Detailed Course Plan for CSE 4208: Computer Graphics Lab

Academic Session 2017-2018

Quality Assurance Cell
Department of Computer Science and Engineering
Khulna University of Engineering & Technology
Khulna-9203

1. **Course Teacher:** Dr. Sk. Md. Masudul Ahsan, Professor, CSE, KUET
   Md. Masum Al Masba, Lecturer, CSE, KUET

2. **The learning objectives:**

   The followings are the learning objective of the course:

   - To introduce the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
   - To learn the basic principles of 3-dimensional computer graphics.
   - Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the scene definition.
   - Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections
   - To introduce the application of computer graphics concepts in the development of computer games, information visualization, and business applications.
   - To comprehend and analyze the fundamentals of animation

3. **Learning Outcomes:**

   Students who complete the course will have demonstrated the ability to do the following:

   - Identify the structure of modern computer graphics systems
   - Employ the key ideas (modelling, viewing transformations) for modelling a 3D object or scene
   - Apply projection, lighting, shading and rasterization techniques to render a 2D image for a 3D scene
   - Apply texture mapping and animation techniques
   - Create an interactive animation or a game using computer graphics programs like OpenGL

Lab no.	Topics
01.	OpenGL Basics 2D/3D
02.	3D Drawing Without Lighting – Modelling Transformation, Rotation
03.	3D Viewing Lighting, Projection
04.	Fractal + Texturing
05.	Curve Surface
06.	Lsb Test + Quiz

References:

B1. *Computer Graphics with OpenGl*, Donald Hearn, M Pauline Baker, Pearson Education

B2. *Computer Graphics*, R. Plastock, Z. Xiang, McGraw Hill, (Schaum's Outline Series)

B3. *Computer Graphics using OpenGL*, F S Hill, Pearson Education

B4. *Computer Graphics: Principles & Practice*, J. D. Foley, A. van Dam, S. K. Feiner, J. F. Hughes, Addison-Wesley,

B5. *Interactive Computer Graphics*, E. Spigel, Pearson Education

Signature of Course Teachers

1.

2.

Signature of Head of the Dept.

Department of Computer Science and Engineering
Khulna University of Engineering & Technology
Khulna - 9203, Bangladesh

Course Plan/Profile

1. **Course No.:** CSE 4213 **Contact Hours:** 3 hours/week
2. **Course Title:** Fault Tolerant System
3. **Course Code(s):** CSE 4213
4. **Course Teacher:** Sk. Imran Hossain and Md. Milon Islam

5. Rationale

The scope, complexity, and pervasiveness of computer-based and controlled systems continue to increase dramatically. The consequences of such systems failing can be important, with serious injury occurring or lives lost, human-made and natural systems destroyed, security breached, businesses failed, or opportunities lost. Although significant progresses have been achieved in recent years, unfortunately not all errors are prevented. Even if the best people, practices, and tools are used, it would be very risky to assume the system developed is error-free. It is therefore important to teach students the current techniques that can be used to develop fault-tolerant system.

6. Overall Objectives of the Course

- To gain knowledge in sources of faults and means for their prevention and forecasting.
- To understand merits and limitations of fault-tolerant design.
- Understand the risk of computer failures and their peculiarities compared with other equipment failures;
- Know the different advantages and limits of fault avoidance and fault tolerance techniques;
- Understand the basics of redundant design;
- Know the different forms of redundancy and their applicability to different classes of dependability requirements;
- Be able to choose among commercial platforms (fault-tolerant or non-fault-tolerant) on the basis of dependability requirements;

7. Intended Learning Outcome

On successful completion of this course, students should be able to:

- Understand the fundamental concepts of fault-tolerance.
- Understand basic techniques for achieving fault-tolerance of a system and the ways how these techniques can be assessed or measured.
- Gain knowledge in sources of faults and means for their prevention.
- Analyze and identify the different components of a fault -tolerant system.
- Develop skills in modeling and evaluating fault-tolerant architectures in terms of reliability, availability and safety.
- Discuss and compare the different fault tolerant design strategies.

- Understand various redundancy methods used to allow software to detect software faults and produce correct results in the presence of software faults.
- Understand software fault tolerance approaches used in operating systems, database systems, and distributed systems.
- Understand fault tolerance, reliability, and availability requirements of different applications (database, aerospace, telecommunications, industrial control, transaction processing).

8. Course Content

Introduction: Definition of fault tolerance, Redundancy, Applications of fault tolerance.

Fundamentals of Dependability: Attributes: reliability, availability, safety, Impairments: faults, errors and failures, Means: fault prevention, removal and forecasting.

Dependability Evaluation Techniques: Common Measures: Failures rate, Mean time to failure, Mean time to repair, etc., Dependability model types, Dependability computation methods.

Hardware Redundancy: Redundancy allocation, Passive redundancy, Triple modular redundancy, Reliability evaluation, Voting techniques, N-modular redundancy, Active redundancy, Duplication, Standby sparing, Pair-and-a-spare, Hybrid redundancy, Selfpurging redundancy, N-modular redundancy, Evaluation and comparison, Applications.

Information Redundancy: Coding Theory: Parity codes, Hamming codes, Cyclic codes, Checksum, M-of-N codes, Berger codes, Arithmetic codes, etc., Encoding and decoding techniques, Applications, Algorithm based fault tolerance.

Time Redundancy: Check-pointing and rollback, Analysis and optimality, Alternating Logic.

Software Redundancy: Single-version techniques, Multi-version techniques, Software testing, Self-checking software.

Fault Detection in Cryptographic Systems: Overview of ciphers, Security attacks through fault injection: Fault attacks on symmetric key ciphers, Fault attacks on public (asymmetric) key ciphers, Countermeasures.

Fault-models: Layers of Reality, Stuck-at fault model and the Single fault assumption, Functional fault models.

Case Studies: Stratus systems, IBM Sysplex.

Soft Error: Overview of soft errors, Sources of soft errors, Soft error mitigation techniques. Reading of Some of the State-of-the-Art Research Material.

9. Class Schedule:

Class No	Topics to be Discussed
1	Introduction
2	Fundamentals of Dependability

3	Fundamentals of Dependability (continued)
4	Dependability Evaluation Techniques
5	Dependability Evaluation Techniques (continued)
6	Dependability Evaluation Techniques (continued)
7	Hardware Redundancy
8	Hardware Redundancy (continued)
9	Hardware Redundancy (continued)
10	Hardware Redundancy (continued)
11	Hardware Redundancy (continued)
12	Information Redundancy
13	Information Redundancy (continued)
14	Information Redundancy (continued)
15	Information Redundancy (continued)
16	Information Redundancy (continued)
17	Information Redundancy (continued)
18	Information Redundancy (continued)
19	Information Redundancy (continued)
20	Time Redundancy
21	Time Redundancy (continued)
22	Software Redundancy
23	Software Redundancy (continued)
24	Software Redundancy (continued)
25	Fault Detection in Cryptographic Systems
26	Fault Detection in Cryptographic Systems (continued)
27	Fault Detection in Cryptographic Systems (continued)
28	Fault Detection in Cryptographic Systems (continued)
29	Fault-models
30	Fault-models (continued)

31	Fault-models (continued)
32	Soft Error
33	Soft Error (continued)
34	Soft Error (continued)
35	Soft Error (continued)
36	Soft Error (continued)
37	Case Studies

10. Teaching Methodology/Strategy:

- Lectures,
- Tutorials,
- Assignments,
- Class Tests, Spot Tests, and
- Examinations

11. **Tentative Date of Class Tests:** 24/09/2018, 22/10/2018 and 10/12/2018

12. **Signature of the Course Teacher (s):**

Department of Computer Science and Engineering
Khulna University of Engineering & Technology
Khulna - 9203, Bangladesh

Course Plan/Profile

1. **Course No.: CSE 4221** **Contact Hours: 3 hours/week**
2. **Course Title: Natural Language Processing**
3. **Course Teacher: K. M. Azharul Hasan, H. M. Abdul Fattah**
4. **Learning Outcomes:** On successful completion of the course students will be able to:
   - Apply the knowledge of NLP to develop NLP powered tools.
   - Specify and analyze the lexical, syntactic and semantic structures of advanced language features.
   - Deal with different Machine Learning and NLP approaches.
   - Lead their carrier in NLP related fields.
   - Extract sentiment from review data using NLP approaches.
   - Acquire the knowledge of sentiment analysis and opinion mining.
5. **References:**
   - Speech and Language Processing by Daniel Jurafsky & James H. Martin (2nd Edition)
6. **Class Schedule:**

Sl. No.	Week	Class	Topics to be Discussed	Text & Reference Book
1.	Week 1	Class 1	Course Introduction and Discussion	Ref. 1: Chap. 1
2.	Week 1	Class 2	Introduction to NLP	Ref. 1: Chap. 1
3.	Week 1	Class 3	N-Grams	Ref. 1: Chap. 4
4.	Week 2	Class 4	N-Grams	Ref. 1: Chap. 4
5.	Week 2	Class 5	N-Grams	Ref. 1: Chap. 4
6.	Week 2	Class 6	N-Grams	Ref. 1: Chap. 4
7.	Week 3	Class 7	Regular Expressions and Automata	Ref. 1: Chap. 2
8.	Week 3	Class 8	Regular Expressions and Automata	Ref. 1: Chap. 2
9.	Week 3	Class 9	N-Grams	Ref. 1: Chap. 4
10.	Week 4	Class 10	Regular Expressions and Automata	Ref. 1: Chap. 2
11.	Week 4	Class 11	Words and Transducers	Ref. 1: Chap. 3
12.	Week 4	Class 12	Part-of-Speech Tagging	Ref. 1: Chap. 5
13.	Week 5	Class 13	Words and Transducers	Ref. 1: Chap. 3
14.	Week 5	Class 14	Words and Transducers	Ref. 1: Chap. 3
15.	Week 5	Class 15	Class Test	
16.	Week 6	Class 16	Hidden Markov and Maximum Entropy Models	Ref. 1: Chap. 6

17.	Week 6	Class 17	Hidden Markov and Maximum Entropy Models	Ref. 1: Chap. 6
18.	Week 6	Class 18	Part-of-Speech Tagging	Ref. 1: Chap. 5
19.	Week 7	Class 19	Hidden Markov and Maximum Entropy Models	Ref. 1: Chap. 6
20.	Week 7	Class 20	Part-of-Speech Tagging	Ref. 1: Chap. 5
21.	Week 7	Class 21	Part-of-Speech Tagging	Ref. 1: Chap. 5
22.	Week 8	Class 22	Hidden Markov and Maximum Entropy Models	Ref. 1: Chap. 6
23.	Week 8	Class 23	Class Test	
24.	Week 8	Class 24	Formal Grammars of English	Ref. 1: Chap. 12
25.	Week 9	Class 25	Phonetics	Ref. 1: Chap. 7
26.	Week 9	Class 26	Formal Grammars of English	Ref. 1: Chap. 12
27.	Week 9	Class 27	Phonetics	Ref. 1: Chap. 7
28.	Week 10	Class 28	Formal Grammars of English	Ref. 1: Chap. 12
29.	Week 10	Class 29	Phonetics	Ref. 1: Chap. 7
30.	Week 10	Class 30	Formal Grammars of English	Ref. 1: Chap. 12
31.	Week 11	Class 31	Phonetics	Ref. 1: Chap. 7
32.	Week 11	Class 32	Formal Grammars of English	Ref. 1: Chap. 12
33.	Week 11	Class 33	Phonetics	Ref. 1: Chap. 7
34.	Week 12	Class 34	Syntactic Parsing	Ref. 1: Chap. 13
35.	Week 12	Class 35	Syntactic Parsing	Ref. 1: Chap. 13
36.	Week 12	Class 36	Syntactic Parsing	Ref. 1: Chap. 13
37.	Week 12	Class 37	Syntactic Parsing	Ref. 1: Chap. 13
38.	Week 12	Class 38	Syntactic Parsing	Ref. 1: Chap. 13
39.	Week 12	Class 39	Class Test	

7. **Teaching Methodology/Strategy:** Class lectures, Exercises, and Assignments.
8. **Signature of the Course Teacher:**

Department of Computer Science and Engineering
Khulna University of Engineering & Technology
Khulna - 9203, Bangladesh

Course Plan/Profile

1. Course No.:CSE 4223 Contact Hours: 3 hours/week
2. Course Title: Digital System Design
3. Course Teacher: Md. Aminul Haque Akhand and Al-Mahmud
4. Course Content: According to the syllabus of Under Graduate program
5. Learning Outcome:
    - Study of different registers, counters and memory structure.
    - Learn about SAP-1 Computer, register transfer logic and processor logic design.
    - Understand the functionality of digital systems.
    - Analyze and synthesize of digital modules.
    - Design and implementation of digital systems.
    - Control logic design of digital system
    - Design of small general-purpose digital computer

6. Text & Reference Book:
    - Digital Logic and Computer Design - Morris Mano
    - Digital Computer Electronics - Malvino, Brown

7. Class Schedule:

Class No	Topics to be Discussed
1	Introduction
2	Registers and Counters
3	Registers and Counters (Continued)
4	Memories
5	Memories (Continued)
6	SAP-1 Computer
7	SAP-1 Computer (Continued)
9	SAP-1 Computer (Continued)
10	SAP-1 Computer (Continued)
11	SAP-1 Computer (Continued)
12	Register Transfer Logic
13	Register Transfer Logic (Continued)
14	Register Transfer Logic (Continued)
15	Register Transfer Logic (Continued)

16	Processor Logic Design
17	Processor Logic Design (Continued)
18	Processor Logic Design (Continued)
19	Micro Computer System Design
20	Micro Computer System Design (Continued)
21	Essence of Control Logic
22	Control Organization
23	Steps of Control Logic Design
24	Hardware Control
25	Hardware Control (Continued)
26	Hardware Control (Continued)
27	PLA Control
28	PLA Control (Continued)
29	Microprogram Control
30	Microprogram Control (Continued)
31	Microprogram Control (Continued)
32	Digital Computer Design
33	Digital Computer Design (Continued)
34	Digital Computer Design (Continued)
35	Digital Computer Design (Continued)
36	Digital Computer Design (Continued)

8. Tentative Date of Class Tests: 08/10/2018, 26/11/2018 and 27/12/2018
9. Teaching Methodology/Strategy: Class lectures, Exercises and Assignments.

Signature of the Course Teacher:

Department of Computer Science and Engineering
Khulna University of Engineering & Technology
Khulna - 9203, Bangladesh

Course Plan/Profile

1. **Course No.: CSE 4224** **Contact Hours:3 hours/week**
2. **Course Title:Digital System Design Laboratory**
3. **Course Teacher:Al-Mahmud and H. M. Abdul Fattah**
4. **Learning Outcome:**

    a. Identify the notions of Digital System Design.
    b. Exposure to logic programming with (Verilog, FPGA Programming etc).
    c. Understand the functionality of digial systems.
    d. Alalyze and synthesize of digital modules.
    e. Design and implementation of digial systems.

5. **Lab Schedule:**

Week	Lab	Topics to be Discussed
1	1	Arithmetic Circuit Design
2	2	Arithmetic Circuit Design (continue)
3	3	ALU Design
4	4	ALU Design (continue)
5	5	Use of Logisim and Introduction to verilog
6	6	Use of Logisim and Introduction to verilog (continue)
7	7	Verilog Programming and Implementation
8	8	Verilog Programming and Implementation (continue)
9	9	Introduction to FPGA
10	10	Introduction to FPGA (continue)
11	11	FPGA Programming and Implementation
12	12	FPGA Programming and Implementation (continue)
13	13	Lab Quiz

6. Teaching Methodology/Strategy: Class lectures, Exercises, Experiments and Assignments.
7. Signature of the Course Teacher:

Detailed Course Plan for CSE 4233: Robotics

Academic Session 2017-2018

Quality Assurance Cell

Department of Computer Science and Engineering

Khulna University of Engineering & Technology

Khulna-9203

Week	Lecture	Date	Topics to be covered	References
01	1	29/08/2018	Introduction	B3(Chapter 1)
	2	30/08/2018	Basics of Robotics & Degree of Freedom	
02	1	3/09/2018	Cartesian Co-ordinate	B2 (Chapter 2)
	2	5/09/2018	Reference Frame, Transformation Matrix.	
	3	6/09/2018	Homogeneous Transformation, Inverse Transformation	
03	1	10/09/2018	Graphs	
	2	12/09/2018	Co-ordinate system overview	
	3	13/09/2018	Robotic System	
04	1	17/09/2018	Robot Architecture	
	2	19/09/2018	Actuation	
	3	20/09/2018	Robotics System Overview	
05	1	24/09/2018	Robot Kinematics Basics	B1(chapter 1) & B2 (chapter 3)
	2	26/09/2018	**Class Test 1**	
	3	27/09/2018	Velocity and acceleration of rigid bodies	
06	1	1/10/2018	Differential Movement	
	2	3/10/2018	Jacobian	B2(Chapter 5)
	3	4/10/2018	Jacobian	
07	1	8/10/2018	Singularities	
	2	10/10/2018	**Class Test 2**	
	3	11/10/2018	Sensors	
08	1	22/10/2018	Sensors(cont.)	
	2	24/10/2018	Sensors(Cont.)	
	3	25/10/2018	Sensors(Cont.)	
09	1	29/10/2018	Classical Approach of Robot Control	B2 (Chapter 6) & B2 (Chapter 9,10,11)
	2	31/10/2018	Classical Approach of Robot Control(Cont.)	
	3	1/11/2018	Feedback Loop	
10	1	5/11/2018	Position and force control	
	2	7/11/2018	Compliance	
	3	8/11/2018	Fuzzy Logic Control	
11	1	12/11/2018	Task and Path Planning	B1 (Chapter 34)
	2	14/11/2018	Task and Path Planning(Cont.)	
	3	15/11/2018	Task and Path Planning(Cont.)	
12	1	19/11/2018	Task and Path Planning(Cont.)	
	2	22/11/2018	Task and Path Planning(Cont.)	
	3	26/11/2018	Different Types of Robots	
13	1	28/11/2018	Different Types of Robots	

	2	29/11/2018	**Class Test 3**	
	3	3/12/2018	Different Types of Robots	
	4	5/12/2018	Different Types of Robots	

** **References:**

1. Bruno Siciliano Prof., Oussama Khatib Prof. (auth.), Bruno Siciliano Prof., Oussama Khatib Prof. (eds.) - Springer Handbook of Robotics (2008, Springer-Verlag Berlin Heidelberg)Seymour Lipschutz, Marc Lipson, "Discrete Mathematics" , Schaum's outlines, second edition.
2. Introduction to Robotics, John J. Craig, Third edition.
3. International Series on INTELLIGENT SYSTEMS, CONTROL, AND AUTOMATION: SCIENCE AND ENGINEERING, *Editor :* Professor S. G. Tzafestas, National Technical University of Athens, Greece
4. Springer Handbook of Robotics, Bruno Siciliano, Oussama Khatib (Eds.), Second edition

Signature of Course Teachers

1.

2.

Signature of the Head of the Dept.

Department of Computer Science and Engineering
Khulna University of Engineering & Technology
Khulna - 9203, Bangladesh

Course Plan/Profile

1. **Course No.:** CSE 4239 **Contact Hours:3**
2. **Course Title:**Data Mining
3. **Course Teacher:**Mehnuma Tabassum Omar,Prottoy Saha
4. **Course Content:**

   An Introduction to Data Mining: What is data mining? Why mine data?Mining large data sets? Origin of data mining. Data mining tasks.

   Know Your Data: Kinds of data and patterns to be mined, center of tendency of data, Basic statistical description of data, Relations between data, Proximity measure of data.

   Mining Frequent Patterns: Basic concepts of mining and frequent pattern. Frequent pattern mining methods (Apriori algorithm, Improved Apriori algorithm, Pattern Growth approach, Vertical Data format), Mining closed and max patterns, Generating association rules from frequent item sets, Multilevel association rules from frequent item sets, pattern Evaluation methods.

   Basic Concepts of Classification: What is classification, General approaches to classification, **Decision tree induction**, attribute selection measures, Over-fitting and tree pruning, Handling missing values, **Bayes Classification Methods** (Bayes Theorem, Naïve Bayesian Classification), **Rule-based Classification** (IF-THEN rules, Sequential covering algorithm), Techniques to improve classification accuracy (Ensemble Methods, Bagging, Random Forest).

   Advanced Classification: Classification bybackpropagation, Backpropagation and interpretability, Lazy Learners, Support Vector machine, Fuzzy Set, Genetic algorithm, Classification Using Frequent pattern, Multiclass Classification (Semi-supervised classification, Active learning, Transfer Learning
5. **Reference:** "DATA MINING, Concepts and Techniques" by Jiawei Han, MichelineKamber, Jain Pei.
6. **Learning Outcome:**
   - Demonstrate advanced knowledge of data mining concepts and techniques.
   - Apply the techniques of clustering, classification, association finding, feature selection and visualization on real world data
   - Determine whether a real world problem has a data mining solution
   - Apply data mining software and toolkits in a range of applications
   - Set up a data mining process for an application, including data preparation, modelling and evaluation
   - Demonstrate knowledge of the ethical considerations involved in data mining.

7. Class Schedule:

Sl. No.	Week	Class	Topics to be Discussed	Text & Reference Book
1.	Week1	Class1	**Introduction to Data Mining:** Definition, motivation & applications	Ref. (Chap. 1)
2.	Week 1	Class 2	**Introduction to Data Mining:** Importance of Data Mining, Data Mining and Database, Data Mining and Data Warehouse, Area of Study	Ref. (Chap. 1)
3.	Week 1	Class 3	**Know your data:** Kinds of data and patterns to be mined.	Ref. (Chap. 2)
4.	Week 2	Class 4	**An overview of Data Warehousing and OLAP Technology:**Introduction, What is data warehouse, Explanation of definition, Data warehouse Vs. Operational Database, Data warehouse architecture	Ref. (Chap. 4)
5.	Week 2	Class 5	**An overview of Data Warehousing and OLAP Technology:** Data Warehouse Models, Data Cube and OLAP, Conceptual Modeling of Data Warehouses.	Ref. (Chap. 4)
6.	Week 2	Class 6	**Know your data:** Center of tendency of data, Basic statistical description of data	Ref. (Chap. 2)
7.	Week 3	Class 7	**An overview of Data Warehousing and OLAP Technology:** Typical OLAP Operations, Data measures, Star-Net Query Model, Data Warehouse Design and Usage (1)	Ref. (Chap. 4)
8.	Week 3	Class 8	**An overview of Data Warehousing and OLAP Technology:** Data Warehouse Design and Usage (2), Data Warehouse Implementation.	Ref. (Chap. 4)
9.	Week 3	Class 9	**Know your data:** Relations between data, Proximity measure of data (part-1)	Ref. (Chap. 2)
10.	Week 4	Class 10	**An overview of Data Warehousing and OLAP Technology:** Data Generalization	Ref. (Chap. 4)
11.	Week 4	Class 11	**Data Cube Technology:** Cube Materialization, Data Cube Computation Methods (1).	Ref. (Chap. 5)
12.	Week 4	Class 12	**Know your data:** Proximity measure of data	Ref. (Chap. 2)
13.	Week 5	Class 13	**Data Cube Technology:** Cube Materialization, Data Cube Computation Methods (2).	Ref. (Chap. 5)
14.	Week 5	Class 14	**Data Cube Technology:**Processing Advanced Kinds of Queries by Exploring Cube Technology	Ref. (Chap. 5)
15.	Week 5	Class 15	**Measuring Data Similarity and Dissimilarity:** Data Matrix versus Dissimilarity Matrix, Proximity Measures for Nominal Attributes, Proximity Measures for Binary Attributes, Dissimilarity of Numeric Data	Ref. (Chap. 2)
16.	Week 6	Class 16	**Data Cube Technology:** Multidimensional Data Analysis in Cube Space	Ref. (Chap. 5)
17.	Week 6	Class 17	**Mining frequent patterns:** Basic concepts of mining and frequent pattern. Frequent pattern mining methods: Apriori algorithm	Ref. (Chap. 6)
18.	Week 6	Class 18	**Data Preprocessing: An Overview:** Data Quality, Major Tasks in Data Preprocessing	Ref. (Chap. 3)
19.	Week 7	Class 19	**Data Cleaning:** Missing Values , Noisy Data, Data Cleaning as a Process	Ref. (Chap. 3)

20.	Week 7	Class 20	**Data Integration:** Entity Identification Problem, Redundancy and Correlation Analysis, Tuple Duplication, Data Value Conflict Detection and Resolution	Ref. (Chap. 3)
21.	Week 7	Class 21	**Mining frequent patterns:** Frequent pattern mining methods: Improved Apriori algorithms, Pattern Growth approach,	Ref. (Chap. 6)
22.	Week 8	Class 22	**Data Reduction:** Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction	Ref. (Chap. 3)
23.	Week 8	Class 23	**Data Transformation and Data Discretization:** Data Transformation Strategies Overview, Data Transformation by Normalization, Discretization by Binning, Discretization by Histogram Analysis, Discretization by Cluster, Decision Tree, and Correlation Analyses	Ref. (Chap. 3)
24.	Week 8	Class 24	**Mining frequent patterns:** Frequent pattern mining methods: Vertical Data format, Mining closed and max patterns	Ref. (Chap. 6)
25.	Week 9	Class 25	**Basic Concepts of Classification:** What is classification, General approaches to classification, Decision tree induction	Ref. (Chap. 8)
26.	Week 9	Class 26	**Basic Concepts of Classification:** Attribute selection measures, Over-fitting and tree pruning, Handling missing values	Ref. (Chap. 8)
27.	Week 9	Class 27	**Mining frequent patterns:** Generating association rules from frequent item sets, Multilevel association rules from frequent item sets	Ref. (Chap. 6)
28.	Week 10	Class 28	**Basic Concepts of Classification:** Bayes Classification Methods (Bayes Theorem, Naïve Bayesian Classification), Rule-based Classification (IF-THEN rules, Sequential covering algorithm).	Ref. (Chap. 8)
29.	Week 10	Class 29	**Basic Concepts of Classification:** Techniques to improve classification accuracy (Ensemble Methods, Bagging, Random Forest)	Ref. (Chap. 9)
30.	Week 10	Class 30	**Mining frequent patterns:** Pattern Evaluation methods	Ref. (Chap. 6)
31.	Week 11	Class 31	**Advanced Classification**: Classification by backpropagation, Backpropagation and interpretability	Ref. (Chap. 9)
32.	Week 11	Class 32	**Advanced Classification:** Lazy Learners	Ref. (Chap. 9)
33.	Week 11	Class 33	**Advanced Pattern Mining:** Pattern Mining in Multilevel, Multidimensional Space,	Ref. (Chap. 7)
34.	Week 12	Class 34	**Advanced Classification:** Support Vector machine, Fuzzy Set, Genetic algorithm	Ref. (Chap. 9)
35.	Week 12	Class 35	**Advanced Classification:** Classification Using Frequent pattern	Ref. (Chap. 9)
36.			**Advanced Pattern Mining:** Constraint-Based Frequent Pattern Mining, Mining High-Dimensional	Ref. (Chap. 7)

			Data and Colossal Patterns	
37.	Week 13	Class 36	**Advanced Classification:** Multiclass Classification (Semi-supervised classification, Active learning)	Ref. (Chap. 9)
38.	Week 13	Class 37	**Advanced Classification:** Multiclass Classification(Transfer Learning)	Ref. (Chap. 9)
39.	Week 13	Class 38	**Advanced Pattern Mining:** Mining Compressed or Approximate Patterns, Pattern Exploration and Application	Ref. (Chap. 7)

8. **Date of Class Test: 23-09-2018, 23-10-18,18-11-18**
9. **Signature of the Course Teacher:**

COURSE PLAN

Course Title: Biomedical Engineering **Course Code: CSE 4241**

Course Teacher: Prof. Dr. A. B. M. Aowlad Hosssain

Syllabus of My Part:

Introduction to Biomedical Engineering

Biopotentials: Membrane Potentials, Resting Potential, Action potential; ECG, EEG, EMG, ERG and EOG Signals, their Origin and Applications in Medical Diagnosis.

Medical Instrumentation: Electrodes for Recording Biosignals, Transducers for Physiological Parameter Reading, their Characteristics. Measurement of Body Temperature, Blood Pressure and Heart Beat. Instrumentation Amplifiers,

Biosignal Processing: Signal Conditioners, A/D and D/A converter Interfaces to PC, Computerized Automatic Analysis, Bio-telemetry, Monitoring Biological Parameters form Distance.

Medical Physics and Imaging: X-ray, Bio-optics, MRI, Ultrasound and CT.

Outcomes:

At the end of the course, the students would be acquainted with the applications of engineering knowledge in biology, medicine and healthcare.

The student can be able to learn about cell biology, origin, generation and propagation of biopotentials. They will know the acquisition procedures of biosignals, their characteristics and common analog/digital processing techniques.

The physics insights behind the diagnosis and therapy methods will be familiar to the students.

Class No.	TOPIC
1	Introduction to Biomedical Engineering
2	Cell Biology Origin of Membrane Potentials, Resting Potential, Action potential
3	Propagation of Action Potential Equivalent Circuit of Nerve fiber
4	Human Circulatory system Cardiac Conduction System Generation of ECG
5	ECG Lead System Electrocardiograph System Noise analysis and Fault Protection
6	EEG Generation Different brain activity analysis
7	Overview on EMG, EOG
8	Bio-potential electrodes: construction, principle, classifiactions
9	Transducers and measurements of different physiological parameters e.g. temperature, pressure etc.
10	Medical instrumentation: instrumentation amplifier
11	Bio-telemetry and Remote Healthcare
12	Bio-optics: imaging, therapy, LASER applications
13	MRI: Resonance concept
14	MRI: Imaging principle
15	Ultrasound: transducer, beamforming concept
16	Ultrasound: imaging, Doppler principle
17	Overview on X-ray and CT techniques.

EFERENCE BOOKS:

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley & Sons, Hoboken, NJ, 2009.