming	3-0	3	CSE3211, CSE4101	34
CSE4226	Network Programming Lab	0-3/2	0.75		35
CSE4231	Multimedia Computing	3-0	3	CSE3103	35
CSE4232	Multimedia Computing Lab	0-3/2	0.75		35
CSE4237	Soft Computing	3-0	3	CSE3101	35
CSE4238	Soft Computing Lab	0-3/2	0.75		36
CSE4281	Web Computing	3-0	3	CSE4101	36
CSE4282	Web Computing Lab	0-3/2	0.75		36

OPTIONS-III

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
CSE4213	Pattern Recognition	3-0	3	MATH2203, CSE4107	36
CSE4214	Pattern Recognition Lab	0-3/2	0.75		37
CSE4243	Expert & Decision Support Systems	3-0	3	CSE4107	37
CSE4244	Expert & Decision Support Systems Lab	0-3/2	0.75		37
CSE4247	Artificial Neural Networks	3-0	3	CSE4107	37
CSE4248	Artificial Neural Networks Lab	0-3/2	0.75		37

OPTIONS-IV

Course no.	Course Title	Hours/Week Theory-Lab	Credits	Prerequisite	Contents on page
CSE4215	Advanced Computer Architecture	3-0	3	CSE2213	38
CSE4217	VLSI Design	3-0	3	CSE2209	38
CSE4233	Advanced Microprocessor Architecture	3-0	3	CSE3107	38
CSE4255	Telecommunication	3-0	3	CSE3211, CSE4101	39
CSE4241	Digital Signal Processing	3-0	3	MATH2101, MATH2203	39
CSE4219	Computational Geometry	3-0	3	MATH2203	39
CSE4221	Graph Theory	3-0	3	CSE1203	40
CSE4223	Computational Complexity Theory	3-0	3	CSE3101, CSE4129	40
CSE4245	Parallel Processing	3-0	3	CSE2213, CSE3213	40

Department of Computer Science and Engineering

SEMESTER-WISE DISTRIBUTION OF CONTACT HOURS/WEEK AND CREDITS

Year	Semester	Theory Hours/Week	Laboratory Hours/Week	Credits
1	1	15	10.5	20.25
1	2	15	10.5	20.25
2	1	15	10.5	20.25
2	2	15	10.5	20.25
3	1	15	7.5	18.75
3	2	15	7.5	18.75
4	1	15	13.5	21.75
4	2	15	12	21
	Total:	120	82.5	161.25

Total Contact Hours (nominal): $(120 + 82.5) \times 15 = 3037.5$

Total Credits: 161.25

YEAR-1, SEMESTER-1

CSE1101	3 hours per week, 3 Cr.
Elementary Structured Programming	**Prereq.: Nil**

Basic programming concepts and notations; Variables, Constants, Data types; Input and Output Statements; Control Structures; Functions and Subroutines; Processing Structured data: Arrays, Strings, Records, Pointers, Structures and Linked lists.

CSE1102   **3 hours per week, 1.5 Cr.**
Elementary Structured Programming Lab

Laboratory works based on CSE1101.

CSE1108   **3 hours per week, 1.5 Cr.**
Introduction to Computer Systems

Types of Computers; Basic principles of analog and digital computation; Brief history of digital computers; Importance of computers & their impact on Society; Application areas. Number systems, conversion of one system to another, complementation of numbers and arithmetic operations, ASCII code representation of data. Bits, Bytes, Words and memory capacity measurement. Generations of digital computer hardware and software; Types of digital computers; Functional units of a typical digital computer; I/O devices & peripherals: Printers, Monitors, Mouse, Joysticks, VDU, Modems, Optical & magnetic document readers. Main memory systems: types of ROMs and RAMs. Backing memory systems: Moveable devices and hard disks, CDROMs and Flash memory devices. Processing units and bus systems. Types of software: Systems software and application software. Operating systems: Objectives and functions, introduction to DOS, Windows and Unix. Computer Security: Objectives, various security issues. Introduction to Internet and World Wide Web.

Experiments based on DOS, Windows, Unix, Word processing and Spreadsheet packages.

Department of Computer Science and Engineering

AUST

YEAR-1, SEMESTER-2

CSE1200   **3 hours per week, 1.5 Cr.**
Software Development-I

Students will develop software in groups or individually using a structured programming language with special emphasis on higher features like strings, files, sound and graphics.

CSE1203   **3 hours per week, 3 Cr.**
Discrete Mathematics   **Prereq.: Nil**

Set Theory: Power set, operations on sets, and laws of set operations; Properties and laws of various sets of numbers. Mathematical logic: Propositional and predicate calculus; Methods of proof. Counting and Countability: Counting principles; Basics of recurrence; Countability of sets. Graph Theory: Definitions, classification and computer representation of graphs; Trees; Directed Graphs; Graph traversals. Relations and Functions: Definitions, types and properties of relations and functions; Composition of relations and functions; Discrete numeric functions. Introduction to theory of groups.

CSE1205   **3 hours per week, 3 Cr.**
Object Oriented Programming   **Prereq.: CSE1101**

Introduction to Object Oriented Programming (OOP); Concepts and Techniques of OOP: Classes and Objects (General forms, Special keywords and methods, objects as parameters), Polymorphism and Overloading; Class hierarchy and inheritance: Creating class hierarchy, Member access and inheritance, Method overriding; OOP facilities for extensive and robust program design.

CSE1206   **3 hours per week, 1.5 Cr.**
Object Oriented Programming Lab

Laboratory works based on CSE1205.

YEAR-2, SEMESTER-1

CSE2100   **3 hours in alternate week, 0.75 Cr.**
Software Development-II

Students will develop software in groups or individually using an object oriented programming language.

CSE2103   **3 hours per week, 3 Cr.**
Data Structures   **Prereq.: CSE1101**

Basic concepts: Data structure notation, search and efficiency; Elementary data objects: Logical values, Integers and Packed words; Common data structures: Arrays, Lists (Sublists and recursive lists, Circular lists and Orthogonal lists); Stacks, Queues and Graphs (Binary Tree and Threaded Tree); Applications of data structures: Sorting, Searching, Hashing; Solving Computational problems.

CSE2104   **3 hours per week, 1.5 Cr.**
Data Structures Lab

Laboratory works based on CSE2103.

CSE2105   **3 hours per week, 3 Cr.**
Digital Logic Design   **Prereq.: Nil**

Boolean Algebra: Basic theorems and properties, Boolean functions and their simplification; Digital logic gates; Combinational Logic: Adder, Subtractor, Multiplexer and Demultiplexer, Encoder and Decoder, Comparator; Parity generator and checker; Synchronous Sequential Logic: Flip-flops, Analysis and Design of sequential circuits; Registers; Synchronous and Asynchronous counters; Basic Memory cell.

CSE2106   **3 hours per week, 1.5 Cr.**
Digital Logic Design Lab

Laboratory works based on CSE2105.

Department of Computer Science and Engineering

YEAR-2, SEMESTER-2

CSE2200	3 hours in alternate week, 0.75 Cr.
Software Development-III	

Students will work in groups or individually to produce software based on current trends and developments in the sector.

CSE2201	3 hours per week, 3 Cr.
Numerical Methods	**Prereq.: Nil**

Methods for solving non-linear equations**:** Iterative methods, Evaluation of polynomials, Bisection method, False position method, Newton-Raphson method, Secant method, Fixed point method; Interpolation; Curve fitting methods; Numerical differentiation and integration; Solution of systems of linear equations: Solution by elimination, Iteration methods, Matrix inversion method, Basic Gauss Elimination method, Gauss Elimination with Pivoting, Gauss-Jordan method; Numerical solution of ordinary differential equations: Taylor's series method, Euler's method, Predictor-Corrector methods.

CSE2202	3 hours in alternate week, 0.75 Cr.
Numerical Methods Lab	

Laboratory works based on CSE2201.

CSE2207	3 hours per week, 3 Cr.
Algorithms	**Prereq.: CSE2103**

Algorithmic Complexity Analysis; Methods for the design of efficient algorithms: Divide and Conquer, Greedy method, Dynamic programming, Backtracking, Branch and Bound, Polynomial evaluation, Lower bound theory, Intractable problems.

CSE2208	3 hours per week, 1.5 Cr.
Algorithms Lab	

Laboratory works based on CSE2207.

CSE2209   3 hours per week, 3 Cr.
Digital Electronics and   Prereq.: CSE2105, EEE2141
Pulse Techniques

Diode logic; Transistor switches; Logic Families: RTL, DTL, DCTL, TTL, ECL, IIL, MOS, CMOS; Electronic circuits for flip-flops, counters and registers, memory systems, PLAs; A/D and D/A converters with applications; Comparator circuits; Switching circuits; Multi vibrator: monostable, bistable, astable, Schmitt trigger; Voltage and current time-based generators; Timing circuits.

CSE2210   3 hours in alternate week, 0.75 Cr.
Digital Electronics and
 Pulse Techniques Lab

Laboratory works based on CSE2209.

CSE2213   3 hours per week, 3 Cr.
Computer Architecture   Prereq.: Nil

Basic structures and concepts of computer systems: Functional units, Basic operational concepts, Bus structures, Software and Performance; Information representation and transfer; Instructions and data access methods: Registers and Addressing, Program flow control, Logic instructions, Program-controlled I/O, Stacks and subroutines; Control Unit: Hardwired control and Microprogrammed control; Memory organization; I/O systems and Interrupts; Introduction to Pipelining, Parallel processing and multiprocessor systems.

CSE2214   3 hours per week, 1.5 Cr.
Assembly Language Programming

System Architecture for Assembly language; Assembly programming basics; Assembly instruction types and their formats: Arithmetic, Logical, Transfer control and conditional processing, String processing, Input/Output; Interrupts; Procedures; Interfacing using Assembly language.

YEAR-3, SEMESTER-1

CSE3100   **3 hours in alternate week, 0.75 Cr.**
Software Development-IV

Students will work in groups or individually to produce software based on current trends and developments in the sector.

CSE3101   **3 hours per week, 3 Cr.**
Mathematical Analysis for   **Prereq.: CSE1203, MATH2101**
Computer Science

Basic mathematical analysis techniques of algorithms: sums and products, binomial coefficients, harmonic numbers, Fibonacci numbers, recurrence relations; generating functions; Probability Distributions and Expectations: total probability and Bayes' rule, discrete probability distributions (geometric, modified geometric, Poisson etc.), continuous probability distributions (exponential, Erlang and gamma, Weibull etc.); Stochastic processes: definitions and classifications, discrete-parameter Markov chains (M/G/1 queuing system, birth-death processes), continuous-parameter Markov chains (birth-death processes, M/m/1 and M/M/m queuing systems); Networks of queues: tandem networks, open and closed queuing models.

CSE3103   **3 hours per week, 3 Cr.**
Database   **Prereq.: CSE1203**

Basic concepts of data and database systems; Data models; Query languages: Relational algebra and calculus, SQL; Query processing: interpretation, cost estimation, optimization; Functional dependency and normalization; File organization; Data Dictionary and directory systems; Database management: database administration, security & integrity; Introduction to advanced database systems.

CSE3104   3 hours per week, 1.5 Cr.
Database Lab

Laboratory works based on CSE3103.

CSE3107   3 hours per week, 3 Cr.
Microprocessors   Prereq.: CSE2105, CSE2213, CSE2214

Introduction to different types of microprocessors and programmable circuits; Study of a primitive microprocessor: architecture, instruction set, interrupt structure, interfacing I/O devices; Distinguishing features of some advanced microprocessors from Intel, Motorola, IBM etc.

CSE3108   3 hours in alternate week, 0.75 Cr.
Microprocessors Lab

Laboratory works based on CSE3107.

CSE3109   3 hours per week, 3 Cr.
Digital System Design   Prereq.: CSE2105, CSE2213

Design of memory subsystems using SRAM and DRAM; PLA design; Microoperations: Inter-register transfer, arithmetic operations, logic operations, shift operations; Design of various components of a computer: ALU, control unit (hardwired, microprogrammed); Computer bus standards; Design of a computer; Digital Systems in control, communication and instrumentation.

CSE3110   3 hours in alternate week, 0.75 Cr.
Digital System Design Lab

Laboratory works based on CSE3109.

YEAR-3, SEMESTER-2

CSE3200   **3 hours in alternate week, 0.75 Cr.**
Software Development-V

Students will work in groups or individually to produce high quality software using state of the art software development tools. Students will have to prepare proper documentation as well to the software developed.

CSE3211   **3 hours per week, 3 Cr.**
Data Communication   **Prereq.: MATH2203**

Data: data representation, signal encoding and signal analysis; Data Transmission Channel: channel capacity, transmission line characteristics, Baseband and Broadband transmission; Guided and unguided transmission media; Transmission networks; Transmission modulation techniques, modems and interfaces; Multiplexing techniques; Introduction to error handling and switching techniques.

CSE3213   **3 hours per week, 3 Cr.**
Operating System   **Prereq.: Nil**

Introduction to operating system concepts; Process management: Inter process communication, concurrency and scheduling; Memory management: addressing, virtual memory techniques (paging, segmentation); File systems: implementation, security and protection; Management of I/O; Deadlock handling; Distributed operating systems: Hardware/Software concepts, communication and synchronization.

CSE3214   **3 hours per week, 1.5 Cr.**
Operating System Lab

Laboratory works based on CSE3213.

CSE3215   **3 hours per week, 3 Cr.**
Microcontroller Based System Design   **Prereq.: CSE3107**

Programmable ports and handshaking I/O, Interfacing alphanumeric and power devices, Analog interfacing techniques, Induction and stepper motors, Interfacing with stepper motors, Controlling semiconductor power switches – BJT, MOSFET, SCR and Triac, Bus organization and arbitration, Application of Opto-coupler and relays, Basic differential amplifiers, Logarithmic amplifiers, Frequency and voltage measurement using digital techniques, Data acquisition system and interfacing to microprocessor based systems, Transducers, DMA, Mass storage systems, Serial communication interface; Barcode reader; MIDI interface; Printer interface; ISA, PCI, AGP, PS/2 and USB interfaces, Embedded Processors, Embedded Computing Platform, Real Time Embedded Systems, Embedded Systems Programming, Mapping between languages and hardware, Embedded Communication Systems, Embedded Computer Security.

CSE3216   **3 hours in alternate week, 0.75 Cr.**
Microcontroller Based
System Design Lab

Laboratory works based on CSE3215.

CSE3223   **3 hours per week, 3 Cr.**
Information System Design and   **Prereq.: CSE3103**
Software Engineering

Information System Design

Information and System; Systems Analysis and Systems Analyst; Information gathering techniques; Structured analysis of systems; Feasibility Study: Concepts (abstraction, refinement, modularity and hierarchy) and classification, Introduction to modeling language (Use case diagram, Sequence diagram and Activity diagram), Cost benefit analysis; Project scheduling; System design techniques; User interface design.

Software Engineering

Introduction to system engineering and software engineering; Software requirements analysis, modeling and specification; Software Designing: principles, models, design patterns and specification; Software testing: objectives and principles, testability, testing design and implementation models and documentations, verification, validation and debugging; Quality factors and metrics for different software engineering phases; Software project management issues.

CSE3224   **3 hours in alternate week, 0.75 Cr.**
Information System Design and
Software Engineering Lab

Laboratory works based on CSE3223.

YEAR-4, SEMESTER-1

CSE4100   **6 hours per week, 3 Cr.**
Project and Thesis-I

Students are required to engage themselves in groups in research and innovative works with a view to develop computer systems of practical importance.

CSE4101   **3 hours per week, 3 Cr.**
Computer Networks   **Prereq.: CSE3211**

Introduction to computer networks, LAN, MAN and WAN; OSI reference model; TCP/IP Reference Model; Data Link Layer: Sliding window protocol, HDLC, SLIP, PPP, ALOHA, CSMA/CD, GSM, CDMA, IEEE standards for LANs, MANs and Wireless Networks, Bridges; Network Layer: Routing algorithms, Internetworking, IP Protocol, Network layer in ATM network; Transport Layer: Transport services, TCP and UDP, ATM Adaptation layer; Application Layer: Network Security, SNMP, DNS, Electronic mail, WWW.

CSE4102   **3 hours per week, 1.5 Cr.**
Computer Networks Lab

Laboratory works based on CSE 4101.

CSE4107   **3 hours per week, 3 Cr.**
Artificial Intelligence   **Prereq.: CSE1203, CSE2207, CSE3101**

Survey of basic AI concepts and controversies; Knowledge Representation and Reasoning: Propositional and first order predicate logic, inconsistencies and uncertainties, structured representation; Knowledge Organization and Manipulation: search and control strategies, game playing, planning, decision making; Perception and Communication: natural language processing, visual image understanding; Knowledge acquisition (Machine learning); Introduction to knowledge-based systems (Expert systems).

CSE4108   **3 hours in alternate week, 0.75 Cr.**
Artificial Intelligence Lab

Laboratory works based on CSE4107.

CSE4125   **3 hours per week, 3 Cr.**
Distributed Database Systems   **Prereq.: CSE3103**

Distributed databases and systems: Distribution transparency, Data Fragmentation, Distributed query processing and optimization, Transaction management, Concurrency control, Data recovery and Replication; Data warehousing: Multidimensional data models and data cubes, Granularity and partitioning of data, Integration of large bodies of data; Implementation of client-server DBMS and distributed database applications; Security aspects for distributed database systems.

CSE4126   **3 hours in alternate week, 0.75 Cr.**
Distributed Database
Systems Lab

Laboratory works based on CSE4125.

Department of Computer Science and Engineering

CSE4129   3 hours per week, 3 Cr.
Formal Languages & Compilers   Prereq.: CSE1203

Formal Languages

Basic elements of formal languages, Finite automata, Context-free grammars, Push down automata, Turing machines, Hierarchy of formal languages and grammars.

Compilers

Compiler structure and phases, Lexical analysis, Top down and bottom up parsing, Symbol table, Syntax-directed translation, Type checking, Run time environment, Intermediate code generation, Code optimization.

CSE4130   3 hours in alternate week, 0.75 Cr.
Formal Languages &
Compilers Lab

Laboratory works based on CSE4129.

YEAR-4, SEMESTER-2

CSE4203   3 hours per week, 3 Cr.
Computer Graphics   Prereq.: MATH2203

Introduction to Graphical data processing; Scan conversion and its side-effects; Implementation of graphics concepts of two-dimensional and three-dimensional viewing, clipping and transformations; Three-dimensional object representations: polygon surface, B-Spline curves and surfaces, BSP trees, Octrees, Fractal-Geometry methods; Hidden line algorithms; Raster graphics concepts: Architecture, algorithms and other image synthesis methods; Design of interactive graphic conversions.

CSE4204   **3 hours in alternate week, 0.75 Cr.**
Computer Graphics Lab

Laboratory works based on CSE4203.

CSE4250   **6 hours per week, 3 Cr.**
Project and Thesis-II

Students are required to engage themselves in groups in research and innovative works with a view to develop computer systems of practical importance.

OPTIONAL COURSES

OPTIONS-I

CSE4211   **3 hours per week, 3 Cr.**
Simulation of Products, Processes   **Prereq.: CSE3101, MATH2101**
& Services

Introduction: Modeling and Simulation Concepts, Simulation methods, Case studies of simulation, Introduction to simulation packages; Model classification: Monte Carlo simulation, Discrete-event simulation, Continuous system simulation, Mixed event simulation; Quantitative modeling paradigms: Queuing networks, Stochastic process algebras, Stochastic Petri nets, Markov model; Input and output analysis: Random numbers, Generating and analyzing random numbers, Simulation of computer networks, Object-Oriented modeling of physical systems, Process-oriented and parallel component simulation and modeling.

CSE4212   **3 hours in alternate week, 0.75 Cr.**
Simulation of Products, Processes
& Services

Laboratory works based on CSE4211.

CSE4227   **3 hours per week, 3 Cr.**
Digital Image Processing   **Prereq.: CSE4203**

Digital image representation and acquisition; Survey of modern techniques for image analysis, processing and enhancement. Two dimensional system and transform theory; Sampling, linear and non-linear filtering, feature extraction, compression and coding, imaging systems.

CSE4228   **3 hours in alternate week, 0.75 Cr.**
Digital Image Processing Lab

Laboratory works based on CSE4227.

CSE4283   **3 hours per week, 3 Cr.**
Advanced Algorithms   **Prereq.: CSE2103, CSE2207**

NP-completeness, Amortized analysis, Approximation algorithms and schemes, Randomized algorithms, Network optimization; Parallel algorithms; Computational geometry; Dynamic trees; Dealing with large data sets: Compression, Streaming algorithms, Compressed sensing; String matching; Pattern matching; Solving homogeneous and non-homogeneous equations.

CSE4284   **3 hours in alternate week, 0.75 Cr.**
Advanced Algorithms Lab

Laboratory works based on CSE4283

OPTIONS-II

CSE4225   **3 hours per week, 3 Cr.**
Network Programming   **Prereq.: CSE3211, CSE4101**

Overview of networking tools; Internetwork-Process Communication (IPC) facilities for distributed applications; IPC user interfaces: pipes, shared memory, message queues, semaphores, sockets, system V Transport Layer Interface (TLI) and Remote Procedure Calls (RPC); Network protocols: TCP/IP, XNS, SNA, and NetBIOS.

Department of Computer Science and Engineering

CSE4226   **3 hours in alternate week, 0.75 Cr.**
Network Programming Lab

Laboratory works based on CSE4225.

CSE4231   **3 hours per week, 3 Cr.**
Multimedia Computing   **Prereq.: CSE3103**

Introduction to multimedia systems: Coding and compression standards; Architectural issues; Operating systems for multimedia computing. Multimedia databases: indexing and storing multimedia data; Disk placement, scheduling and searching for multimedia data. Networking issues in multimedia computing: Resource reservation, traffic specification, shaping, and monitoring; Admission control; Multicasting issues; Session directories; Protocols for controlling sessions. Security issues in multimedia: Digital water-marking; Partial encryption schemes for video streams. Multimedia applications: Audio and video conferencing; Video on demand; Voice over IP.

CSE4232   **3 hours in alternate week, 0.75 Cr.**
Multimedia Computing Lab

Laboratory works based on CSE4231.

CSE4237   **3 hours per week, 3 Cr.**
Soft Computing   **Prereq.: CSE3101**

Aims and constituents of soft computing. Fuzzy sets and logic: Concepts and properties of fuzzy sets; Mathematical & logical implications of fuzzy sets; Fuzzy relations; Applications of fuzzy sets in information processing, decision making and control systems. Artificial neural networks: Underlying ideas and concepts of artificial neural networks; Feed-Forward, Recurrent and other types of artificial neural networks; Rules and methodologies of training artificial neural networks; Error backpropagation, recurrent backpropagation and other learning algorithms for neural networks. Probabilistic reasoning: Bayesian inference models and Bayesian networks; Dempster – Shafer theory; Probabilistic decision support systems. Genetic algorithms: Underlying principles and fundamental operators of genetic algorithms; Searching based on genetic algorithms; Genetic algorithm based optimization, learning and control. Introduction to various neuro-fuzzy-probabilistic-genetic combined approaches to computing applications.

CSE4238   3 hours in alternate week, 0.75 Cr.
Soft Computing Lab

Laboratory works based on CSE4237.

CSE4281   3 hours per week, 3 Cr.
Web Computing   Prereq.: CSE4101

Introduction to Internet technology: Word Wide Web (WWW), Web pages, Web servers, HTTP, HTTPs, FTP, Electronic mail, Search engines, Global databases, digital libraries, video on demand, streaming audio and video; Web page design: HTML and DHTML concepts, tags, commands, form design, table design, online request, dynamic functions, buttons, animations and multimedia, Script languages, Embedding scripts in HTML; Intranet: Usefulness of intranet, Sharing scarce resources over intranet, Network chatting and newsgroups; E-Commerce: Paying money over the network, Online shopping cart, Mobile   payment system; Web Security: Privacy Policy, Encryption techniques, Network security and firewalls.

CSE4282   3 hours in alternate week, 0.75 Cr.
Web Computing Lab

Laboratory works based on CSE4281.

OPTIONS-III

CSE4213   3 hours per week, 3 Cr.
Pattern Recognition   Prereq.: MATH2203, CSE4107

Introduction: Object features, classifications and learning; Statistical, structural and hybrid methods. Bayesian classifier and Bayesian decision theory. Learning algorithms: Perceptron algorithm and its variants, backpropagation algorithm and its variants. Pattern grammars, languages, parsing techniques and clustering. Application of pattern recognition methods to speech recognition, remote sensing, biomedical area and computer aided design.

CSE4214   **3 hours in alternate week, 0.75 Cr.**
Pattern Recognition Lab

Laboratory works based on CSE4213.

CSE4243   **3 hours per week, 3 Cr.**
Expert and Decision Support Systems   **Prereq.: CSE4107**

Decision making and expert decision support fundamentals; The knowledge base;
Expert-knowledge acquisition; The inference engine; Modeling of uncertain
reasoning; Coherence and validation; ES shells, environments and existing ES.

CSE4244   **3 hours in alternate week, 0.75 Cr.**
Expert and Decision Support
Systems Lab

Laboratory works based on CSE4243.

CSE4247   **3 hours per week, 3 Cr.**
Artificial Neural Networks   **Prereq.: CSE4107**

Elementary neurophysiological principles; Artificial neuron models; Single-layer
networks (perceptrons); Multi-layer feed forward networks and backpropagation;
Cascade correlation (correlation training); Recurrent networks (Hopfield); Self-
organizing maps (Kohonen maps); Bi-directional associative memory; Counter
propagation networks; Adaptive resonance theory; Spatiotemporal sequences;
Hardware realization of neural networks.

CSE4248   **3 hours in alternate week, 0.75 Cr.**
Artificial Neural Networks Lab

Laboratory works based on CSE4247.

OPTIONS-IV

CSE4215   3 hours per week, 3 Cr.
Advanced Computer Architecture   Prereq.: CSE2213

Pipelined machines, interleaved memory systems, caches. Hardware and architectural issues of parallel machines. Array processors, associative processors, multiprocessors, systolic processors, data-flow computers and interconnection networks. High level language concept of computer architecture.

CSE4217   3 hours per week, 3 Cr.
VLSI Design   Prereq.: CSE2209

VLSI Technology: MOS transistor and inverter characteristics, complex CMOS gates and functional circuits. Design and operation of large fan-out and fan-in circuits; Clocking methodologies; Techniques for data path and data control design. VLSI layout partitioning, placement routine, and writing in VLSI. Reliability aspects and testing of VLSI.

CSE4233   3 hours per week, 3 Cr.
Advanced Microprocessor Architecture   Prereq.: CSE3107

Intel 80x86 and beyond: Architecture, Addressing modes and Instruction set; Motorola 6800: Programming model, Addressing structure, Addressing modes, Instruction set, Stacks, Pins and Signals, Memory interface, Programmed I/O, Interrupt I/O, DMA, Exception Handling; RISC processors: Key performance features, Registers, Data types and addresses, Instruction set, Pins and signals; SPARC and MIPS.

CSE4255   **3 hours per week, 3 Cr.**
Telecommunication   **Prereq.: CSE3211, CSE4101**

Overview of Telecommunication: History, Evolution, Convergence of telecommunication and data networks, Types of telecommunication networks, Generations of wireless telecommunication system; Switching System: Blocking probability and multistage switching, Time division switching and two dimensional switching; Cellular telephony: Frequencies reuse, Frequency management channel alignment, Hand off strategies, GSM, CDMA; Mobile Radio Propagation - Large Scale Path Loss: Free space propagation model; Three basic propagation mechanisms: reflection, diffraction, scattering; Practical link budget design using path loss models; Small scale fading and multipath; Modulation Techniques for Mobile Radio; Modern Telephone Services and Network: Internet Telephony, Facsimile, ISDN, ATM and intelligent networks, Satellite communication, Optical fiber communication.

CSE4241   **3 hours per week, 3 Cr.**
Digital Signal Processing   **Prereq.: MATH2101, MATH2203**

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.

CSE4219   **3 hours per week, 3 Cr.**
Computational Geometry   **Prereq.: MATH2203**

Drawing fundamental geometric objects: Basic concepts, algorithms and their complexity; Point inclusion problems, convexity testing; Polygon triangulations and polygon partitioning; Convex hulls in two-dimensional and three-dimensional spaces; Proximity analysis: Voronoi diagrams and Delaunay triangulations. Drawing Graphs: Styles and applications of graph drawing; Drawing of rooted trees and planar graphs.

Department of Computer Science and Engineering

CSE4221   3 hours per week, 3 Cr.
Graph Theory   Prereq.: CSE1203

Introduction: Graphs as abstract connection diagrams; Fundamental concepts and definitions: Simple graphs, digraphs, subgraphs, vertex-degrees, walks, paths and cycles; Varieties of graphs; Trees: Properties, Spanning trees, Isomorphism of trees, Trees and optimization; Planar, Eulerian and Hamiltonian graphs; Cuts and connectivity of graphs; Network flow problem; Graph coloring.

CSE4223   3 hours per week, 3 Cr.
Computational Complexity Theory   Prereq.: CSE3101, CSE4129

Turing Machines and Computational complexity classes: Representation of computational tasks and algorithms using Turing machines, Time and space complexity classes; Computable functions and recursive function theory; Unsolvable/undecidable problems; Intractable problems and NP-completeness: P versus NP question, polynomial-time reductions, NP-complete problems.

CSE4245   3 hours per week, 3 Cr.
Parallel Processing   Prereq.: CSE2213, CSE3213

Introduction to Parallel Architectures: Shared memory, VLSI, Message-Passing. Relation between architectures. Introduction to multithreaded, parallel, and distributed programming. A concurrent programming language. Process and synchronization. Locks and barriers. Semaphores. Monitors. Message-Passing. RPC and Rendezvous. Paradigms for process interaction. Parallel programming for science and engineering.

Department of Computer Science and Engineering

AUST

YEAR-1, SEMESTER-1

HUM1107   3 hours per week, 3 Cr.
Critical Thinking & Communication   Prereq.: Nil

Objective: The aim of this foundational course is to help the second language learners acquire fluency in both spoken and written English to communicate messages with clarity, precision and confidence in the workplace. The course will have three components: Language, Speaking and Writing. The skills required in these areas will be imparted through Lectures and Sessionals. While lectures will introduce to basic concepts in communication, sessionals will provide hands-on experience.

Lecture Topics : Introduction to communication, Language and grammar skills, Speaking skills, Writing skills.

HUM1108   3 hours per week, 1.5 Cr.
English Language Sessional   Prereq.: Nil

Building vocabulary, Building sentences, Grammar, Pronunciation drills, Phonetics, Vowels, Dipthongs, Consonants, Stress, Rhythm and intonation, Conversational skills, Meta Language, The Writing process, Writing with a thesis, Writing topic sentences, Writing a paragraph, Linking paragraphs.

MATH1115   3 hours per week, 3 Cr.
Mathematics-I   Prereq.: Nil

Differential Calculus

Limit, Continuity and Differentiability, Successive Differentiation, Mean value theorem, Taylor's theorem, Maclaurine's series with remainder, Expansion of function, L' Hospital's rule, Partial Differentiation, Tangent & Normal, Maxima & Minima, Points of inflection, Asymptotes, Curvature.

Co-ordinate Geometry

2D Geometry: Change of axes, Transformation of Coordinates, Pair of Straight lines, System of circles, Co-axial circles & limiting points, Tangent and Normal, Chord of contact, Chord in terms of middle points, Conjugate Diameter, Director Circles.
3D Geometry: Straight lines, Planes and Equation of solid bodies.

PHY1115   **3 hours per week, 3 Cr.**
Physics   **Prereq. : Nil**

Electromagnetism

Magnetic field, Lorentz force, Ampere's law, Faraday's Law, Biot-Savart law, Inductance, Calculation of inductance (LR circuit).

States of Matter

Conductor, Insulator and semiconductor, Properties of semiconductor, Bands in semiconductor, Energy band description of semiconductor, Effect of temperature on semiconductor, P-type and N-type semiconductor, P-N junction.

Waves and Oscillations

Oscillations: Simple harmonic motion (SHM), Damped harmonic motion, Forced oscillation, Combination and composition of simple harmonic motions, Lissajous figures. Transverse and Longitudinal nature of waves, Travelling and standing waves, Intensity of waves, Energy calculation of travelling and standing waves, Phase velocity and group velocity, Doppler effect.

Physical Optics

Theories of light: Different theories of light, Huygen's principles and constructions. Interference of light: Coherent source, Relation between path difference and phase difference, Definition of interference, Young's double slit experiment, Interference in thin film, Newton's ring. Diffraction of light: Fresnel and Fraunhoffer diffraction, Diffraction by single slit, Diffraction by double slit. Polarization of light: Brewster's law, Malus law.

Department of Computer Science and Engineering

AUST

PHY1116   **3 hours in alternate week, 0.75 Cr.**
Physics Lab

Laboratory experiments based on PHY1115.

CHEM1115   **3 hours per week, 3 Cr.**
Chemistry   **Prereq. : Nil**

Atomic structure and placement of elements in the 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 and phase diagram of mono-component systems; Properties of dilute solutions; Thermo-chemistry, chemical kinetics and chemical equilibrium; Ionization of water and pH concept; Electrical properties of solutions.

YEAR-1, SEMESTER-2

MATH1219   **3 hours per week, 3 Cr.**
Mathematics-II   **Prereq.: MATH1115**

Integral Calculus

Definition of integration, Integration by the methods of Substitution, Integration by parts, Standard integrals, Reduction methods, Definite integrals with properties, Walli's formula, Improper integral, Beta and Gamma Function, Intrinsic equations, Determination of Area; Length, Surface and volume in Cartesian and Polar Co-ordinate Systems.

Differential Equations

Degree and order of ordinary differential equations, Formation of differential equations, Solution of first order differential equations by various methods, Solution of general linear differential equations of second and higher orders with constant coefficients, Solution of homogeneous linear equations, Solution of differential equations by operator methods; Applications of solution of differential equations of higher order when the dependent and independent variables are absent; Concept of partial differential equations.

Department of Computer Science and Engineering

ME1211   **3 hours per week, 3 Cr.**
Basic Mechanical Engineering   **Prereq.: Nil**

Revision of fundamental principles of kinematics, heat and thermodynamics; Forces and Motion: Forces in trusses and frames, relative motion, transfer of motion and momentum; Introduction to internal combustion engines, refrigerating and air conditioning systems; Elements of robotics: rotational and spatial motion, geometric configurations and structural elements of arms, grippers and other manipulators.

ME1214   **3 hours in alternate week, 0.75 Cr.**
Engineering Drawing

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

EEE1241   **3 hours per week, 3 Cr.**
Basic Electrical Engineering   **Prereq.: Nil**

Fundamental electrical concepts and measuring units; DC voltage, current, resistance and power; Laws of electrical circuits and methods of network analysis; Principles of DC measuring apparatus; Laws of magnetic fields and methods of solving simple magnetic circuits.

Alternating current: Instantaneous and rms current, voltage and power; average power for various combinations of R, L and C circuits; Phasor representation of sinusoidal quantities, Introduction to three phase circuits.

EEE1242   **3 hours per week, 1.5 Cr.**
Basic Electrical Engineering Lab

Laboratory Experiments based on EEE1241.

YEAR-2, SEMESTER-1

`

HUM2109   **3 hours per week, 3 Cr.**
Society, Ethics and Technology   **Prereq.: Nil**

Historical Perspectives of Technology, Social Perspectives of Technology, Ethical Perspectives of Technology, Globalization and Human Rights, Information Technology, Biomedical Technology, Population and the Environment.

MATH2101   **3 hours per week, 3 Cr.**
Mathematics-III   **Prereq.: MATH1219**

Complex Variable

Complex Number system; General function of Complex variables, Limits and continuity of a function of complex variable, Complex differentiation and the Cauchy–Riemann equation, Mapping and conformal mapping of elementary functions, Cauchy's Integral theorem, Cauchy's Integral formula; Taylor's and Laurent's theorem; Singular points, Residues and evaluation of residues, Cauchy's Residues theorem, Contour integration.

Laplace Transform

Definition, Laplace transform of some elementary functions, Inverse Laplace transformations, The unit step function, Periodic function, Evaluation of improper integrals. Solution of some differential equations and integral equations by Laplace transform.

Statistics

Frequency distribution, Mean, Median, Mode and other measures of central tendency, Standard deviation and other measures of dispersion, Moments, Skewness and kurtosis, Elementary probability theory and discrete probability distribution e.g. Uniform, Bernoulli, Bionomial; Continuous probability distribution e.g. Uniform, Normal and Poisson; Hypothesis testing and Regression analysis.

EEE2141   **3 hours per week, 3 Cr.**
Electronic Devices and Circuits   **Prereq.: EEE1241**

Semiconductor Diode: Junction diode characteristics; Operation and small signal models of diodes. Bipolar Transistor: Characteristics; BJT biasing and thermal stabilization; CE, CB, CC configurations; Small signal low frequency h-parameter models and hybrid-π model. Introduction to JFET, MOSFET and CMOS: Biasing and application in switching circuits. Oscillators: Hartley, Colpitts & Wine-Bridge oscillators. Power Electronic Devices: SCR, TRIAC, DIAC, UJT characteristics and application; Introduction to rectifiers, active filters, regulated power supply; Introduction to IC fabrication techniques.

EEE2142   **3 hours per week, 1.5 Cr.**
Electronic Devices and Circuits Lab

Laboratory Experiments based on EEE2141.

YEAR-2, SEMESTER-2

MATH2203   **3 hours per week, 3 Cr.**
Mathematics-IV   **Prereq.: MATH1115**

Matrices

Definition of Matrix, Different types of matrices, Algebra of Matrices, Adjoint and inverse of a matrix, Rank of elementary transformations of matrices; Normal and canonical forms; Solution of linear equations; Matrix polynomials, Eigen values and eigen vectors.

Vector

Scalars and vectors, Equality of vectors, Addition and subtraction of Vectors, Multiplication of vectors by scalars, Scalar and Vector products and their geometrical interpretation, Triple product and multiple product, Linear dependence and independence of vectors, Differentiation and integration of vectors, Definition of Line, Surface and Volume integrals; Gradient, divergence and curl of a point function, Gauss's theorem, Stoke's theorem and Green's theorem.

Fourier Analysis

Fourier series, real and complex form of finite transform, Fourier Integral, Fourier Transforms and their uses in solving boundary value problems.

YEAR-3, SEMESTER-1

HUM3115	**3 hours per week, 2+1 Cr.**
Economics and Accounting	**Prereq.: Nil**

Economics

Micro-Economics: The theory of demand and supply and their elasticity, Price determination, Indifference curve technique. Marginal analysis: Production function, Types of productivity, Rational region of production of an engineering firm, Concepts of market and market structure, Cost analysis and cost function, Small scale production and large scale production, Optimization theory of distribution.

Macro-Economics: Savings, Investments, Employment, National income analysis, Inflation, Monetary policy, Fiscal policy and trade policy with reference to Bangladesh, Economics of development and planning.

Accounting

Principles of accounting: accounts, transactions, the accounting procedures and financial statements. Cost in general: objectives and classifications. Cost sheet under job costing. Cost-volume-profit analysis. Long–run planning and control: capital budgeting.

YEAR-3, SEMESTER-2

HUM3207	**3 hours per week, 3 Cr.**
Industrial Law and Safety Management	**Prereq.: Nil**

Principles of law of contract; Company law: Law regarding formation, incorporation, management and winding up of companies; Labor law: Law in relation to wage hours, health, safety and other work conditions; The trade

union legislation arbitration; The policy of the state in relation to labor; The Factory Act; Law of Compensation.

Safety Management: Evolution of modern safety concepts; Industrial hazard, Safety and risk management; Worker health and safety; Proactive techniques for safety management; Safety standard and regulation for engineering works.

YEAR-4, SEMESTER-1

IPE4111   **3 hours per week, 3 Cr.**
Industrial Management   **Prereq.: Nil**

Introduction to Management: Organization and the need for management; Organization: Design and Structure, Coordination; Management Theory, Social Responsibility and Ethics, Globalization and Multiculturalism.

Personnel Management: Scope, Importance, Motivation, Need Hierarchy, Job Design, Leadership, Performance, Appraisal, Informal Group, Communication and Negotiation, Human Resource Management.

Production Management: Forecasting, Line Balancing, Master Production Schedule, Material Requirements Planning, Project Management, Ergonomics, Maintenance Management, Quality Management, Supply Chain Management, Information Technology and the Supply Chain.

Financial Management: Time and Money, Methods of Comparing Alternatives, Concept of Depreciation, Break Even Analysis, Benefit Cost Ratio Analysis.

Marketing Management: Concept, Strategy, Sales Promotion, Patent Laws.

Technology Management: Management of Innovation and Changes, Technology Life Cycle.

ARCHITECTURE

ARC1130   **3 hours per week, 1.5 Cr.**
Computer Application I

Word processing and spreadsheet analysis using available software packages.

CIVIL ENGINEERING

CSE2153   **3 hours per week, 3 Cr.**
**Numerical Methods and
Computer Programming**

Basic components of computer systems; FORTRAN/C language; numerical solution of algebraic and transcendental equations; matrices; solution of systems of linear equations; curve-fitting by least squares; finite differences; divided differences; interpolation; computer applications to Civil Engineering problems, numerical differentiation and integration; numerical solution of differential equations.

CSE2154*   **3 hours per week, 1.5 Cr.**
**Numerical Methods and
Computer Programming Lab**

Operating system for microcomputers; development of FORTRAN/C programs and solution of problems using a computer, solution of Civil Engineering problems using microcomputers.

_____
* Unified form of the previous course code CSE2163

TEXTILE TECHNOLOGY

CSE2146   **3 hours per week, 1.5 Cr.**
Introduction to Computer Science

Types of computers, Functional units of a computer, Typical input and output devices, Auxiliary storage devices, Commonly used DOS Commands, GUI, Numerical methods, Programming techniques.

CSE2186   **3 hours per week, 1.5 Cr.**
Basic Programming Techniques

Writing Algorithms and drawing Flowcharts, Use of different elements of C (variables, operators, input-output statements, branching and looping, library functions, defining functions and sub-routines, arrays and subscripted variables, sequential and random data files, use of graphics and sound.)

MECHANICAL AND PRODUCTION ENGINEERING

CSE1287
Computer Programming   **3 hours per week, 3 Cr.**

Introduction to the Digital Computer; Introduction to Programming Variables, Assignment; Expressions; Input/Output; Conditionals and Branching; Iteration; Functions; Recursion; Arrays; Introduction to Pointers; Structures; Introduction to Data-Procedure Encapsulation; Dynamic allocation; Linked structures; Introduction to Data Structure, Stacks and Queues; Search Trees; Time and space requirements. (A programming language like C/C++ may be used as a basis language. The same language must be used for the laboratory.)

CSE1288
Computer Programming Sessional   **3 hours per week, 1.5 Cr.**

Sessional works compatible to CSE1287.

PROGRAMMING CONTESTS

REEUNION

YEAR-1, SEMESTER-1

1. Schildt H., *C, The Complete Reference*, McGraw-Hill, 4th Ed., 2000
2. Schildt H., *Teach Yourself C*, McGraw-Hill, 3rd Ed., 1997
3. Kernighan B. W., Ritchie D. M., *The C Programming Language*, Prentice Hall, 2nd Ed., 1988
4. Hutchinson E., Sawyer S. C., *Computers and Information Systems*, McGraw-Hill, 5th Ed., 1996
5. Sinha K.P., *Computer Fundamentals*, BPB, 4th Ed., 2004
6. Young M.J., Halvorson M., *Microsoft Office XP, Inside Out*, Microsoft Press, 2001
7. Resnick R., Halliday D., *Physics*: *Part II*, New Age International, 1999
8. Tewary K.K., *Electricity and Magnetism with Electronics*, S. Chand & Co., 3rd Ed., 2001
9. Subrahmanyam N., Brijlal, *A Text Book of Optics*, S. Chand & Co., 23rd Ed., 1995
10. Subrahmanyam N., Brijlal, *Wave and Oscillation*, Vikas Publ., 2nd Ed., 1994
11. O'Connor J.D., *Better English Pronunciation*, Cambridge University Press, 2nd Ed.
12. Maniruzzaman Dr. M., *Advanced Reading and Writing Skills*, Friends Publ., 2008
13. Pyle A.M., Page M.E.M., *Cliffs TOEFL*, Cliffs, 2001
14. Mohammad, Bhattacharjee, Latif, *A Text Book on Differential Calculus*, S. Tripaty, 10th Ed., 2001
15. Rahman, Bhattacharjee, *A Text book on Co-ordinate Geometry*, S. Bhattacharjee Publ., 1st Ed., 2003
16. Howard A., *Calculus*, John Wiley & Sons, 7th Ed., 2001
17. Haider S.Z., *Introduction to Modern Inorganic Chemistry*, Friends International, 2nd Ed., 2000
18. Bahl B.S., Tuli G.D., *Essential of Physical Chemistry*, S. Chand, 24th Ed., 2000
19. Ebbing D., *General Chemistry*, Hauton Miffin Company, 8th Ed., 2006

YEAR-1, SEMESTER-2

1. Rosen K. H., *Discrete Mathematics and its Applications*, McGraw-Hill, 6th Ed., 2006
2. Nicodemi O., *Discrete Mathematics: A Bridge to Computer Science and Advanced Mathematics,* West, 1987 (CBS, 3rd reprint, 2002)
3. Liu C.L., *Elements of Discrete Mathematics*, McGraw-Hill, 3rd Ed., 2008

4. Schildt H., *Java 2: The Complete Reference*, McGraw-Hill, 6th Ed., 2007

5. Deitel H.M., Deitel P.J., *Java: How to Program*, Prentice Hall, 6th Ed., 2005

6. Schildt H., *Teach Yourself C++*, McGraw-Hill, 3rd Ed., 2005

7. Boylestad R.L., *Introductory Circuit Analysis*, Prentice Hall, 12th Ed., 2010

8. Nilsson W., Riedel S.A., *Electrical Circuits*, Addison-Wesley, 8th Ed., 2007

9. Mohammad, Bhattacharjee, Latif, *A Text Book on Integral Calculus*, Kanta Bhattacharjee Publ., 2003

10. Gupta J.K., Khurmi R.S., *A Textbook of Thermal Engineering (Mechanical Technology)*, S. Chand, 2006

11. Vasandani V.P., Kumar D.S., *Treatise on Heat Engineering*, Metropolitan Books, 1995

12. John J.C., *Introduction To Robotics : Mechanics and Control*, Prentice Hall, 3rd Ed., 2004

YEAR-2, SEMESTER-1

1. Reingold M.E., Hansen J.W., *Data Structures*, CBS, 1st Ed., 1988

2. Lipscutz, *Data Structure*, Pearson, 2007

3. Tanenbaum A.M., Langsam Y., Augenstein M.J, *Data structure using C*, Pearson Education, 1998

4. Floyd T.L., *Digital Fundamentals*, Prentice Hall, 10th Ed., 2008

5. Mano M.M., *Digital Logic and Computer Design*, Prentice Hall of India Pvt. Ltd., 2008

6. Leach D.P., Malvino A. P., *Digital Principles and Applications*, Prentice Hall, 5th Ed., 1994

7. Boylestad R., Nashelskey L., *Electronic Devices and Circuit Theory*, Prentice Hall, 10th Ed., 2008

8. Horenstein M.N., *Microelectronic Circuits and Devices*, Prentice Hall, 2nd Ed., 1995

9. Brown J.W., Churchill R.V., *Complex Variables and Applications*, McGraw-Hill, 8th Revised Ed., 2008

10. Spiegel M.R., *Theory and Problems on Laplace Transformations*, McGraw-Hill, 1986

11. Gupta S.C., Kapoor V.K., *Fundamentals of Mathematical Statistics*, S Chand & Sons, 9th Ed., 1994

12. Giddens A., *Sociology,* Blackwell Publishers, 6th Edition, 2009

13. Winston M., Edelbach R., *Society, Ethics and Technology*, Wadsworth Publishing, 4th Ed., 2008

YEAR-2, SEMESTER-2

1. Rao S.B., Shantha C.K, *Numerical Methods With Programs in Basic*, *Fortran, Pascal & C++ (Revised Edition),* University Press, 2004

2. Horawitz E., Sahni S., Rajasekaram S., *Computer Algorithms*, Silicon Press, 2nd Ed., 2007

3. Cormen T.H., Leiserson C.E., Rivest R.L., *Introduction to Algorithms*, McGraw-Hill, 2nd Ed.,1990

4. Zaky S.G., Vranesic Z.G., Hamacher C., *Computer Organization*, McGraw-Hill, 5th Ed., 2007

5. Hayes J.P., *Computer Architecture and Organization*, McGraw-Hill, 3rd Ed., 1998

6. Patterson D. A., Hennessy J. L., *Computer Organization & Design*, Morgan Kaufmann Publishers Inc, 4th Ed., 2007

7. Millman J., Arvin G., *Microelectronics: Digital and Analog Circuits and Systems*, McGraw-Hill, 1988

8. Taub H., Schilling D. L., *Digital Integrated Electronics*, McGraw-Hill, 1997

9. Millman J., Taub H., *Pulse, Digital and Switching Waveforms*, McGraw-Hill, 2nd Ed., 2008

10. Irvine K.R., *Assembly Language for the IBM PC*, Macmillan, 1990

11. Yu Y., Marut C., *Assembly Language Programming and the Organization of the IBM PC*, McGraw-Hill, International Ed., 1992

12. Bronson R., *Schaum's Outline of Theory and Problems of Matrix Operations*, McGraw-Hill, 1988

13. Grewall B.S., *Higher Engineering Mathematics*, Khanna Publ., 39th Ed., 2004

14. Howad A., *Elementary Linear Algebra*, John Wiley & Sons, 9th Ed., 2005

YEAR-3, SEMESTER-1

1. Graham R.L., Knuth D.E., Patashnik O., *Concrete Mathematics*, Pearson Education, 2nd Ed., 2007

2. Ross S.M., *Introduction to Probability Models*, Elsevier, 10th Ed., 2007

3. Silberschatz A., Korth H., Sudarshan S., *Database System Concepts*, McGraw-Hill, 6th Ed., 2010

4. Elmasri R., Navathe S.B., *Fundamentals of Database Systems*, Addison-Wesley, 5th Ed., 2006

5. Date C. J., *An Intrduction to Database Systems*, Addison Wesley, 8th Ed., 2003

6. Gaonkar R.S., *Microprocessor Architecture, Programming and Application with the 8085*, PenRam International (India), 5th Ed., 2006

7. Rafiquzaman M., *Microprocessor and Microcomputer Based System Design*, CRC press, 2nd Ed., 1995

8. Brey B.B., *The Intel Microprocessors*, Prentice Hall, 8th Ed., 2009

9. Mano M. M., *Digital Logic and Computer Design,* Prentice Hall of India Pvt. Ltd., 2008

10. Malvino A., Brown J., *Digital Computer Electronics*, Tata McGraw-Hill, 3rd Ed., 2008

11. Coughlin R.F., Driscoll F.F., *Operational Amplifier and Linear Integrated Circuits*, Prentice Hall, 6th Ed., 2000

12. Floyd T.L., *Digital Fundamentals*, Prentice Hall, 10th Ed., 2008

13. Larson K.D., Wild J.J., Chaiappetta B., *Fundamentals of Accounting Principles*, McGraw-Hill, 18th Ed., 2007

14. Samuelson P.A., Nordhaus W.D., *Economics*, McGraw-Hill, 2009

15. Dewett K.K., *Modern Economic Theory*, S Chand & Co., 2006

YEAR-3, SEMESTER-2

1. Stallings W., *Data And Computer Communications*, Prentice Hall, 8th Ed., 2007

2. Gupta P.C., *Data Communications*, Prentice Hall, 2004

3. Schweber W.L., *Data Communications*, McGraw-Hill, 1995

4. Tanenbaum A.S., *Modern Operating Systems*, Prentice Hall, 3rd Ed., 2008

5. Silberschatz A., Galvin P.B., *Operating System Concepts*, John Wiley & Sons, 7th Ed., 2004

6. Douglas V.H., *Microprocessors and Interfacing*, McGraw-Hill, 2nd Ed., 2006

7. Cook B.M., White N.H., *Computer Peripherals*, Arnold Publishers, 3rd Ed.,1995

8. Awad E.M., *Systems Analysis and Design*, Galgotia, 2nd Ed., 1985

9. Whitten J. L., *System Analysis and Design Methods*, McGraw-Hill, 7th Ed., 2007

10. Pressman R.S., *Software Engineering*, McGraw-Hill, International Ed., 6th Ed., 2005

11. Sommerville I., *Software Engineering*, Addison-Wesley, 6th Ed., 2000

12. Petersen R., *Linux: The Complete Reference*, Tata McGraw-Hill, 6th Ed., 2007

13. Prata S., *Advanced Unix: A programmer's Guide*, The Waite Group, 1986

14. Stranks J., *Health and Safety Law*, Pearson Education, 5th Ed., 2005

15. Malik P.L., *Industrial Law*, Eastern Book Company, 22nd Ed., 2010

YEAR-4, SEMESTER-1

1. Tanenbaum A.S., *Computer Networks*, Prentice Hall, 4th Ed., 2003

2. Forouzan B.A., *Data Communication and Networking*, McGraw-Hill, 4th Ed., 2006

3. Russell S. J., Norvig P., *Artificial Intelligence*, Pearson Education, 2nd Ed., 2003

4. Patterson D.W., *Introduction to Artificial Intelligence and Expert Systems*, Prentice Hall, 4th Indian Reprint, 1998

5. Shapiro E., Sterling L., *The Art of Prolog*, MIT Press, 2nd Ed., 1994

6. Clockskin W.F., Mellish C.S., *Programming in Prolog*, Springer-Verlag, 4th Ed., 1994

7. Winston P., Horn B., *LISP*, Addison-Wesley, 3rd Ed., 1989

8. Ceri S., Pelagatti G., *Distributed Database*, McGraw-Hill, International Student Ed., 1985

9. Inmon W.H., *Building the Data Warehouse*, John Wiley & Sons, 4th Ed., 2005

10. Silberschatz A., Korth H., Sudarshan S., *Database System Concepts*, McGraw-Hill, 6th Ed., 2010

11. Han J., Kamber M., *Data Mining: Concepts and Techniques*, Morgan Kaufman, 2nd Ed., 2006

12. Martin J.C., *Introduction to Languages and the Theory of Computation*, McGraw-Hill, 3rd Ed., 2003

13. Hopcroft J.E., Ullman J.D., *Introduction to Automata Theory, Languages and Computation*, Addison-Wesley, 2nd Ed., 2000

14. Papadimitriou, *Elements of the Theory of Computation*, Pearson Education, 2nd Ed., 1997

15. Aho A.V., Sethi R., Ullman J.D., *Compilers*, Addison-Wesley , 2nd Ed, 2007

16. Aho A. V., Ullman J. D., *Principles of Compiler Design*, Addison-Wesley, 22nd Reprint, 1999

17. Kerzner H., *Project Management: A System Approach & Planning, Scheduling and Controlling*, John Wiley & Sons, 10th Ed., 2009

18. Taylor B.W., *Introduction to Management Science*, Prentice Hall, 10th Ed., 2009

19. Griffin R.W., *Management,* South-Western College Publishers, 10th Ed., 2010

YEAR-4, SEMESTER-2

1. Foley J.D., Dam A.V., Ferner S.K., Hughes J.F., *Computer Graphics: Principles and Practice in C*, Pearson Education, 2nd Ed., 1995

2. Xiang Z., Plastock R., *Computer Graphics*, McGraw-Hill, 2nd Ed., 2000

OPTIONAL COURSES (for YEAR-4, SEMESTER-2)

3. Cormen T.H., Leiserson C.E., Rivest R.L., *Introduction to Algorithms*, McGraw-Hill, 2nd Ed.,1990

4. Kleinberg J., Tardos E., *Algorithm Design,* Pearson/Addison-Wesley, 2006

5. Stevens W.R., Fenner B., Rudoff A. M., *UNIX Network Programming Volume1:The Sockets Networking API*, Prentice Hall, 3rd Ed., 2004

6. Matthew N, Stones R., Cox A., *Beginning Linux Programming*, Wrox Publication, 4th Ed., 2007

7. Ermine J.L., *Expert Systems: Theory and Practice*, PHI Learning, 2005

8. Ignizio J.P., *Introduction to Expert Systems*, McGraw-Hill, International Ed., 1991

9. Turban E., Aronson J.E., *Decision Support Systems and Intelligent Systems*, Prentice Hall, 7th Ed., 2005

10. Mehrotra K., Ranka M.S., *Elements of Artificial Neural Networks*, MIT Press, 1997

11. Fauselt L.V., *Fundamentals of Neural Networks*, Prentice Hall, 1st Ed., 1994

12. Law A.M., Kelton W.D., *Simulation Modeling and Analysis*, McGraw-Hill, 3rd Ed., 1999

13. Banks J., Carson J.S., Nelson B.L., *Discrete-Event Systems Simulation*, Prentice Hall, 5th Ed., 2010

14. Kontroumbas K., Theodoridis S., *Pattern Recognition*, Academic Press, 3rd Ed., 2006

15. Gose E., Johnsonbaugh R., *Pattern Recognition and Image Analysis*, Prentice Hall, 1996.

16. Gonzalez R.C., Woods R.E., *Digital Image Processing*, Addison-Wesley, 2nd Ed., 2002

17. Catanzaro B., *Multiprocessor System Architectures*, Sun Microsystems, 1996

18. Kain R.Y., *Advanced Computer Architecture*, Prentice Hall India, 2003

19. Hwang K., Briggs F.A., *Computer Architecture and Parallel Processing*, McGraw-Hill, 2000

20. Brackenbury L.E.M., *Design of VLSI Systems: A Practical Introduction*, Macmillan, 2002

21. Pucknell D.A., Eshraghian K., *Basic VLSI Design*, Prentice Hall, 3rd Ed, 2009

22. Jha N.K., Kundu S., *Testing and Reliable Design of CMOS Circuits*, Kluwer Academic Publishers, 1990

23. Weste N. H. E., Eshraghian K., *Principles of CMOS VLSI Design*, Addison-Wesley, 2nd Ed., 1993

24. Diestel R., *Graph Theory*, Springer-Verlag, 4th Ed., 2010

25. West D. B., *Introduction to Graph Theory*, Prentice Hall, 2nd Ed., 2001

26. Tabak D., *Advanced Microprocessors*, McGraw-Hill, 2nd Ed., 1995

27. Stein J., *Digital Signal Processing: A Computer Science Perspective*, John Wiley & Sons, 2000

28. Xavier C., Iyengar S.S., *Introduction to Parallel Algorithms*, Wiley-Inter Science, 1998

29. Jaja J., *An Introduction to Parallel Algorithms*, Addison-Wesley, 1992

30. Aliev R., *Soft Computing and Its Application*, World Scientific, 1st Ed., 2001

31. Konar A., *Artificial Intelligence and Soft Computing: Behavioral and Cognitive Modeling of the Human Brain*, CRC Press, 1st Ed., 2000

32. Steinmetz R., Nahrstedt K., *Multimedia: Computing, Communications & Applications*, Pearson Education, 2002

33. O'Rourke J., *Computational Geometry in C*, Cambridge University Press, 2nd Ed., 1998

34. de Berg M., Cheong O., Kreveld M. V., Overmars M., *Computational Geometry: Algorithms and Applications*, Springer, 3rd Ed., 2008

35. Martin J.C., *Introduction to Languages and the Theory of Computation*, McGraw-Hill, 3rd Ed., 2003

36. Papadimitriou C.H., *Computational Complexity,* Addison-Wesley, 1st Ed., 1994

37. Stallings W., *Wireless Communications and Networking*, Prentice Hall, 2nd Ed., 2005

38. Forouzan B.A., *Data Communication and Networking*, McGraw-Hill, 4th Ed., 2006

39. Rappaport T.S., *Wireless Communications: Principles and Practice*, Pearson Education Inc., 2nd Ed., 2002

CHEESS RECEPTION

Department of Computer Science and Engineering

CAMPUS

CONVOCATION