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

4th year Course Plan

1. CSE 4105 (Computer Networks) Credit: 3.0

a) Course Teacher: Prof. Dr. Sk. Md. Masudul Ahsan and Abdul Aziz

b) Learning Outcome:

- ✓ Become familiar with layered communication architectures (OSI and TCP/IP).
- ✓ Understand the client/server model and key application layer protocols.
- ✓ Learn sockets programming and how to implement client/server programs.
- ✓ Understand the concepts of reliable data transfer and how TCP implements these concepts.
- ✓ Know the principles of congestion control and trade-offs in fairness and efficiency.
- ✓ Learn the principles of routing and the semantics and syntax of IP.
- ✓ Familiarize the student with current topics such as security, network management, sensor networks, and/or other topics.

c) Schedule:

SL.	Topics
1	Introduction to Computer Network.
2	Computer Network and Internet
3	Internet, Network Core and Edge
4	Delay, Loss, Throughput in Packet Switched Network
5	OSI application layer and web
6	Protocol layers, encapsulation, decapsulation
7	Network layer, routing and forwarding
8	HTTP protocol and its message formats
9	Network service models, Datagram networks
10	DHCP, NAT
11	HTTP proxy service, FTP
12	IP fragmentation and reassembly
13	Subnetting
14	SMTP
15	Virtual circuit, IP packet format, What is inside a router

16	Link State routing, Distance vector routing
17	POP3 and IMAP
18	RIP, OSPF
19	BGP
20	Link Layer
21	DNS basics
22	Error-Detection and -Correction Techniques
23	Multiple Access Links and Protocols
24	DNS protocol
25	Aloha, CSMA/CD
26	Basics of Transport protocols
27	Principles of reliable data transfer (RDT)
28	Etherenet, ARP, switch, router
29	Go back n, selective repeat pipelined protocol
30	TCP: how it works, message formats
31	Wireless Networks, IEEE 802.11
32	TCP: flow control, timers
33	TCP: congestion control
34	CSMA/CA, hidden terminal problem
35	Network Security: definition, principles of cryptography
36	Message authentication, integrity checking
37	Bluetooth, Zigbee, Mobile IP
38	Internet attacks and counter measure
39	SSL, IPSec

d) Date of class tests: 26.02.18, 06.03.18, 04.04.18 **(Tentative)**

2. CSE 4106 (Computer Networks Laboratory) **Credit : 1.5**

a) Course Teacher: Saifuddin Mahmud and Shaikh Akib Shahriyar

b) Learning Outcome:

- ✓ To have clear idea about computer networks and ISO/TCP IP Layers
- ✓ Learn about IP addressing and classification of IP addresses.
- ✓ Know how to minimize IPV4 IP address limitation by using subnet masking and VLSM.
- ✓ Implementation of DHCP, DNS, FTP, SMTP; and configuring Windows and Linux server
- ✓ To be introduced with socket programming.
- ✓ Implementation of the protocol stack to have a clear idea about network layers.

- ✓ Explain issues involved in design and managing a local area network and wide area networks
- ✓ Discuss the vulnerabilities, threats, attacks, security measures and mechanisms in both computer systems and networks
- ✓ Become familiar with Basic Network Troubleshooting Tools and Techniques.

c) Schedule:

SL.	Topics
1	Introduction to Computer Networks and Cabling
2	IP Addressing, Sub-netting and VLSM
3	DNS and DHCP
4	Packet Sniffing and Analysis
5	Configuring Mail Server
6	Configuring FTP Server
7	**Lab test 01**
8	Socket Programming
9	Protocol Stack Implementation (Part -1)
10	Protocol Stack Implementation (Part -2)
11	Network Security
12	Network Troubleshooting
13	**Lab test 02**
14	**Quiz**

3. CSE 4109 (Artificial Intelligence) Credit : 3.0

To be uploaded soon

4. CSE 4110 (Artificial Intelligence Laboratory) Credit : 1.5

a) Course Teacher: Prof. Dr. M.M.A. Hashem and Abdul Aziz

b) Learning Outcome:

- ✓ Identify the notions of rational behavior and intelligent agents.
- ✓ Explain the basic issues of knowledge representation and heuristic search.
- ✓ Define major concepts and approaches in knowledge representation, planning, learning, robotics and other AI areas.
- ✓ Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.
- ✓ Develop a general appreciation of the goals, subareas, achievements and difficulties of AI.
- ✓ Developing programming skills for AI applications.

- ✓ Exposure to logic programming with (Prolog, Lisp).
- ✓ Apply the principles of human-computer interaction to the evaluation and construction of a wide range of application.
- ✓ Specify, design, and implement computer-based systems.
- ✓ Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem.
- ✓ Develop strong problem-solving and decision-making skills, and will be able to apply those skills effectively in all aspects of their future lives.
- ✓ Develop Creativity and imagination skills, Self-assessment ability and Critical thinking and analytic ability.

c) Schedule:

SL.	Topics
1	Introduction to Python
2	Graph based search using Python
3	Game Theory – two player game
4	SWI Prolog
5	Search and Optimization technique(Ex. GA/PSO)
6	Fuzzy Expert System/NLP related problem solving

5. IEM 4127 (Artificial Intelligence Laboratory) Credit : 3.0

To be uploaded soon

6. CSE 4120 (Technical writing) Credit : 0.75

To be uploaded soon

7. CSE 4111 (Machine Learning) Credit : 3.0

a) Course Teacher: Dr. Md. Aminul Haque Akhand and Jarin Firose Moon

b) Learning Outcome:

- ✓ Have a good understanding of the fundamental issues and challenges of machine learning.
- ✓ Have an understanding of the strengths and weaknesses of popular machine learning approaches
- ✓ Be able to analytically demonstrate how different models and different algorithms are related to one another.
- ✓ Be able to design and implement various machine learning algorithms in a range of real-world applications.
- ✓ Be able to read current research papers and understand the issues raised by current research.

c) Schedule:

SL.	Topics
1	**Introduction**: Aspects of machine learning
2	**Introduction**: Leaning Frameworks: supervised, unsupervised, semi-supervised, reinforcement; Evaluation of hypothesis; Practical applications of machine learning.
3	**Artificial Neural Networks:** Neurons and biological motivation; Perceptron and solving Boolean functions;
4	**Artificial Neural Networks:** Feed forward and recurrent networks
5	**Artificial Neural Networks:** Single layer and multilayer networks
6	**Artificial Neural Networks:** Back-propagation training method
7	**Artificial Neural Networks:** Back-propagation training method(Continued)
8	**Artificial Neural Networks:** Radial basis function networks;
9	**Artificial Neural Networks:** Associative memory;
10	**Artificial Neural Networks:** Ensemble methods.
11	**Artificial Neural Networks:** Ensemble methods(Continued)
12	**Support Vector Machines**: Linear maximal margin classifier
13	**Support Vector Machines**: Linear soft margin classifier; Nonlinear Classifier
14	**Swarm Intelligence:** Features of natural swarms
15	**Swarm Intelligence**: Ant colony optimization
16	**Swarm Intelligence:** Particle Swarm optimization
17	**Swarm Intelligence:** Other optimization methods
18	**Genetic Algorithms:** Motivation from Natural evolution
19	**Genetic Algorithms:** Genetic operators
20	**Genetic Algorithms:** Fitness function
21	**Genetic Algorithms:** Genetic algorithms for optimization
22	**Decision Trees:** Recursive induction
23	**Decision Trees:** Splitting attribute selection: Entropy and Information Gain
24	**Decision Trees:** Overfitting and Pruning
25	**Decision Trees:** ID3 and C4.5 algorithms
26	**Clustering and Unsupervised Learning:** Learning from unclassified data;
27	**Clustering and Unsupervised Learning:** Partitioning method
28	**Clustering and Unsupervised Learning:** Hierarchical method
29	**Clustering and Unsupervised Learning:** Density based method
30	**Clustering and Unsupervised Learning:** Grid based method
31	**Dimensionality Reduction:** Curse of the dimensionality, empty space phenomenon

32	**Dimensionality Reduction**: Linear and nonlinear techniques for dimensionality reduction
33	**Linear & Logistic Regression**
34	**Linear & Logistic Regression(Continued)**
35	**Large Scale Machine Learning**

d) Date of class tests: 25.02.18, 05.03.18, 05.04.18 **(Tentative)**

8. CSE 4112 (Machine Learning Laboratory) Credit : 3.0

a) Course Teacher: Dr. Md. Aminul Haque Akhand and Shaikh Akib Shahriyar

b) Learning Outcome:

- ✓ Practical knowledge on machine learning algorithms along with their strengths and weaknesses.
- ✓ Be able to formulate machine learning methods to different applications.
- ✓ Be able to apply machine learning algorithms in solving real-life problems.

c) Schedule:

SL.	Topics
1	Optimization with Genetic Algorithm
2	Classification and Function Optimization with Neural Network
3	Classification with Decision Tree
4	Optimization with Particle Swarm Optimization
5	Clustering with K- Means Algorithm
6	Dimensionality Reduction through Principle Component Analysis (PCA)

9. CSE 4115 (Computer and Network Security) Credit : 3.0

To be uploaded soon

10. CSE 4116 (Computer and Network Security Laboratory) Credit : 0.75

To be uploaded soon

11. CSE 4127 (Image Processing and Computer Vision) Credit : 3.0

a) Course Teacher: Prof. Dr. Sk. Md. Masudul Ahsan, Md. Shamimur Rahman

b) Learning Outcome:

- ✓ Understand image formation and the role human visual system plays in perception of gray and color image data.
- ✓ Apply filtering on images. Linear filters can be used for noise removal, edge detection and analysis of image properties.

- ✓ Compute and estimate noises from digital images.
- ✓ Explain the principles of motion and tracking in image sequences (video).
- ✓ Conduct independent study and analysis of image processing problems and techniques.
- ✓ learn the principles and commonly used paradigms and techniques of computer vision

c) Schedule:

SL.	Topics
1	Digital Image Fundamentals, Binary Image, Binary Image processing
2	Sampling and quantization, Imaging geometry
3	Introduction to Image Processing and Computer Vision and their application and challenges
4	Image acquisition systems, Image transformation (log transform, negative transform, gamma transform)
5	Linear Transformation (Contrast stretching, Intensity level transform, Bit plans slicing)
6	Mechanics of Spatial Filtering, Convolution and Correlation
7	Point Processing (Histogram Processing, Histogram Equalization)
8	Histogram Matching or specification
9	Linear/ Nonlinear Spatial Filters: average, Gaussian, median filters
10	Morphological Image Processing (Opening and Closing), Basic morphological concept
11	Hit or miss transformation, Convex Hull, Boundary Extraction algorithm for Morphological Image Processing
12	Image Smoothing and Sharpening methods
13	Thinning and Thickening operation for binary image
14	Human visual system, Light, Brightness, Contrast
15	Fourier Transform and its properties
16	Color modeling and representation
17	Image filtering in Frequency domain
18	Color modeling and representation (cont..)
19	Image filtering in Frequency domain (cont)
20	Lossy and lossless compression schemes
21	Image degradation model and restoration of additive noise
22	restoration of periodic noise
23	Predictive compression methods
24	Estimation of degradation functions, Weiner filter, Geometric Transformation

25	Image thresholding, Finding global optimum and adaptive threshold
26	Vector quantization
27	Image segmentation methods
28	Edge models and edge detection
29	JPEG image compression
30	Line detection algorithms
31	MPEG image compression
32	Optical flow and motion estimation
33	Stereo Vision
34	Review Class
35	Representation of feature descriptor
36	Object recognition methods

d) Date of class tests:

12.CSE 4128 (Image Processing and Computer Vision Laboratory) Credit : 0.75

a) Course Teacher: Prof. Dr. Sk. Md. Masudul Ahsan and Md. Shamimur Rahman

b) Learning Outcome:

- ✓ Apply basic Image operations and transformation
- ✓ Apply filtering on images. Linear filters can be used for noise removal, edge detection and analysis of image properties.
- ✓ Compute and estimate noises from digital images.
- ✓ Detect specific object from an image by object detection techniques.

c) Schedule:

SL.	Topics
1	Open_CV Installation and run a simple program to read an image and change it to different mode and apply some basic operations, Basic Transformation (log, negative, gamma, contrast stretching)
2	Histogram Processing, Histogram Equalization and Histogram Matching
3	Different types of filtering techniques (min, max, average, median, Gaussian, laplacian, adaptive mean)
4	Thresholding and Segmentation
5	Introduction to Fourier transform, basic morphological operations (openings, closings, boundary extraction)
6	**Lab test and Quiz**