Far Western University

Faculty of Engineering

Bachelor in computer engineering

(Course of Study)

Course Title: Computer Network	**Credit: 3**
Course Code: CT 471	**Number of lecture/week: 3**
Year/Semester: Fourth/Seventh	**Tutorial/week: 1**
Level: Bachelor of Engineering (Computer)	**Total hours: 45**

Course Introduction

This course will provide the principles of Computer Networking and Security System.

Course Objectives

To understand the concepts of computer networking, functions of different layers and protocols, and know the idea of IPV6 and security.

Course Outline

Specific Objectives	Contents (UNIT/CHAPTER)	Duration (Time allocated)
Introduction to Computer Network	**Chapter 1. Introduction to Computer Network** Uses of Computer Network,Networking model: client/server, p2p and active network,Protocols and Standards,OSI model and TCP/IP model, Example network: The Internet, X.25, Frame Relay, Ethernet, VoIP, NGN and MPLS, Wireless Network, Network Goals : Business Goals , Business Constraints and Technical Goals .	**5 hr**
Physical Layer	**Chapter 2. Physical Layer** Transmission media: Twisted pair, Coaxial, Fiber optic, Line-of-site and Satellite, Multiplexing, Circuit switching, Packet switching, VC Switching, Telecommunication switching system (Networking of Telephone exchanges).	**5 hr**

Data Link Layer	**Chapter 3. Data Link Layer** Goal of DLL: Design issues of DLL; Services provided to the Network layer, Framing, Error control, Flow control, Link Management, Error Detection and correction, Examples of Data Link Protocol: HDLC; PPP, The Medium Access Sub-layer, The channel allocation problem, Multiple Access Protocols, Ethernet.	**6 hr**
Network Layer	**Chapter 4. Network Layer** Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router and Gateway, Addressing: Internet address; classful address, Subnetting, Supernetting, Routing techniques: static vs. dynamic routing , routing table for classful address, Routing Protocols: RIP, OSPF, EIGRP, BGP, Unicast and multicast routing protocols, Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing, Protocols: ARP, RARP, IP and ICMP.	**8 hr**
Transport Layer	**Chapter 5. Transport Layer** Services of Transport layer,Transport protocols: UDP; TCP, Port and Socket, Connection establishment, Connection release, Flow control & buffering, Multiplexing & de-multiplexing, Congestion control algorithm: Token Bucket and Leaky Bucket.	**5 hr**
Application Layer	**Chapter 6. Application Layer** Web: HTTP & HTTPS File Transfer: FTP, PuTTY Electronic Mail: SMTP, POP3, IMAP Application server concept: proxy caching, Web/Mail/DNS server optimization Concept of traffic analyzer: MRTG, PRTG, SNMP, Packet tracer, Wireshark Internet of Things (IOT).	**4 hr**
Introduction to IPV6	**Chapter 7. Introduction to IPV6** IPv6- Advantages,Packet formats, Extension headers,Transition from IPv4 to IPv6: Dual stack, Tunneling, Header Translation, Multicasting.	**4 hr**

Network Security	**Chapter 8. Network Security** Principles of cryptography: Symmetric Key and Public Key RSA Algorithm,Digital Signatures, Securing e-mail (PGP), Securing TCP connections (SSL), Network layer security (IPsec, VPN), Securing wireless LANs (WEP), Firewalls: Application Gateway and Packet Filtering Intrusion Detection System(IDS)	**8 hr**

Tutorials/Assignments

Four to five class assignments will be provided to the students along with class works in classes.

Practical

Each practical lab is fully instructed and the lab manual consists of stepwise instruction necessary for carrying out lab work. Each lab consists of sets of questions that have to be answered and submitted to the instructor inside class room. Practical will be done in real environment as well in virtual environment.

SN	Topics	Hours	Remarks
1	Cabling	3	
2	VLAN	3	
3	Subnetting	3	
4	Configuring a network using distance vector routing protocol	3	
5	Configuring a network using Link State routing protocol	3	
6	Configuring DHCP, SMTP, POP , DNS servers	6	

References

1. A.S. Tanenbaum, "Computer Networks", 3rd Edition, Prentice Hall India, 1997.
2. W. Stallings, "Data and Computer Communication", Macmillan Press, 1989.
3. Kurose Ross, "Computer Networking: A top down approach", 2nd Edition, Pearson Education
4. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", 3rd Edition, Morgan Kaufmann Publishers

Evaluation scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as possible as indicated in the table below:

Chapters	Hours	Marks distribution* (Tentative %)
Chapter 1. Introduction	5	10
Chapter 2. Physical Layer	5	10
Chapter 3. Data Link Layer	6	16
Chapter 4. Network Layer	8	20
Chapter 5. Transport Layer	5	10
Chapter 6. Application Layer	4	10
Chapter 7. Introduction to IPV6	4	8
Chapter 8. Network Security	8	16

* There may be minor variation in marks distribution

Internal Evaluation (Marks Weightage)		Final Exam (Marks Weightage)	Total	Remarks
Assessment/Class Performance/Attendance/Quizzes/ Tutorials/Presentation	Practical			
20	20	60	100	Internal marks will be of 20 if there are practicals in the course (20 marks will be allocated for Practicals)

Far Western University

Faculty of Engineering

Bachelor in computer engineering

(Course of Study)

Course title: **Data Mining and Data Warehousing**	**Credit: 3**
Course Code: CT 474	**Number of lecture/week: 3**
Year/Semester: Fourth/Seventh	**Tutorial/week: 1** **Practical: 1.5 hours/week**
Level: Bachelor of Engineering (Computer)	**Total hours: 45**

Course Objectives: This course gives an introduction to methods and theory for development of data warehouses and data analysis using data mining. Data quality and methods and techniques for preprocessing of data. Modeling and design of data warehouses. Algorithms for classification, clustering and association rule analysis. Practical use of software for data analysis.

Specific Objectives	Contents (UNIT/CHAPTER)	Duration (Time allocated)
	1. Introduction to Data Mining 1.1. **Introduction to Data Mining**: what and why is data mining? 1.2. **The Origins of Data Mining** 1.3. **Data Mining Tasks** 1.4. **Data and Patterns used in Data Mining** 1.5. **Technologies Used in Data Mining** 1.6. **Major Issues in Data Mining**	**2 Hours**
	2. Data Preprocessing 2.1. **Data Objects and Attribute Types** 2.2. **Basic Statistical Descriptions of Data** 2.3. **Data Preprocessing** 2.4. **Data Cleaning** 2.5. **Data Integration** 2.6. **Data Reduction**	**5 Hours**

	2.7. **Data Transformation and Data Discretization** 2.8. **Measures of Similarity and Dissimilarity**	
	3. Data Warehousing and Online Analytical Processing 3.1. **Data Warehouse:** Basic Concepts and features 3.2. **Trends in Data Warehousing** 3.3. **Data Warehouse Modeling:** Data Cube and OLAP 3.4. **Data Warehouse Design and Usage** 3.5. **Data Warehouse Implementation**	**5 Hours**
	4. Classification 4.1. **Basic Concepts:** General Approach to Classification 4.2. **Decision Tree Induction** 4.3. **Rule-Based Classifier** 4.4. **Nearest-Neighbor Classifiers** 4.5. **Bayesian Classifiers** 4.6. **Artificial Neural Network** 4.7. **Support Vector Machines** 4.8. **Ensemble Methods** 4.9. **Model Evaluation and Selection:** Overfitting, Cross-Validation, Bootstrap, Comparing Classifiers Based on Cost‑Benefit and ROC Curves, and Model Selection Using Statistical Tests of Significance	**12 hours**
	5. Association Analysis 5.1. **Basic Concepts and Algorithms:** Frequent item set Mining Methods 5.2. **FP-Growth Algorithm** 5.3. **Handling Categorical Attributes** 5.4. **Handling Continuous Attributes** 5.5. **Sequential Patterns** 5.6. **Subgraph Patterns** 5.7. **Infrequent Patterns**	**9 hours**
	6. Cluster Analysis 6.1. **Introduction:** Overview and Requirements of Cluster Analysis	**8 hours**

	6.2. **K-means Clustering** 6.3. **Hierarchical Clustering** 6.4. **DBSCAN Clustering** 6.5. **Cluster Evaluation**	
	7. Anomaly Detection 7.1. **Causes of Anomalies** 7.2. **Approaches to Anomaly Detection** 7.3. **Statistical Approaches** 7.4. **Proximity-Based Outlier Detection** 7.5. **Classification-Based Approaches** 7.6. **Clustering-Based Approaches**	**4 hours**

Practical: Using either MATLAB or Python or any other Data Mining tools (such as WEKA), students should practice enough on real-world data intensive problems like IRIS or Wiki dataset.

References

1) Jiawei Han, Micheline Kamber, Jian Pei - Data mining _ concepts and techniques-Elsevier, Morgan Kaufmann
2) P. Tan, M. Steinbach, V. Kumar - Introduction To Data Mining
3) Mark W. Humphries, Michael W. Hawkins, Michelle C. Dy - Data warehousing_ architecture and implementation-Prentice Hall PTR
4) Ponniah P., Reddy P. - Data Warehousing Fundamentals. Volume 1

Evaluation Scheme

The questions will cover all the chapters of syllabus. The evaluation scheme will be as indicated in the table below:

SN.	***Chapter***	***Hours***	***Marks Distribution****
1	Chapter-1	2	4
2	Chapter-2	5	7
3	Chapter-3	5	7
4	Chapter-4	12	15
5	Chapter-5	9	12
6	Chapter-6	8	10
7	Chapter-7	4	5
Total		***45***	***60***

There could be a minor deviation in the marks distribution.

Internal Evaluation (Marks Weightage)		Final Exam (Marks Weightage)	Total	Remarks
Assessment/Class Performance/Attendance/Quizzes/ Tutorials/Presentation	Practical			
20	20	60	100	Internal marks will be of 20 if there are practicals in the course (20 marks will be allocated for Practicals)

Far Western University

Faculty of Engineering

Bachelor in Computer engineering

(Course of Study)

Course Title: Distributed Computing	**Credit: 3**
Course Code: CT 472	**Number of lecture/week:3**
Year/Semester: Fourth/Seventh	**Tutorial/week:1**
Level: Bachelor of Engineering (Computer)	**Totalhours:45**

Course Introduction:
Design and development of distributed and Object oriented database systems
Goals: This course introduces fundamental concepts and implementation of object oriented and distributed database systems with focus on data distribution, query processing, transaction processing, concurrency control and recovery.

Course Outline

Specific Objectives	Contents (UNIT/CHAPTER)	Duration (Time allocated)
Introduction to Distributed System	**Chapter1. Characterization of Distributed Computing:** Introduction, Centralized vs Distributed Computing, Challenges, Features, Examples of Distributed Systems, Resource Sharing and Web, Architecture and Fundamental Models	**5hr**
Clock Synchronization	**Chapter2. Theoretical Foundations of Distributed System:** Absence of Global Clock, Physical Clock Synchronization Algorithms (Berkeley, Cristian's and NTP), Causal Order, Logical clock, Lamport and Vector Clock, Causal Ordering of Message, Global State and Recording (Chandy Lamport Algorithm)	**8hr**
Distributed Mutual Exclusion and Deadlock	**Chapter3: Distributed Mutual Exclusion and Deadlock:** Requirements of Mutual Exclusion Algorithms, Token and Non Token Based Algorithms, Election Algorithms,	**8hr**

	Resource vs communication deadlock, Centralized deadlock detection, distributed deadlock detection, path pushing and edge chasing algorithms	
Distributed Object and Resource Management	**Chapter4: Distributed object and File system:** Distributed object model, programming model in distributed computing(RPC,RMI and EBP), Issues in distributed file system, NFS Architecture and issues, Algorithm for implementation of distributed shared memory, examples of DFS	**8hr**
Transaction and Concurrency Control	**Chapter5: Distributed Transactions and Concurrency Control:** Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Atomic commit protocols, System model and group communication, transaction and replicated data.	**8hr**
Failure Recovery and Fault Tolerance	**Chapter6: Failure Recovery in Distributed Systems:** Faults, Failure and error, Concepts in Backward and Forward recovery, Recovery in Concurrent system, obtaining consistent checkpoints, Recovery in Distributed Database system, Agreement Problems, Byzantine agreement problem, consensus problem, Atomic Commit in Distributed Database System, Replication Architecture	**8hr**

References

- George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems Concepts and Design", Third Edition, Pearson Education.
- A.S. Tanenbaum, M. VanSteen, "Distributed Systems", Pearson Education.
- Distributed Systems Concepts and Design, G. Coulouris, J. Dollimore, Addison Wesley
- Advanced Operating Systems, M. Singhal, N.G. Shivarathri, McGraw Hill
- Distributed Operating Systems and Algorithms, Randy Chow, T. Johnson, Addison Wesley
- Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez, Prentice Hall International

Tutorials/Assignments

Four to five class assignments will be provided to the students along with class works in classes.

Practical and Project

Each practical lab is fully instructed and the lab manual consists of stepwise instruction necessary for carrying out lab work. Each lab consists of sets of questions that have to be answered and submitted to the instructor inside class room. Practical will be done in real environment as well in virtual environment.

There will be 5 projects throughout the semester, each worth 10% of the total grade. The projects will be completed in teams of 2 students, and will be programming intensive. Some projects will require knowledge of Java, while others will require knowledge of C and/or C++. It is expected that students know the basics of both C/C++ and Java. For some projects, you will be allowed to choose the language in which to implement your work

Evaluation scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as possible as indicated in the table below:

Chapters	Hours	Marks distribution* (Tentative %)
Chapter1. Characterization of Distributed Computing	5	10
Chapter2. Theoretical Foundations of Distributed System	8	18
Chapter3: Distributed Mutual Exclusion and Deadlock:	8	18
Chapter4: Distributed object and File system:	8	18
Chapter5: Distributed Transactions and Concurrency Control:	8	18
Chapter6: Failure Recovery in Distributed Systems:	8	18

* There may be minor variation in marks distribution

Internal Evaluation (Marks Weightage)		Final Exam (Marks Weightage)	Total	Remarks
Assessment/Class Performance/Attendance/Quizzes/ Tutorials/Presentation	Practical			
20	20	60	100	Internal marks will be of 20 if there are practicals in the course (20 marks will be allocated for Practicals)

Far Western University

Faculty of Engineering

Bachelor in Computer Engineering

(Course of Study)

Course Title: Information systems	Credit: 3
Course Code: CT 473	Number of lecture/week: 3
Year/Semester: Fourth/Seventh	Tutorial/week: 0
Level: Bachelor of Engineering (Computer)	Total hours: 45

Course Objectives:

To familiarize fundamental concept, theory and practices of information system.

Specific Objectives	Contents (UNIT/CHAPTER)	Duration (Time allocated)
	1. Introduction to Information system Data and Information , Classification and evolution of Information system, Information system architecture, Managing Information System resources, contemporary approaches to information systems, information systems in an organizations, use of Information system for new opportunities with technology	(4 hours)
	2. Information system, organization and management Organization and information systems, the changing role of Information systems,	(4 Hrs)

	management of information system-decision making	
	3. Ethical and social impact of information systems Understanding ethical and social issues related to information systems, ethics in an information society, the moral dimension of information systems.	(4 Hrs)
	4. Enterprise Management Systems Enterprise management Systems (EMS), Enterprise Software: ERP/SCM/CRM, Information Management and Technology of Enterprise Software, Role of IS and IT in Enterprise Management, Enterprise engineering, Electronic organism, Loose integration vs full integration, Process alignment, Frame work to manage integrated change, future trends	(10 hours)
	5. Decision support and Knowledge management DSS, DSS applications in e-Enterprise, Group decision support systems, Enterprise and executive decision support systems, Knowledge Management and systems, Knowledge based Expert system, AI Neural Networks, Intelligent Agents, business intelligence, Data mining, Data ware housing	(8 hours)
	6. Web based information system and navigation The structure of the web, Link Analysis, Searching the web, navigating the web, Web uses mining, Collaborative filtering, Recommender systems, Collective intelligence	(5 Hrs)
	7. Information systems security and control Security threats and vulnerability, managing security threat in e-Business, disaster management and planning, role of auditing in the control process.	(6Hrs)
	8. E-business technology E-business models, electronic payment system, impact of web on strategic management, content management system, enterprise portal.	(4 Hrs)

References:

1. Leonard Jessup and Joseph valacich, “Information Systems Today.” Prentice hall
2. J.Kanter, “Managing With Information System”, PHI
3. Waman S. Jawadekar, Management Information system

Internal Evaluation (Marks Weightage)		**Final Exam (Marks Weightage)**	Total	Remarks
Assessment/Class Performance/Attendance/Quizzes/ Tutorials/Presentation	Practical			
40		60	100	Internal marks will be of 40 if there are no practical works in the course
20	20	60	100	Internal marks will be of 20 if there are practicals in the course (20 marks will be allocated for Practicals)

Far Western University
Faculty of Engineering
Mahendranagar, Kanchanpur

Course Title: Project - Part A **Credit: 2**
Course No: **Number of period per week:**
Nature of the Course: Project **Total hours:**
Year: IV, Semester: I
Level: B.E.
Degree: Bachelor's Degree in Computer Engineering

1. Course Introduction
The Project- Part A aims to provide the practical knowledge of project undertaking by focusing on planning, requirements elicitation and design of a project.

2. Objectives
After successfully completing the course activities, the student will be able to:

- Get acquainted with knowledge of programming tools currently used in the market by carrying out a project.
- Conduct work and solve problem in a team environment.
- Acquire knowledge to formulate project documentation and oral presentation for his/her project.

3. Course Contents:

1. Procedures

The project course requires students to make a group of generally 3-4 members and work jointly in a team, on a proposed task under the direct supervision of the faculty members of their respective department. The project may be done using any programming language or any platform and it may be any type of application e.g. Scientific Applications, Information Systems, Web Application, Games, Simulations etc. but it must find its practical usage in daily life and it should be relevant, as possible, to the local industry environment and its demands.

The project must be started at the beginning of the VII semester and finished by the end of VIII semester. Oral examination will be conducted by internal and external examiners as appointed by the University.

2. Project Work Phases

The entire project work shall be divided in to two phases and evaluation shall be done accordingly.

2.1 First Phase: The students are required to form a group of 3-4 team members and present the conceptual framework of their project work which must be documented in the form of a proposal. The presentation of each group lasts for about 10 minutes. 40% of the marks shall be based on the following criteria:

2.1.1 Evaluation Criteria:

Task Accomplished (20%)

- Feasibility study
- Requirements Analysis and Specification
- Project Plan
- Creativity, Innovativeness and Usefulness of the Idea

2.1.2 Documentation (20%)

- Proposal Report
- Estimations
- Time Line

2.2 Second Phase: The students are required to show the progress of their work and the work done so far must be justifiable and significant. They must have finished the design phase including the overall system/architectural design. 60% of total mark shall be based on the following criteria:

2.2.1 Evaluation Criteria:

Task Accomplished (40%)

- System. Architectural Design
- Depth of project work
- Progress
- Level of achievement
- Group/Team Effort
- Ability to propose solutions

2.2.2 Documentation (20%)

- Report organization
- Completeness and consistency of the report
- Validation Criteria
- Organization and analysis of data and results

Evaluation may be done on continued basis by the department.

Far Western University

Faculty of Engineering

Bachelor in Computer Engineering

(Course of Study)

Course Title: **Simulation and Modeling**	Credit: 3
Course Code: CT 475	Number of lecture/week: 3
Year/Semester: Fourth/Seventh	Tutorial/week: 0
Level: Bachelor of Engineering (Computer)	Total hours: 45

Course Objectives **:** The main objectives of this course are to be familiar with the discrete and continuous system, generation of random variables, and analysis of simulation output and simulation languages.

Specific Objectives	Contents (UNIT/CHAPTER)	Duration (Time allocated)
	1. Introduction to Simulation System Concept, Boundary, Environment, Continuous and Discrete System, Real time simulation, Types of simulation model(Static Physical, Dynamic Physical, Static Mathematical),Principles used in Modeling, Distributed Lag model ,Phases and steps in Simulation Study, Advantages and Disadvantages of Simulation, Areas of Application.	(6 Hrs)
	2. Simulation of Continuous System Queuing System, Characteristics, Notation, Discipline, Single Server queues , Server Utilization, Concept of Multi Server Queues, Markov Chains-Introduction, Application and examples, Differential and Partial Differential Equations	(8 Hrs)
	3. Random Numbers Pseudo Random Numbers, Generation of Random Numbers ,Uniform-Linear Congruential Method, Non	(10 Hrs)

	uniform – Inverse Transformation ,Rejection, Testing for Randomness ,Uniformity(Frequency) Test , Kolmogorov- smirnov Test, Chi-Square Test, Testing for Auto correlation , Poker Test, Gap Test	
	4. Verification and Validation of Simulation Model Model Building, Verification of Simulation Model, Calibration and Validation of Models	(5 Hrs)
	5. Analysis of Simulation Output Estimation Methods, Simulation Run Statistics, Replication of Runs, Elimination of Internal Bias	(6 Hrs)
	6. Simulation Language Basic Concept of Simulation Tools ,Discrete Systems modeling and simulation-– Introduction to GPSS, Continuous system modeling and simulation- Introduction to CSMP, Data and control Statement in CSMP, Hybrid Simulation, Feedback Systems: typical applications (Auto pilot)	(6 Hrs)
	7. Simulation of computer systems Simulation tools, High Level computer –system simulation, CPU simulation, Memory Simulation	(4Hours)

References:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, Devid M. Nicol, P. Shahabudeen:Discrete-Event system simulation
2. Geoffrey Gordon: System Simulation
3. A.M. Law and W.D. Kelton: Simulation and Modeling and analysis
4. R. Y. Rubinstein, B. Melamed: Modern Simulation and Modeling
5. S. Shakya: Lab Manual on Simulation and modeling

Internal Evaluation (Marks Weightage)		**Final Exam (Marks Weightage)**	Total	Remarks
Assessment/Class Performance/Attendance/Quizzes/ Tutorials/Presentation	Practical			
40		60	100	Internal marks will be of 40 if there are no practical works in the course
20	20	60	100	Internal marks will be of 20 if there are practicals in the course (20 marks will be allocated for Practicals)