

SUST Handbook

Department of
Computer Science and Engineering

Session: 2019-20



Shahjalal University of Science and Technology
Sylhet, Bangladesh

Handbook Preparation Committee

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Publication Date:

02/02/2020

Cover Design

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Department of Computer Science and Engineering

Welcome

Welcome to the Department of Computer Science and Engineering (CSE), Shahjalal University of Science & Technology (SUST). The Department, founded in 1992, has been dedicated and committed to university education, with equal emphasis on high quality research and teaching in computer science and engineering. It has around 500 students who are pursuing the academic deliberations and enhancement of research capabilities. We are in the midst of exciting times. We have witnessed unprecedented growth, both in number and quality of students, faculty, and facilities. Two years back from 2016-17 session, we have increased our students from 60 to 100 because of the present market's demand and students are doing great!

One of the leading markers of success for a department is its ability to attract quality students and quality faculty. We are very happy to report that over the last few years we have been immensely successful in both those categories. Lots of highly qualified faculty members are coming back to the department after completing their PhD. Our students have been excelling outside the classroom as well. Our graduates are also doing great in industry. The greatest strength of our graduates is the commitment. Major national and international industry partners have been hiring our students through campus interviews and site interviews in record numbers. We have also seen an increase in the number of students who seek graduate education after their bachelor's degree.

Very recently, our program is evaluated by the IQAC and achieved very good score. Various constituents including our alumni, industry and university colleagues, and current students have been helping us in this cause by keeping our program relevant through curricular evolution and outcome evaluation. CSE continues to grow strong in research. We strive to excel in teaching, research and outreach. If the achievements in the past few years are true indicators, we are on the right path.

Our promise is that we shall continue our endeavor to place the name of this department along with the university at the frontier in the international arena.
Good luck freshman!

Md. Abdullah-Al-Mumin
Professor and Head
Department of Computer Science and Engineering
Shahjalal University of Science and Technology, Sylhet.

Faculties

Head of the Department
Prof Md. Abdullah-Al-Mumin

Student Advisors
Dr. Md. Forhad Rabbi; 01844175805; (Monday 9:00 to 12:00)
Mahruba Sharmin Chowdhury; 01917566699; (Thursday 12:00 to 2:00)

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Aisa Akhter; Office Attendant
Lukman Ahmed; M.L.S.S

Introduction

The Department of Computer Science and Engineering was established in 1992 as the first department under the school of Applied Science and Technology. The Department offers four-year undergraduate and one to two-year graduate program in Computer Science and Engineering. The undergraduate courses cover computer programming, data structure, algorithms, theory of computation, compiler construction, computer network and architecture, communication engineering, analog and digital electronics, digital signal and image processing and multimedia etc. The courses have been designed so that students graduating from this department have a balance of theory and practical skills to prepare them for the highly competitive workplace. Despite resource constraints, care is taken so that high teaching quality is maintained at each stage of education. Besides teaching, the department is also engaged in research carried out by its faculty members and senior students in areas like computer networking, fiber optics, and speech processing and pattern recognition, language processing, quantum computation, etc.

Highlights of Semester System

Examination System

A student will be evaluated continuously in the courses system, for theoretical classes s/he will be assessed by class participation, assignments, quizzes, mid-semester examinations and final examination. For laboratory work s/he will be assessed by observation of the student at work, viva-voce during laboratory works, from his/her written reports and grades of examinations designed by the respective course teacher and the examination committee.

Distribution of Marks

The marks of a given course will be as follows:

Class Attendance	10%
Assignments and Mid-Semester Examinations	20%
Class Evaluation (Quiz, Assignment, etc.)	10%
Final Examination	60%

Class Attendance

The marks for class attendance will be as follows:

Attendance (Percentage)	Marks	Attendance (Percentage)	Marks	Attendance (Percentage)	Marks
95 and above	10	80 to 84	7	65 to 69	4
90 to 94	9	75 to 79	6	60 to 64	3
85 to 89	8	70 to 74	5	Less than 60	0

A student will not be allowed to appear at the examination of a course if his/her class attendance in that course is less than 50%.

Grading System

Letter Grade and corresponding Grade-Point for a course will be awarded from the roundup marks of individual courses as follows:

Numerical Grade	Letter Grade	Grade Point
80% and 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%	C-	2.00
Less than 40%	F	0.00

Calculation of Grades, GPA and CGPA

Grade Point Average (GPA) is the weighted average of the grade points obtained in all the courses completed by a student in a semester. Cumulative Grade Point Average (CGPA) of only major and both major and second major degree will be calculated by the weighted average of every course of previous semesters along with the present semester. For clearing graduates if the roundup value of the third digit after decimal is nonzero the second digit will be incremented by one. A student will also receive a separate CGPA for his second major courses.

Academic Obligations

As a student, you are now joining an academic community. The privilege of membership has certain obligations. Academic Integrity is of highest priority. Cheating and plagiarism will not be tolerated at all. Deceitful activities on any assignment or exam will be taken seriously. Failure to meet established standards may result in various penalties. In extreme cases this could result in eviction from the University.

Detail Information regarding the ordinance for semester system of Bachelor's Degree can be found in Syllabus book.

Orientation Program

Central

Date	Event	Time	Place
02/02/2020 (Sunday)	Central Orientation	09:30 am	Central Auditorium
Will be informed	Medical Center Orientation	Will be informed	Medical Center
09/02/2020 (Sunday)	Library Orientation	09:30 am	Central Library

Departmental

Date	Event	Time	Place
02/02/2020 (Sunday)	Inaugral Session: All teachers, officers and staffs will be present	3:00 pm	
	Math Quiz Conducted By: Mr. Md Saiful Islam, Mr. Enamul Hassan	4:00 pm	
05/02/2020 (Wednesday)	Introducing the Department Conducted By: Department Head Prof Md. Abdullah-Al-Mumin	9:00 am	
	Introducing Departmental Facilities Conducted By: Mr. Md. Mahadi Hasan Nahid, Mr. Enamul Hassan	10:00 am	Gallery 2, IICT Building
	Introducing Semester System and Curriculum Conducted By: Prof Dr. M. Shahidur Rahman, Prof Dr. Md Reza Selim	11:00 am	
	Social Responsibilities and Awareness Session Conducted By: Dr. Md. Forhad Rabbi, Mrs. Mahruba Sharmin Chowdhury	2:00 pm	
	SUST in Programming Competitions Conducted By: Ms. Ayesha Tasnim	3:00 pm	
	Opportunities for CSE Graduates Conducted By: Mr. Md. Saiful Islam	4:00 pm	

Academic Calendar of 1st Year 1st Semester

Classes Start	06/02/2020
Classes End	30/04/2020
Mid Semester Examination1 Week	01/03/2020 – 07/03/2020
Results of Mid Sem 1 to be Published by	14/03/2020
Mid Semester Examination2 Week	19/04/2020 – 25/04/2020
Results of Mid Sem 2 to be Published by	06/05/2020
Declaration of Class Records (Class Performance and Attendance) by	01/06/2020
PL (Preparatory Leave)	01/05/2020 – 31/05/2020
Semester Final Examination	01/06/2020 – 30/06/2020
Semester Final Results to be Published by	30/07/2020

Syllabus for Undergraduate Program
Session 2019-20

1st Year: 1st Semester

Course No.	Course Title	Hours Week		Credits	Prerequisite
		Theory	Lab		
CSE 133	Structured Programming Language	3	0	3.0	
CSE 134	Structured Programming Language Lab	0	6	3.0	
CSE 143	Discrete Mathematics	3	0	3.0	
EEE 109D	Electrical Circuits	3	0	3.0	
EEE 110D	Electrical Circuits Lab	0	3	1.5	
MAT102D	Matrices, Vector Analysis and Geometry	3	0	3.0	
ENG 101D	Effective Communication in English	2	0	2.0	
ENG 102D	English Language Lab I	0	2	1.0	
Total		14	11	19.5	

1st Year: 2nd Semester

Course No.	Course Title	Hours Week		Credits	Prerequisite
		Theory	Lab		
CSE 137	Data Structure	3	0	3.0	CSE 133
CSE 138	Data Structure Lab	0	4	2.0	
EEE 111D	Electronic Devices and Circuits	3	0	3.0	EEE 109D
EEE 112D	Electronic Devices and Circuits Lab	0	3	1.5	
IPE 106D	Engineering Graphics	0	3	1.5	
IPE 108D	Workshop Practice	0	2	1.0	
PHY 103D	Mechanics, Wave, Heat & Thermodynamics	3	0	3.0	
MAT 103D	Calculus	3	0	3.0	
CSE 147	Engineering Ethics and Cyber Law	2	0	2.0	
CSE 150	Project Work I	0	2	1.0	
Total		14	14	21.0	

2nd Year: 1st Semester

Course No.	Course Title	Hours/Week		Credits	Prerequisite
		Theory	Lab		
CSE 233	Object Oriented Programming Language	3	0	3.0	CSE 133
CSE 234	Object Oriented Programming Language Lab	0	4	2.0	
CSE 237	Algorithm Design & Analysis	3	0	3.0	CSE 137
CSE 238	Algorithm Design & Analysis Lab	0	4	2.0	
BUS 203	Cost and Management Accounting	3	0	3.0	
PHY 207D	Electromagnetism, Optics & Modern Physics	3	0	3.0	
PHY 202D	Basic Physics Lab	0	3	1.5	
STA 202D	Basic Statistics & Probability	3	0	3.0	
Total		15	11	20.5	

2nd Year: 2nd Semester

Course No.	Course Title	Hours/Week		Credits	Prerequisite
		Theory	Lab		
EEE 201D	Digital Logic Design	3	0	3.0	EEE 109D, EEE 111D
EEE 202D	Digital Logic Design Lab	0	4	2.0	
CSE 239	Numerical Analysis	2	0	2.0	
CSE 240	Numerical Analysis Lab	0	3	1.5	
CSE 241	Introduction to Data Science	2	0	2.0	
CSE 242	Introduction to Data Science Lab	0	3	1.5	
CSE 247	Theory of Computation	3	0	3.0	
CSE 252	Introduction to Competitive Programming	0	3	1.5	
ECOI05D	Principles of Economics	3	0	3.0	
MAT204D	Complex Variables, Laplace Transform and Fourier Series	3	0	3.0	
CSE 250	Project Work II	0	2	1.0	
Total		16	15	23.5	

3rd Year: 1st Semester

Course No.	Course Title	Hours/Week		Credits	Prerequisite
		Theory	Lab		
CSE 333	Database System	3	0	3.0	
CSE 334	Database System Lab	0	4	2.0	
CSE 335	Operating System and System Programming	3	0	3.0	
CSE 336	Operating System and System Programming Lab	0	3	1.5	
CSE 341	Software Engineering & Design Patterns	3	0	3.0	
CSE 342	Software Engineering & Design Patterns Lab	0	3	1.5	
CSE 344	Web Technologies	0	4	2.0	
CSE 365	Communication Engineering	2	0	2.0	
CSE 366	Communication Engineering Lab	0	2	1.0	
CSE 367	Microprocessor and Interfacing	3	0	3.0	EEE 201D
CSE 368	Microprocessor and Interfacing Lab	0	3	1.5	
Total		14	19	23.5	

3rd Year: 2nd Semester

Course No.	Course Title	Hours/Week		Credits	Prerequisite
		Theory	Lab		
CSE 325	Digital Signal Processing	3	0	3.0	MAT103D, MAT204D
CSE 326	Digital Signal Processing Lab	0	3	1.5	
CSE 329	Computer Architecture	3	0	3.0	
CSE 337	Artificial Intelligence	3	0	3.0	
CSE 338	Artificial Intelligence Lab	0	3	1.5	
CSE 361	Computer Networking	3	0	3.0	CSE 365
CSE 362	Computer Networking Lab	0	3	1.5	
CSE 376	Technical Writing And Presentation	0	4	2.0	
CSE 350	Project Work III	0	4	2.0	
Total		12	17	20.5	

4th Year: 1st Semester

Course No.	Course Title	Hours/Week		Credits	Prerequisite
		Theory	Lab		
CSE 421	Software Project Management	2	0	2.0	
CSE 461	Introduction to Computer Security	3	0	3.0	
CSE 462	Introduction to Computer Security Lab	0	3	1.5	
CSE 475	Machine Learning	3	0	3.0	
CSE 476	Machine LearningLab	0	3	1.5	
CSE/EEE 4**	Option I	3	0	3.0	
CSE/EEE 4**	Option I Lab	0	3	1.5	
CSE 4**	Thesis / Project	0	4	2.0	
Total		11	13	17.5	
CSE 450	Project	0	4	2.0	
CSE 480	Thesis	0	4	2.0	

4th Year: 2nd Semester

Course No.	Course Title	Hours/Week		Credits	Prerequisite
		Theory	Lab		
CSE 493	Computer Graphics	3	0	3.0	
CSE 494	Computer Graphics Lab	0	3	1.5	
CSE/EEE 4**	Option II	3	0	3.0	
CSE/EEE 4**	Option II Lab	0	3	1.5	
CSE 4**	Thesis / Project	0	8	4.0	
CSE 484	Viva Voce	0	2	1.0	
Total		6	16	14.0	
CSE 452	Project	0	8	4.0	
CSE 482	Thesis	0	8	4.0	

Optional Options

Course No.	Course Title	Hours/Week	Week	Credits	Prerequisite
		Theory	Lab		
EEE481	Optical Fiber Communication	3	0	3.0	PHY 207D
EEE482	Optical Fiber Communication Lab	0	3	1.5	
CSE439	Compiler Construction	3	0	3.0	
CSE440	Compiler Construction Lab	0	3	1.5	
CSE453	Cloud Computing	3	0	3.0	
CSE454	Cloud Computing Lab	0	3	1.5	
CSE455	Advanced Database System	3	0	3.0	
CSE456	Advanced Database System Lab	0	3	1.5	
CSE457	Mobile and Wireless Communication	3	0	3.0	CSE 365
CSE458	Mobile and Wireless Communication Lab	0	3	1.5	
CSE459	Advanced Data Structure and Algorithm	3	0	3.0	CSE 137, CSE 237
CSE460	Advanced Data Structure and Algorithm Lab	0	3	1.5	
CSE463	Security Engineering	3	0	3.0	
CSE464	Security Engineering Lab	0	3	1.5	
CSE465	Internet of Things	3	0	3.0	
CSE466	Internet of Things Lab	0	3	1.5	
CSE467	VLSI Design	3	0	3.0	EEE 201
CSE468	VLSI Design Lab	0	3	1.5	
CSE469	Bio-informatics	3	0	3.0	CSE 237
CSE470	Bio-informatics Lab	0	3	1.5	
CSE471	Digital Image Processing	3	0	3.0	
CSE472	Digital Image Processing Lab	0	3	1.5	
CSE473	Natural Language Processing	3	0	3.0	CSE 247
CSE474	Natural Language Processing Lab	0	3	1.5	
CSE477	Contemporary Course on Computer Science & Engineering I	3	0	3.0	
CSE478	Lab on Contemporary Course on Computer	0	3	1.5	

	Science & Engineering I				
CSE487	Contemporary Course on Computer Science & Engineering II	3	0	3.0	
CSE488	Lab on Contemporary Course on Computer Science & Engineering II	0	3	1.5	
CSE485	Distributed and Parallel Computing	3	0	3.0	
CSE486	Distributed and Parallel Computing Lab	0	3	1.5	
CSE495	Human Computer Interaction	3	0	3.0	
CSE496	Human Computer Interaction Lab	0	3	1.5	
CSE497	Neural Network and Deep Learning	3	0	3.0	STA 202, MAT 103D, CSE 475 and CSE 476
CSE498	Neural Network and Deep Learning Lab	0	3	1.5	

Condition to receive Degree from the Department of CSE

			Remarks
1	Total Credit to complete	160	Major courses -70% Non-major courses-20% Other courses-10%
2	Major courses	Non-core courses	CSE 325 CSE 326 Option I (Theory and Lab) Option II (Theory and Lab)
		Core courses	All major courses except mentioned above.
3	Non-Major courses	Non-core courses	IPE 108D EEE 481 EEE 482
		Core courses	All non-major courses except mentioned above
4	Other courses		Any courses offered by SUST (major and non-major courses)

*Core-core courses means mandatory courses for the degree

Course Description

First Year First Semester

CSE 133: Structured Programming Language

Credits: 3.0

Contact Hours: 3 hours lecture per week

Programming Language: Basic concept, Overview of programming languages, Problem Solving Techniques and Data Flow Diagram.

C-Language: Preliminaries, Program constructs, variables and data types in C. Input and output, Character and formatted I/O; Arithmetic Expressions and Assignment statements; Control statement, Loops and Nested loops; break, continue, goto, Decision making; Arrays, Functions; Arguments and local variables, Calling Functions and arrays. Recursion and Recursive functions; Structures within structure. Automatic, external, static variable, Files; File functions for sequential and Random I/O. Pointers; Pointers and structures, union; Pointer and functions; Pointer and arrays; Operation and Pointer; Pointer and memory addresses; Operations on Bits; Bit Operation; Bit field; Advanced features; Preprocessor and Macros, enumeration, Standard library.

Recursion: Basic idea of recursion (3 laws-base case, call itself, move towards base case by state change), tracing output of a recursive function, applications: factorial, fibonacci, tower of Hanoi, merge sort, permutation, combination.

Sorting: Insertion sort, selection sort, bubble sort, merge sort, quick sort, distribution sort (counting sort, radix sort, bucket sort).

Searching: Linear search, binary Search, application of Binary Search- finding element in a sorted array, finding nth root of a real number, solving equations.

Stack and Queue: Basic stack operations (push/pop/peek), stack-class implementation using Array and linked list, in-fix to post-fix expressions conversion and evaluation, balancing parentheses using stack, basic queue operations (enqueue, dequeue), circular queue/ dequeue, queue-class implementation using array and linked list, application- Josephus problem, palindrome checker using stack and queue.

Textbook

1. Schaum's Outline of Programming with C by Byron S. Gottfried
2. C: The Complete Reference by Herbert Schildt

CSE 134: Structured Programming Language Lab

Credits: 3.0

Contact hours: 6 hours lab per week

Introduction: Introductory outputs using C. Data Types & Operator, Declaring variables of different data types and doing different types of operations on them, facing problems when internal result of calculation crosses the boundary of a data type.

Data Input/Output: Variation and formats of getting input and giving output.

Control Statement: Implementation of all types of control statement structures, odd/even test, find max/min from 2/3 numbers, generate grades from marks, floor, ceiling, absolute value, sum of n numbers using loop and calculate average, test prime, generate Fibonacci sequence.

Array, String and Nested Looping: Finding the number of students getting marks above average, finding vowel and consonant from a given string, detecting palindrome, counting words of a string, reversing each words of a sentence, using different functions of string.h library, bubble sort, matrix multiplication.
Using Library Functions: Functions from stdio.h, math.h, stdlib.h and ctype.h library. Functions: Doing some previous problems using function, implement call by value and call by reference, prime factorization.

Recursion: Find Greatest Common Divisor, Fibonacci, Factorial, Tower of Hanoi. Program Structure: Use static and global variable.

Pointers: Passing pointer to a function, dynamic memory allocation, arrays of pointers. Structure and Union: Sorting points (first according to x, then according to y), using line segment structure, using union.

File: Opening, closing, creating and processing data files.

Number Theory: Prime Generation, Sieve and How to Optimize, Prime factorization, Factorial Factors, sum of divisor, number of divisor, Big Mod.

Recursion: Basic idea of recursion (3 laws-base case, call itself, move towards base case by state change), tracing output of a recursive function, applications: factorial, fibonacci, tower of Hanoi, merge sort, permutation, combination.

Sorting: Insertion sort, selection sort, bubble sort, merge sort, quick sort, distribution sort (counting sort, radix sort, bucket sort).

Searching: Linear search, binary Search, application of Binary Search- finding element in a sorted array, finding nth root of a real number, solving equations.

Stack and Queue: Basic stack operations (push/pop/peek), stack-class implementation using Array and linked list, in-fix to post-fix expressions conversion and evaluation, balancing parentheses using stack, basic queue operations (enqueue, dequeue), circular queue/ dequeue, queue-class implementation using array and linked list, application- Josephus problem, palindrome checker using stack and queue.

CSE 143: Discrete Mathematics

Credits: 3.0

Contact hours: 3 hours lecture per week

Set, Relations, Functions: Set, Function, Representing Relations, Equivalence Relations.

Propositional Calculus: Propositions, Predicate and Quantifier.

Algorithms: Complexity, Divisions, Algorithm, Application of Number Theory.

Recursion: Sequences and summations, Recursive Definition and algorithm. Combinatorial Analysis: Permutation and Combination, Divide and Conquer Algorithms, Generating Functions.

Graphs: Representation, Isomorphism, Connectivity, Euler and Hamilton path, Shortest path, Planer, Coloring.

Trees: Spanning trees, Rooted Trees, Binary Trees, Huffman Trees.

Boolean Algebra: Number System, Boolean Function, representing Boolean Function, Logic gate, Minimization of Circuits.

Textbook

1. Discrete Mathematics and Its Applications by Kenneth H. Rosen

EEE 109D: Electrical Circuits

Credits: 3.0

Contact hours: 3 hours lecture per week

Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, and resistance. Basic laws: Ohm's law, Kirchhoff's current and voltage laws. Simple resistive circuits: Series and parallel circuits, voltage and current division, wye-delta transformation. Techniques of circuit analysis: Nodal and mesh analysis including super node and super mesh. Network theorems: Source transformation, Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem. Energy storage elements: Inductors and capacitors, series parallel combination of inductors and capacitors. Responses of RL and RC circuits: Natural and step responses. Sinusoidal functions: Instantaneous current, voltage, power, effective current and voltage, average power, phasors and complex quantities, impedance, real and reactive power, power factor. Analysis of single phase AC circuits: Series and parallel RL, RC and RLC circuits, nodal and mesh analysis, application of network theorems in AC circuits.

Textbook: Introductory circuit analysis by Boylestad

Reference: Networks, lines and fields by J. D. Ryder

Alternating Current Circuits by Russel M. Kerchner, George F. Corcoran

EEE 109D: Electrical Circuits Lab

Credits: 1.5

Contact hours: 3 hours lab per week

In this course students will perform experiments to verify practically the theories and concepts learned in EEE-109.

1. To familiar with the operation of different electrical instruments.
2. To verify the following theorems:
 - i. KCL and KVL theorem,
 - ii. Superposition theorem,
 - iii. Thevenin's theorem,
 - iv. Norton's theorem and
 - v. Maximum power transfer theorem
3. RL and RC response.
4. Study the frequency response of an RLC circuit and find its resonant frequency.
5. Basic electrical element like fan, bulb, calling bell etc connection from 220v AC single phase supply.
6. Relevant application based on EEE 109.

Textbook: Introductory circuit analysis by Boylestad

Reference: Networks, lines and fields by J. D. Ryder

Alternating Current Circuits by Russel M. Kerchner, George F. Corcoran

MAT 102D: Matrices, Vector Analysis and Geometry

Credits: 3.0

Contact hours: 3 hours lecture per week

Matrices: Types of matrices; null and unit matrices; algebraic operations on matrices; determinant of a square matrix; matrix equivalence; adjoint and inverse of a matrix; orthogonal and unitary matrices; system of linear equations; vector spaces; linear transformations; similarity of matrices; characteristic roots and vectors; diagonalization of matrices. **Vector Analysis:** Scalars and vectors; operations on vectors; null and unit vectors; components of a vector; scalar and vector products of two, three and four vectors - their applications; vector components in spherical and cylindrical coordinates systems; derivative of vectors; vector operator Del; gradient, divergence and curl - their physical significance; vector integration: line, surface and volume integrals; Green's, Gauss's and Stoke's theorem and their applications. **Geometry:** pair of straight lines; general equation of the second degree. **Three-dimensional coordinates:** Equations for a plane, sphere, cylinder, cone, ellipsoid and paraboloid.

Textbook

1. Ayres, F.: Matrices
2. Kolman, B.: Elementary Linear Algebra
3. Speigel M R.: Vector analysis
4. Smith C.: An elementary treatise on coordinate geometry of three dimension
5. Rahman and Bhattacharjee: A Text Book on coordinate geometry
6. Harun Ar Rashid: A Text Book on coordinate geometry

ENG 101D: Effective Communication in English

Credits: 2.0

Contact hours: 2 hours lecture per week

Objectives:

1. Developing oral and written communication with grammatical accuracy.
2. Practicing reading to facilitate communication

Course Contents:

Reading a selection of texts (story, essay, newspaper article, etc)

Forms and functions of different word categories (e.g. noun, verb, adjective, adverb, etc.)

Aspects and use of tense

Subject-verb agreement

Use of infinitive, gerund, present participle, past participle, modals, causatives, conditionals, subjunctives

Use of sentence connectors/cohesion markers (e.g. moreover, in addition, in contrast, similarly, as a result, though, although, etc)

Effective combination of sentences (e.g. simple, complex, compound, etc)

Writing composition (To demonstrate grammatical competence)

Textbook

1. Books and resources recommended by course instructors
2. Books recommended by teachers
3. Headway-Upper Intermediate (Work book and student's book)
- Liz and John Soars
4. Cliff's TOEFL

ENG 102D: English Language Lab I

Credits: 1.0

Contact hours: 2 hours lecture per week

Objectives:

1. To develop students awareness of standard English pronunciation
2. To develop students understanding of the variations in pronunciation
3. To develop students ability to use conversational English

Contents:

English phonemes, Varieties of English, English stress and intonation, Dialogue, debate, extempore speech, interview, role-play, presentation.

First Year Second Semester

CSE 137: Data Structure

Credits: 3.0

Contact hours: 3 hours lecture per week

Internal Data Representation: Specification, representation, Asymptotic analysis: Recurrences, Substitution method and manipulation of basic data structures: arrays, records and pointers, linked lists, stacks, queues, recursion, trees, optimal search trees, heaps, disjoint sets. **Recursion:** permutation, combination. **Sorting:** merge sort, quick sort (randomized quick sort), distribution sort (counting sort, radix sort, bucket sort), lower bounds for sorting, external sort. **Binary Tree:** Binary tree representation using array and pointers, traversal of Binary Tree (in-order, pre-order and postorder). **Ternary tree, Binary Search Tree:** BST representation, basic operations on BST (creation, insertion, deletion, querying and traversing), application- searching, sets. **Ternary search tree, Binary Index tree, Segment tree, RMQ(Range Minimum Query).** **Searching:** Application of Binary Search- finding element in a sorted array, finding nth root of a real number, solving equations. **Heap:** Min-heap, max-heap, Fibonacci-heap, applications- priority queue, heap sort. **SetOperations& Disjoint Set:** Union find, path compression. **Huffman Coding** **Graph:** Graph representation (adjacency matrix/adjacency list), basic operations on graph (node/edge insertion and deletion), traversing a graph: Review of Breadth first search (BFS), Depth first search (DFS), Topological Sort, Strongly Connected Components, Euler Path, Articulation Point, Bridge, Bi-connected Components, graph-bicoloring, Floodfill, Dijkstra's Shortest Path Algorithm, Bellman -Ford algorithm and negative cycle detection, Floyd-Warshall all pair shortest path algorithm, Johnson's algorithm, shortest path in Directed Acyclic Graph. **Minimum spanning tree:** Prim's algorithm and Kruskal's algorithm. **Self balancing Binary Search Tree:** AVL tree (rotation, insertion). **SetOperations:** Set representation using bitmask, set/clear bit, querying the status of a bit, toggling bit values, LSB, application of set operations. **String ADT:** The concatenation of two strings, the extraction of substrings, searching a string for a matching substring, parsing, Suffix tree, Suffix array.

Textbook

1. Advanced Data Structures, Peter Brass
2. Data Structures - Seymour Lipschutz, Schaum's Outlines Series.
3. Introduction to Algorithms Thomas H. Cormen , Charles E. Leiserson

CSE 138: Data Structure Lab

Credits: 2.0

Contact hours: 4 hours lab per week

Objectives:

- To understand numerous examples of relationships between data
- To understand the purpose and mathematical background of algorithm analysis and be able to apply this to determine the run time and memory usage of algorithms
- To understand the abstract data types of stacks, queues and deques
- To understand the variety of ways that linearly and weakly ordered data can be stored, accessed, and manipulated
- To understand the characteristics and optimal behavior of hash tables for access and retrieval
- To understand various sorting algorithms and the run-time analysis required to determine their efficiencies
- To understand various tree traversal technique and graph algorithms.
- Good programming practices
- To explain the concepts relating to the complexity analysis of algorithms, apply them to the algorithms discussed in the course, and use the results of the analysis to make good design decisions in building programs.

CSE 147 (2 credits)

ENGINEERING ETHICS AND CYBER LAW

Applied Ethics: What ethics is and is not, Explore differences between laws and ethics, Ethical viewpoints, Virtue (deontology), Utilitarianism, Natural Rights, Fairness (Justice), Common good, Ethical decision making process

Professionalism and Work Place Issues in the IT Field: Impact of technology on employment trends, Laws and ethics of employee monitoring, Review ethical codes of IT professional organizations

Introduction to Research Ethics: Overview of theories and methods in ethics and research ethics. How to handle data, The meaning of secrecy and confidentiality, Good research practice, research integrity and scientific misconduct, Criteria and principles for good research practice, Meaning of scientific misconduct and fraud, Cases and procedures for establishing misconduct, prevention and sanctions, Responsibility for the results of research, Responsibility for research and the results and consequences of research, The limits of responsibility, Risks and the precautionary principle.

Cyber laws and rights in today's digital age: Digital Security Act, Intellectual Property Issues connected with use and management of Digital Data The similar Acts of other countries **Information Warfare:** Nature of information warfare, including computer crime and information terrorism; Threats to information resources, including military and economic espionage, communications eavesdropping, computer break-ins, denial-of-service, destruction and modification of data, distortion and fabrication of information, forgery, control and disruption of information How, electronic bombs, and sops and perception management. Countermeasures, including authentication, encryption, auditing, monitoring, intrusion election, and firewalls, and the limitations of those countermeasures. Cyberspace law and law enforcement, information warfare and the military, and intelligence in the information age. Information warfare policy and ethical Issues.

CSE 150: Project Work

Credits: 1.0

Contact hours: 2 hours lab per week

Objectives:

Any project based on C language including implementation of Data Structure is acceptable. Gaming project using graphics.h library in C is preferable. Teachers must have to ensure every project is unique. Innovative project idea should get extra weight to prevent imitating old projects.

EEEIIID: Electronic Devices and Circuits

Credits: 3.0

Contact hours: 3 hours lecture per week

P-N junction as a circuit element: Intrinsic and extrinsic semiconductors, operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode; Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a Zener diode, clamping and clipping circuits. Bipolar Junction Transistor (BJT) as a circuit element: current components, BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuits, small signal equivalent circuit models, BJT as a switch.

Metal Oxide Semiconductor Field Effect Transistor (MOSFET) as circuit element: structure and physical operation of an enhancement MOSFET, threshold voltage, Body effect, current-voltage characteristics of an enhancement MOSFET, biasing discrete and integrated MOS amplifier circuits, single-stage MOS amplifiers, MOSFET as a switch, CMOS inverter.

Operational amplifiers (Op-Amp): Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits.

Introduction to photodiode, Laser, Solar cell, Photo detector, LED.

Textbook: Electronics Devices by R. L. Boylestad

Reference: Electronics Principles. By Malvino

EEEII2D: Electronic Devices and Circuits Lab

Credits: 1.5

Contact hours: 3 hours lab per week

Students will also perform different experiments based on EEE203.

1. To familiar with electronics devices and Laboratory Equipments.
2. To study of V-I Characteristics curve of P-N junction diode.
3. To study of Half-Wave Rectification circuit.
4. To study of Full-Wave Rectification circuit (Bridge & Center-tap).
5. To study of Clipping and clamping circuit.
6. To study MosFET and BJT characteristics.
7. Speech/ Audio amplification using NPN/PNP Transistor.
8. MosFET as an amplifier and switch.
9. Different operational amplifier circuits.

Textbook: Electronics Devices by R. L. Boylestad

Reference: Electronics Principles. By Malvino

IPEI06D: Engineering Graphics

Credits: 1.5

Contact hours: 3 hours lab per week

Introduction, Instruments and their uses, First angle and Third angle projections, Orthographic drawing, Sectional views, Isometric views.

IPE108D: Workshop Practice

Credits: 1.0

Contact hours: 2 hours lab per week

Introduction to Hand Tools. Study and operation of an Engine Lathe. Study and operation of Milling Machine. Study and operation of Bench Drilling Machine, Study and operation of Shaper Machine. Preparation of a hexagonal nut.

MAT103D: Calculus

Credits: 3.0

Contact hours: 3 hours lecture per week

Differential Calculus: Functions of a real variables and their plots; limit; continuity and derivatives; physical meaning of derivative of a function; Leibnitz Theorem; Rolle's Theorem; mean value theorem and Taylor's theorem (statement only). Taylor's and Maclaurin's series and expansion of functions; maximum and minimum values of functions; functions of two or three variables; partial and total derivatives. Integral Calculus: Physical meaning of integration of a function; integration as an inverse process of differentiation; different techniques of integrations; definite integrate as the limit of a sum and as an area; definition of Riemann integrals; fundamental theorem of integral calculus and its application to definite integrals; reduction formula; improper integrals; double integration; evaluation of area and volume by integration. Differential Equations: Definition and solution of ordinary differential equation; first order ordinary differential equation; second order ordinary linear differential equation with constant coefficients; initial value problems.

Textbook

1. Differential Calculus by Das and Mukherjee.
2. Integral Calculus by Das and Mukherjee.
3. Advanced Calculus by M.R. Spiegel.
4. Differential Calculus by J. Edwards.
5. Integral Calculus by J. Edwards.
6. Differential Calculus by R.A. Sardar.
7. Differential equations by S. L. Ross.

PHY103D: Mechanics, Wave, Heat and Thermodynamics

Credits: 3.0

Contact hours: 3 hours lecture per week

Mechanics: Motion in two dimensions; projectile motion; Newton's laws of motion; conservation theorems (momentum and energy); collisions; circular motion; rotational dynamics of rigid bodies; central forces and gravitation; Kepler's laws. Waves: Simple harmonic motion; damped and forced vibrations; waves in elastic media; sound waves; Doppler effect; Fourier's theorem and its applications. Heat and thermodynamics: Principles of thermometry; measurement of high and low temperature; zeroeth law of thermodynamics, kinetic theory of ideal gas; first and second laws of thermodynamics; entropy; black body radiation. Wein's law and Planck's law.

Textbook

1. Physics (Vol. 1) by Halliday, D. and Resnick, R.

Reference

1. Fundamentals of Vibrations and Waves by Puri, S. P.
2. A Treatise of Heat By Saha and Srivastava

Student Resources

Library

The Central Library of SUST has more than 69 thousand books, 6 thousand hard copy journals, periodicals and 23 Dailies. Students can access all the books and e-resources.

Departmental Seminar library should have most of the books you need for the course and will stock multiple copies of the most frequently used. Your tutor or librarian will usually order more copies if there are not enough, and you can request books to be bought that are not stocked.

Computer Centre

Computer Center provides you the email ID and internet access. This university is covered with wi fi blanket. So you can get access at your department, at your hall and in playgrounds.

SUST Competitive Programming Lab

SUST Competitive Programming Lab is an open platform to practice real world algorithmic, mathematical and analytical problems to enhance the skill of innovation, creativity and collaboration under the pressure of a limited time frame. SUST Competitive Programming Lab is continuously supporting SUST students by arranging training programs for the students of SUST who love to learn new techniques in the domain of computer programming, mathematics and so on.

The SUST ACM ICPC Lab originally started competing in the Association for Computing Machinery's International Collegiate Programming Contest (ICPC) in the 2002-2003 academic year. The SUST ACM ICPC Lab produce talented programmers who competed every single year since then, always placing a team in the top ten (a feat not duplicated by any other school in our Sylhet region). SUST team became second highest (Seven time) participant team to participate in ACM ICPC World Final.

We have advanced to the World Finals competition almost every year since that first start in 2013. At the international level, SUST has placed as high as 54th place and competes well each year against the best teams from across the globe. The team is chosen each year from SUST students and any SUST student is eligible that is taking at least Data structure and algorithm course within second years of starting university (some waivers are possible for this last guideline so please contact us if you have questions). We hold the SUST Intra Programming Contest (SIPC) at the start of each semester; results are used to help choose the team. If you are interested and a SUST student (or prospective college student that may attend SUST), please be sure to contact Md. Saiful Islam. He will give you information about the team and place you on his mailing list so you can get

announcements as they occur. Even if you have missed the contest for this academic year, you are welcome to join us at our practices!

Mobile Game and Apps Development Laboratory

The Department of Computer Science and Engineering (CSE), SUST maintains the Mobile Game and Apps Development Laboratory to promote education and research into software design and development for mobile games and application. The lab, located in Room 216 of the 'A' Building, is open to CSE students interested in learning and doing research more about the interactive entertainment industry. Equipments in the lab include 20 high configured workstations equipped with 3-D graphics and authoring and development software. Other necessary tools including audio visual and drawing hardware are also available in the lab.

PhD Research Laboratory

PhD Research Laboratory is designed under a research project on Bangla Language Processing supported by HEQEP and UGC under the project CP3888- Development of Multi-Platform Speech and Language Processing Software for Bangla (UGC Window 4 Innovation Fund). There are 6 (six) PhD students who are working on this research project in different Natural Language Processing related topics such as TTS or Speech synthesis, Bangla Speech to Text - STT or Speech Recognition, Bangla Optical Character Recognition (OCR), and Machine Translation (MT) of English to Bangla and vice versa. There is an Audio Lab and two GPU servers are available for Machine Learning and Big data processing under this project - one server is with 8 (eight) GPU processing power and other is with 2 (two) GPU processing power.

Big Data Analytics Laboratory

Big data analytics lab was founded in 2017 by Bangladesh Hi-Tech Park Authority, ICT Division. The purpose of Big Data Analytics Lab is to educate a student in machine learning, data science, and distributed information system. The lab consists of a cluster build out of four individual servers. The cluster has 1.5 TB RAM, 56 CPU cores and 35 TB Hard drives. The lab also has a NAS server contains around 15 TB hard drives. CPU intensive computation requiring large memory can be run in this cluster. Currently, the lab is used by faculties, researchers, students of the Department of CSE and Bangla Search Engine, Pipilika for R&D purpose.

Health

The Health Service Centre, SUST located near the central auditorium just opposite to the basket ball ground , offers free experienced general practitioner and emergency medical care services to all members of the University community students (undergraduate and post graduate), teachers ,staffs and their families in a user-friendly efficient environment. Students get medicine from the Centre at free of cost but they need to show their Medical card at all consultations and

employees get medicine at minimum cost. The Centre provides service round the clock, seven days a week. The centre also has an ambulance.

Sexual Harassment Prevention Cell

As per the guidelines of UGC and the Supreme Court a Sexual Harassment Prevention Cell has been established by Shahjalal University of Science and

Technology to provide a healthy and congenial atmosphere to the staff and students of the University. you will find details of the guidelines and norms of the policy against sexual harassment, principles and procedure for combating sexual harassment and the sexual harassment prevention committee in your diary written in Bangla. Also you will find a complaint box in the ground floor of the Central library Building.

Research

CRTC

CRTC (Center for Research, Testing and Consultancy) was formed to perform jointly research, testing and consultancy on commercial basis with any person or organization outside SUST. As soon as the policy is in place, the service provider department, teachers-officers-employees and the university authorities are beneficiaries of the service. Several departments including the CSE department are working with a number of national organizations for this purpose.

SUST NLP

The Natural Language Processing Group at Shahjalal University of Science and Technology is a team of faculty, programmers and students who work together on algorithms that allow computers to process and understand human languages. Our work ranges from basic research in computational linguistics to key applications in human language technology, and covers areas such as sentence understanding, Morphology, Information Retrieval, Data Mining, Data Analytics, Automatic Question Answering, Machine Translation, Syntactic parsing and tagging, Sentiment Analysis, Text Mining, Social Mining, Speech Processing, Machine Learning, and Visual Text Analytics, as well as applications of natural language processing to the digital humanities and computational social sciences. Our work combines empirical and theoretical approaches. We work on projects with partners in the academia, industry and government organizations, in various application domains.

SUBSEL

SUBSEL (Shahjalal University Blockchain and SEcurity Laboratory) is the first blockchain focused security research group in SUST as well as in Bangladesh. The aim of the lab is to carry out cutting-edge research in the intersection of security, privacy and blockchain. The group has been established and is being currently led by Dr. Md Sadek Ferdous, Assistant Professor of CSE, SUST. Currently, there are several blockchain-based projects being carried out within the group, mostly by undergraduate students for their final-year projects/thesis. The group also interested for inter-disciplinary research, specifically involving Economics, Computer Science and Psychology. More information can be found on subsel.org

Design and Data Science

In Design and Data Science research group, we blend Data Science, Machine Learning, and statistical inference with human-centric design principals, Social Computing, Human Computer Interaction and Software Engineering to aid policymakers, developers and designers what they do the best. This group tries to create novel social-computational tools to coordinate creative activities within established and emergent communities. Specifically, we adopt and enhance techniques from crowd sourcing, social networking, and design thinking towards the goal of developing theory and technology that fundamentally transforms how we practice human-centered design.

Bangla Search Engine, Pipilika

Bangla Search Engine, Pipilika (pipilika.com) is mostly known to Bangladeshi people as the first Bangladeshi web search engine, which had been developed by the researchers and developers of Computer Science and Engineering Department at Shahjalal University of Science and Technology, Sylhet. It has the ability to search both in Bengali and in English language. It collects and automatically characterizes Bangla and English newspapers, blogs, Wikipedia, government sites and web portals which publish Bangladesh related contents. Pipilika builds intelligent products and services powered by Machine Learning, Data Science and Artificial intelligence. Pipilika's goal is to help consumers and businesses better navigate the online and offline Bangla content. Since its inception in 2009, we have delivered world-class, locally relevant search and information services.

SCDN

SUST CSE Developer Network (SCDN), an official student software development group of the CSE Department established in May 2014. Making the students interested in software development is the main target of this group. To achieve this target necessary workshops have been taken regularly by the Current Students. We believe Academic and Industry collaboration is the

bridge for the students to know theoretical and practical software engineering trends and topics. Considering this SCDN regularly arrange seminars and workshops by the Alumni of CSE Department who are currently serving well in National and International Software Industry

Software Competitions like Hackathons, Idea Contents are the way to enhance knowledge of the student and represent our university in national and international platforms with dignity. SCDN encourage students to participate in Software Competitions and also support them if needed. From the beginning of its journey, we have achieved tremendous success in Software Competitions and prove our capabilities various times. SCDN also organize Intern University Software Contest as a part of SUST CSE Carnival to enrich their management skills and to provide opportunities to the students from all over the country to show their talents in software development.

Another big mission of SCDN is to encourage students to contribute for open source community and build open source software. Any student interested in Software Development from the CSE Department is welcome to join this exciting Group to explore the world with a new vision.

Organization and Alumni Association

CSE Society

CSE Society, SUST is a non-political departmental organization. All the students and teachers of CSE department of SUST are the general member of this society. The main purpose of this society is to represent the student activities and conduct all type of co-curricular activities for students of CSE, SUST.

The objective of the CSE Society is to promote Computer Science & Engineering awareness among the students by organizing technical activities such as Seminars, Career Meet Up, Workshop, etc. and helps the department to organize different type of National/International events like CSE Carnival, Robotics Contest, Hackathon, etc. The CSE Society, SUST arranges CSE Carnival every year. It is one of the mega event of the department where almost all the universities of Bangladesh participate to develop their skills. The society also arranges Sports event, Annual Tour, Picnic, Fresher's Reception Program, etc.

The society engages alumni with the students, strengthen industry partnerships, mentor students, honor faculty, alumni, and researchers.

CSE Society is run by an executive committee where the Head of the Department of CSE is the President of the society by the constitution. A treasurer is also appointed by the President among the teachers of the Department.

Rest of the executive members of the society are formed by conduction election among students.

CSE Alumni Association

As the Department of CSE has grown, there has been a huge demand for a platform for students and alumnus. The CSE Alumni Association was recently formed to fulfill this demand and to foster communication and collaboration among its current students and alumnus. An executive committee was nominated using a fair-selection process during the last Silver Jubilee celebration of CSE, SUST in 2018 and it was unanimously agreed upon by the participating alumnus. The committee is working actively to achieve its goal by organizing different activities.

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