**Advanced Computer Architecture**

**BEG478CO**

**Year: IV Semester: II**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Teaching Schedule**  **Hours/Week** | | | **Examination Scheme** | | | | |
| **Theory** | **Tutorial** | **Practical** | **Internal** | | **Final** | | **Total** |
| **3** | **1** | **-** | **Theory** | **Practical** | **Theory** | **Practical** | **100** |
| **20** |  | **80** | **-** |

**Course Objectives**: To gain the knowledge needed to design and analyze high performance computer architecture

1. **Concept [5 Hrs]**
   1. Basic computational model
   2. Key concept relating to computational models
   3. Concept of Computer Architecture with interpretations and descriptions
2. **Introduction to Parallel Processing [6 Hrs]**
   1. Introduction, architectural classification schemes.
   2. Evolution of parallel processors, current & future trends towards parallel processors.
   3. Principles of pipelining and array processing.
   4. Scalar and vector pipelines.
3. **Vectorand pipelined processors [6 Hrs]**
   1. Classification of pipelined processors, performance evaluation factors.
   2. Vector processing concepts, pipelined vector processors, Cray type vector processor

-design example.

* 1. Array processors, an example of data routing in array processor.
  2. Systolic arrays and their applications.

1. **Different parallel processing architectures [6 Hrs]**

|  |  |  |
| --- | --- | --- |
|  | * 1. Introduction to Associative memory processors. |  |
|  | * 1. Multi threaded arch –principles of multi threading, Latency hiding techniques. |
|  | * 1. Scalable coherent multiprocessor model with distributed shared memory. |  |

1. **Distributed Memory Architecture [6 Hrs]**
   1. Loosely coupled and tightly coupled architectures.
   2. Cluster computing as an application of loosely coupled architecture. Examples – CM\* and Hadup.
2. **Programmability Issues [3 Hrs]**
   1. Types and levels of parallelism.
   2. Operating systems for parallel processing, Models of parallel operating systems - Master-slave configuration, Separate supervisor configuration, Floating supervisor control.
3. **ProgramandNetworkProperties [5 Hrs]**
   1. Conditionsofparallelism
      1. DataandResourceDependences.
      2. Datadependencyanalysis- Bernstein’scondition
      3. Hardware and Software Parallelism.
      4. The role of Compilers.
   2. ProgramPartitioningandScheduling
      1. GrainSizesandLatency.
      2. GrainPackingandScheduling.
      3. StaticMultiprocessorScheduling.
   3. SystemInterconnectArchitectures
      1. Network Properties and Routing.
      2. Static Connection Networks.
      3. Dynamic Connection Networks.
4. **ParallelModels,LanguagesandCompilers [8 Hrs]**
   1. ParallelProgrammingModels
      1. Shared-Variable Model.
      2. Message-Passing Model.
      3. Data-Parallel Model.
      4. Object Oriented Model.
      5. Functional and Logic Models. f.
      6. Study of Open MP.
   2. ParallelLanguagesandCompilers
      1. Language Features for Parallelism.
      2. Parallel Language Constructs.
      3. Optimizing Compilers for Parallelism.
   3. DependenceAnalysisofDataArrays
      1. Iteration Space and Dependence Analysis.
      2. Subscript Separability and Partitioning.
      3. Categorized Dependence Tests.
   4. CodeOptimizationandScheduling
      1. Scalar Optimization with Basic Blocks.
      2. Local and Global Optimizations.
      3. Vectorization and Parallelization Methods.
      4. Code Generation and Scheduling.
      5. Trace Scheduling Compilation

**ReferenceBooks:**

1. Advancedcomputerarchitecture–KaiHwang(MGH).
2. ComputerArchitectureandParallelProcessing–KaiHwangAndBriggs(MGH).
3. Advanced computer Architecture – Dezso Sima, Terence Fountain &Peter Kacsuk(PearsonEducation)
4. Parallel Programming Techniques &Applications using Networked Worksataions &Parallel Computers-Barry Wilkinson & Michael Allen–Second Edition (PearsonEducation).
5. Introduction toParallel Processing –M.Sasikumar, D. Shikare &P.Ravi Prakash(PHI).
6. InternetforOpenMP,Hadupandothers.
7. Advanced Computer Architecture – William Stallings

**Student Work**:

Itshouldconsistof minimum10-12assignmentswithemphasisonsolvingproblems.

**Board Exam Questions patterns**

Total 10 questions and 8 questions to solve 10\*8=80 marks

**Project**

**BEG479CO**

**Year: IV Semester: II**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Teaching Schedule**  **Hours/Week** | | | **Examination Scheme** | | | | |
| **Theory** | **Tutorial** | **Practical** | **Internal** | | **Final** | | **Total** |
| **-** | **3** | **6** | **Theory** | **Practical** | **Theory** | **Practical** | **200** |
| **-** | **120\*** |  | **80\*\*** |

**\*Continuous**

**\*\*Final Presentation 3 hours**

**Objectives**: The objective of this project work is to give knowledge on project planning, designing, reporting and presentation skill. Student should plan and complete an individual computer engineering design projects under the supervision of teacher and prepare project reports.

**Guidelines of Project Work**

Students are required to submit project on any one of the emerging technology. Project should be application based reflecting real time scenarios with some research in it. Previously accomplished projects and topics should be rejected. Students are highly encouraged for their innovative ideas.

Following activities must be followed during project.

1. Proposal submission
2. Proposal defense
3. Midterm defense
4. Final defense
5. Project documentation

**Students are advised to follow the given guidelines for report formatting**

**For Proposals**

It must contain:-

Abstract

1. Introduction

1.1 Background and Significance

1.2 Statement of the problem

1.3 Rationale of the Project

1.4 Objectives of the project

1. Literature Review
2. Project Design and Implementation
3. Schedule and Expected Results

4.1 Schedule

4.2 Expected outcomes and testing

4.3 Expected Innovative Points

1. Project budget
2. References

**Format of Project Proposal**

**1. Paper Size :** A- 4 size paper

**2. Margins :**

**Top :** 1”

**Bottom :** 1.15”

**Left :** 1.5”

**Right :** 0.6”

**3. Line Spacing:** 1.5 lines

**4. Headings - Title of Chapter**

**First Order Heading:**

(for example – **CHAPTER 1 : INTRODUCTION**)

**Font :** Times New Roman (Bold face)

**Size :** 18 point

**Alignment :** Center Alignment

**5. Headings – Sub headings**

**Second Order Heading:** (for example – **1.1 Background**)

**Font :** Times New Roman ( Bold Face)

**Size :** 16 point

One blank line before the heading (12 points)

**Third Order Heading:** (for example – **1.1.1 Abc**)

**Font :** Times New Roman (Bold Face)

**Size :** 14 point

One blank line before the heading (12 points)

**6. Text**

**Font :** Times New Roman

**Size :** 14 point

**Alignment :** Justified (Full Text)

**7. Abstract (up to 150 words)**

**Heading (i.e. ABSTRACT)**

**Font :** Times New Roman (**Bold Face**)

**Size :** 16 point

Two blank lines after the heading. (12 points)

**Remaining Text**

**Font :** Times New Roman

**Size :** 12 point

**Alignment :** Justified (Full Text)

**8. Figures and Tables :** Centered Placed

**Caption**

**Font :** Times New Roman (**Bold**)

**Size :** 10 point

**Alignment :** Centered

**\*Figure Caption must be bellow the figure and centered, Table caption must be above the table and right justified.**

**9. Page Numbering (Centered)**

**Till page, “FIGURE INDEX” :** Roman (I, II, etc.)

**For Remaining Pages**

**(i.e. from CHAPTER 1-to- REFERENCE) :** 1, 2, …… N

**10. References / Bibliography**

**Line Spacing :** 1.5 Line

**Font :** Times New Roman

**Size :** 12 point

**Publication details and/or URL must be in Italics.**

**Format:**

[Citation number] Author’s Name, “Article Title”, Journal, Publisher,

Location, Year, Edition/Reprint, PP Page *No Start-End*.

[Citation number] Author’s Name, “Article Title”, Complete URL of Web

Page.

[Citation number] Author’s Name, “Title of the Book”, Publication, Edition, Year of Printing.

**Header:Title**- BE (Computer), [Name of College], [Address]

**Font -**Times New Roman

**Size -** 12 point

**Alignment -** Centered

**\*No header should be applied to cover page, front page, table of content and abstract.**

**Footer:Title**-left hand- Project title

**Right hand**-page no (only integer)

**Font -**Times New Roman

**Size-** 12 point

**Requirements for Report Writing:**

Your report should meet following standards:

**Font Name**: Times New Roman

**Left Margin**: 1.5 inch

**Right Margin**: 1.25 inch

**Top Margin**: 1.25 inch

**Bottom Margin**: 1.25 inch

**Header and Footer**: 0.5 inch

**Line Spacing**: 1.5

**Paragraph Spacing:** 18 pt

**Font Size**: 12 pt (for normal text)

Follow following standard for headings

* 1. **Heading1 (16 pt, Bold)** 
     1. **Heading2 (14 pt, Bold)** 
        1. **Heading3 (13 pt, Bold)** 
           1. **Heading4 (12 pt, Bold)**

**Format of Report**

It must contain:-

Chapter 1: Introduction (Background and Significance of the project, Objectives and Scope, Project Features, Summary and Project Organization)

Chapter 2: Literature Review (Previous System or work study)

Chapter 3: Analysis of Issues and Solution (Introduction to Existing Systems, Solution to the issues that you have raised with specific method of solving)

Chapter 4: Design Specification and Implementation (System Architecture, Context Diagram and 1 Level Data Flow Diagram (DFD), Data Dictionary, Working Procedure, Flowchart Diagram (if any), Use Case Diagram)

Chapter 5: Experiment Result and Analysis (Scenario, Experiment, Result with analysis)

Chapter 6: Conclusion and Future Work

References

Bibliography (Optional)

Appendixes

**ENGINEERING PROFESSIONAL PRACTICE**

# BEG 459CI

**Year: IV Semester: II**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Teaching Schedule**  **Hours/Week** | | | **Examination Scheme** | | | | |
| **Theory** | **Tutorial** | **Practical** | **Internal** | | **Final** | | **Total** |
| **2** | **-** | **-** | **Theory** | **Practical** | **Theory** | **Practical** | **50** |
| **10** | **-** | **40** | **-** |

**Course objectives:** To introduce the ethical and legal environment in which engineering is practiced**.**

1. **Historical Background of Engineering and Professionalism 8 Hours**
   1. History of engineering practice in eastern and western society
   2. Professionalism and Engineering morals and ethics
   3. Codes of ethics and guidelines for engineering profession
   4. Individual freedoms vs societal goals
   5. Duties of the engineer to its profession, science and technology, clients
   6. Major ethical system that guide decision making: Eternal law, Universalism, utilitarianism, distributive Justice and personal Liberty
2. **Engineering Profession Practices in Nepal 12 Hours**
   1. The Engineering Council Act 2057
   2. Contract law: valid, void and voidable contracts
   3. Types of business forms and their features: private, partnership and company
   4. Multinational Company and joint ventures
   5. Preparation of Tender Document and Tendering process
   6. Liability, tort and negligence
   7. Business and labour laws
   8. Trade Union Act
3. **Issues on engineering profession 8 Hours**
   1. Intellectual property rights: Copyright, Patent, Trademark and Industrial design
   2. Industrialization vs. protection of the environment
   3. Corporate Social Responsibility (CSR)
   4. Role of engineering in development
4. **Engineering Professional Practice in Other Countries: 2 Hours**
   1. Other Asian countries
   2. The USSR and Eastern Europe
   3. Western Europe
   4. North America

**Recommended Books:**

1. Carson Morrison and Philip Hughes, "Professional Engineering Practice – Ethical Aspects", McGraw-Hill Ryerson Ltd., Totanto, 1982

**E-Commerce**

**BEG475EC**

**Year: IV Semester: II**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Teaching Schedule**  **Hours/Week** | | | **Examination Scheme** | | | | |
| **Theory** | **Tutorial** | **Practical** | **Internal** | | **Final** | | **Total** |
| **3** | **-** | **2** | **Theory** | **Practical** | **Theory** | **Practical** | **125** |
| **20** | **25** | **80** | **-** |

**Course Objectives**: To provide the students with the theoretical background of e-commerce and its application in business and develop a working e-commerce site.

1. **Introduction to Electronic Commerce [4Hours]** 
   1. E-Commerce and E-Business
   2. Comparison of E-Commerce with Traditional Commerce
   3. Advantages and Disadvantages of E-Commerce
   4. Media Convergence
   5. Business Applications of E-Commerce
   6. Need for E-Commerce and E-Business
   7. Basics of E-Commerce: Network and Electronic TransactionsToday
   8. M-Commerce and its application
2. **Business Models of E-Commerce [3 Hours]** 
   1. Business Models and its Importance
   2. Business-to-Business (B2B) E-Commerce, uses and advantages/disadvantages
   3. Business-to-Consumer (B2C) E-Commerce, uses and advantages/disadvantages
   4. Consumer-to-Consumer (C2C) E-Commerce, uses and advantages/disadvantages
   5. Consumer-to-Business (C2B) E-Commerce, uses and advantages/disadvantages
3. **The Internet and WWW** **[3 Hours]** 
   1. Evolution of Internet
   2. Domain Names and Internet Organization(.edu , .com , .mil .gov , .net etc)
   3. Types of Network(LAN , MAN, WAN)
   4. Internet Service provider
   5. World wide web
4. **Internet and Extranet [7 Hours]** 
   1. Definition of Internet
   2. Advantages and Disadvantages of the Internet
   3. Information Superhighway (I-way) and its component
   4. Component of a Intranet Information technology structure
   5. Development of a Intranet
   6. Extranet and Intranet Difference
   7. Role of Intranet in B2B Application
5. **Security Framework [10Hours]** 
   1. Secure Transaction
   2. Computer Monitoring
   3. Privacy on Internet
   4. Computer Crime ( Laws , Types of Crimes)
   5. Threats
   6. Software Packages for Privacy
   7. Hacking
   8. Computer Virus ( How it spreads , Virus problem ,
   9. Virus protection
   10. Encryption and Decryption
       1. Secret key Cryptography
       2. DES
       3. Public key Encryption
       4. RSA
   11. Authorization and Authentication
   12. Firewall
   13. Digital Signature (How it works )
6. **Electronic Data Interchange [4 Hours]** 
   1. Concepts of EDI and Limitation
   2. Application of EDI
   3. Disadvantages of EDI
   4. EDI model
7. **Electronic payment System [8Hours]** 
   1. Introduction
   2. Importance of Electronic Payment System
   3. Types of Electronic payment system
   4. Payment types
   5. Traditional payment
   6. Value exchange system
   7. Credit card system and working principle
   8. Smart Card and its working mechanism
   9. Electronic cash, its properties and working mechanism
   10. E-Cheque
   11. Electronic funds transfer
8. **Internet Marketing [4 Hours]** 
   1. The PROS and CONS of online shopping
   2. The cons of online shopping
   3. Justify an Internet business
   4. Internet marketing techniques
   5. The E-cycle of Internet marketing
   6. Personalization e – Commerce
9. **Management of Change [2 Hours]** 
   1. Overview of Change Management
   2. E-Commerce in Nepal

**Reference books**

1. Andrew B. Whinston and Ravi Kalakota, “Frontiers on Electronics”, Pearson 1996, ISBN 81-7808-357-5
2. Electronic Commerce by Gary P. Schneider
3. Kenneth C. Laudon, Carol G. Traver, “E-Commerce Business, Technology, Society”, Pearson
4. E-Commerce Concepts, Models, Strategies by G.S.V Murthy
5. E-Commerce by Kamlesh K Bajaj and Debjani Nag

**Laboratory Work**

**Based on subjects students have to make a e-commerce site individually or in group and complete report have submitted to department via subject teacher for their practical marks.**

**Board Exam Questions patterns**

Total 10 questions and 8 questions to solve 10\*8=80 marks

**Distributed Processing (System)**

**BEG475DP**

**Year: IV Semester: II**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Teaching Schedule**  **Hours/Week** | | | **Examination Scheme** | | | | |
| **Theory** | **Tutorial** | **Practical** | **Internal** | | **Final** | | **Total** |
| **3** | **1** | **2** | **Theory** | **Practical** | **Theory** | **Practical** | **125** |
| **20** | **25** | **80** | **-** |

**Course Objectives:**

1. **Introduction to Distributed system [3 hours]**
   1. Introduction
   2. Examples of distributed systems
   3. Resource sharing and the web
   4. Distributed System Models
   5. Challenges

**Lab: Overview of Linux and Java Programming**

1. **Introduction to inter-process communication and OS support [8 hours]**
   1. API for Internet protocols
   2. External data representation and Marshalling.
      1. CORBA’s Common Data Representation (CDR)
      2. XML
      3. Java Object Serialization
   3. Client-Server communication
   4. Group communication.
   5. The Operating System layer
   6. Protection
   7. Processes and Thread
   8. Virtual Memory

**Labs: TCP/IP and UDP programming and multithreaded programming in Java**

1. **Distributed Objects and RMI [4 hours]**
   1. Introduction
   2. Communication between distributed objects
   3. Remote procedure call
   4. Events and notifications
   5. Java RMI

**Labs: Programming lab work on Java RMI and CORBA**

1. **Distributed File System [3 hours]**
   1. File Service architecture
   2. Sun Network File System
   3. Overview of Global File System and Andrew File System

**Labs: Configuring and accessing NFS**

1. **Name Services [3 hours]**
   1. Introduction
   2. Name services and the DNS with BIND
   3. Directory Services
   4. Overview of Global Name Service ans X.500 Directory Service

**Labs: working with LDAP and DNS/Host related APIs in Java**

1. **Time and Co-ordination [3 hours]**
   1. Introduction
   2. Synchronous physical clocks
   3. Logical time and logical clocks
   4. Distribution coordination

**Lab: Configuring NTP server in Linux**

1. **Web Services [6 hours]**
   1. Introduction to Web services
   2. Service description and IDL for web services
   3. A directory service for using with web services
   4. XML security
   5. Coordination of Web services
   6. RESTful services

**Labs: writing web services in Java using SOAP and REST**

1. **Replication and Concurrency control [4 hours]**
   1. Introduction and Basic architecture of Replication
   2. Fault tolerance services
   3. Locks
   4. Optimistic concurrency control
   5. Time stamp ordering

**Lab:Configuring Pacemaker in Linux to achieve replication (For example web server replication)**

1. **Shared Data, Transaction and distributed transactions [7 hours]**
   1. Introduction
   2. Conversion between a client and a server
   3. Fault tolerance and recovery
   4. Simple and nested Transactions
   5. Concurrency control in distributed transactions
   6. Distributed deadlocks

**Lab: Basic administration of MySQL, configuration of MySQL replication, backup and recovery**

1. **Security [4 hours]**
   1. Introduction
   2. Threats and Attacks
   3. Digital Signatures
   4. Firewall
   5. Kerberos
   6. TLS
   7. Cryptography

**Labs: creating self-signed digital certificate and verified digital certification in apache Web server as example. Configuring firewall to protect Network from attacks**

**Reference Books**

1. Distributed Systems concept and design, George Coulouris, Jean Dollimore and Tim Kindberg
2. Distributed Operating Systems,Tenanbaum A, Prentice Hall.
3. MySQL High Availability, Tools for Building Robust Data Centers, Charles Bell, Mats Kindahl, Lars Thalmann,O'Reilly Media

**Data Mining & Data warehousing**

**BEG 476CO**

**Year: IV Semester:II**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Teaching Schedule**  **Hours/Week** | | | **Examination Scheme** | | | | |
| **Theory** | **Tutorial** | **Practical** | **Internal** | | **Final** | | **Total** |
| **3** | **1** | **-** | **Theory** | **Practical** | **Theory** | **Practical** | **100** |
| **20** |  | **80** | **-** |

**Goals:** This course introduces advanced aspects of data warehousing and data mining, encompassing the principles, research results and commercial application of the current technologies. To introduce students to the basic concepts and techniques of Data Mining. To develop skills of using recent data mining software for solving practical problems. To gain experience of doing independent study and research.

**Course Content:**

**Unit 1. Introduction to Data Mining 4 Hrs.**

Basic concepts of data mining

Use and benefits of data mining

Application of data mining

KDD Environment: Data selection cleaning, enrichment, coding and mining

Problems in data mining

**Unit 2. Introduction to Data Warehousing 4 Hrs.**

Basic concepts of data warehousing

Use and benefits of data warehousing

Application of data warehousing

Problems in data warehousing

**Unit 3. Data warehouse logical and Physical design 6 Hrs.**

Data warehouse logical design: star schemas, fact tables, dimensions, other schemas, multidimensional data models, materialized views

Data warehouse physical design: hardware and I/O considerations, parallelism, indexes

**Unit 4. Data warehousing technologies and implementations 4 Hrs.**

Data extraction, transportation, transformation, loading and refreshing.

**Unit 5. Data Warehouse to Data Mining 9 Hrs.**

Data mining architecture

Data warehouse architecture

OLAP architecture

Types of OLAP servers

OLAP operations in Multidimensional data models

OLAP to OLAM

Stages of Data Mining Process

**Unit 6. Data Mining Approaches and Methods 10 Hrs.**

Models of Data Mining

Data Mining Techniques

Data Mining Tasks

Classification and Predictions

* Decision tree, rule-based classification, Backpropagation, genetic algorithm, Linear regression, non-linear regression

Association rules and Mining frequent patterns

* Market basket analysis, APriori algorithm, FP growth

Clustering

* Partitioning method (K Means, K Medoids)
* Hierarchical method (Agglomerative, Divisive)

**Unit 7. Mining complex types of data 3 Hrs.**

Multimedia Data mining

Text mining

Web mining

* Web content mining, web usage mining, web structure mininig

**Unit 8. Application and trends in data warehousing and data mining 5 Hrs.**

Integration of data mining tools with database systems

Data mining in distributed heterogeneous database systems

Importance of data mining in Marketing, E- commerce and CRM

Aspects of Security and Privacy in Data Mining

Social impact of data mining

Trends in data mining

**Reference Books:** “**Data Mining Concepts and Techniques”**, Morgan Kaufmann J. Han, M Kamber, Second Edition

Sam Anahory, Dennis Murray, **"Data warehousing In the Real World",** Pearson Education.

Adriaans, P. and D. Zatinge, **" Data Mining" ,** Addison Wesley, 1996

Kimball, R., **"The Data Warehouse Toolkit",** Wiley, 1996.

W.H.Inmon, **“Building the Data Warehouse”**, 3rd Edition, Wiley, 2003.

Margaret H.Dunham, **“Data Mining: Introductory and Advanced Topics”,** Pearson Education 2004.

**Prerequisite:** C, Data Structure, Database Management Systems

**Cryptography**

**BEG 477 CO**

**Year: IV Semester: II**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Teaching Schedule**  **Hours/Week** | | | **Examination Scheme** | | | | |
| **Theory** | **Tutorial** | **Practical** | **Internal** | | **Final** | | **Total** |
| **3** | **1** | **-** | **Theory** | **Practical** | **Theory** | **Practical** | **100** |
| **20** | **-** | **80** | **-** |

Objectives: To understand differentcryptography schemes and security related issues.

1. **Introduction (4 hours)**
   1. Basic Terms In cryptography
   2. Generic Model of Secure Communication
   3. OSI Security Architecture
   4. Categories of Cryptographic systems
   5. Conventional Encryption model
2. **Classical Cipher schemes ( 4 hours)**
   1. Classical Substitution Ciphers : Caesar Cipher, Mono-alphabetic Cipher
   2. Hill Cipher
   3. Staganography
3. **Mathematical Foundations** **(4 hours)**
   1. Group, Ring , Integral Domain and Field
   2. Modular Arithmetic
   3. Residue Classes
   4. Primes and Co-Primes
   5. Eulicd's algorithm
4. **Modern Symmetric Ciphers** **(10 hours)**
   1. Binary Block Substitution
   2. Shannon's theory of diffusion and confusion
   3. Fistel cipher
   4. Data Encryption Standard
   5. Modes of Block / Stream Cipher
   6. International data encryption algorithm (IDEA)
   7. Advanced Encryption Standard (AES)
5. **Public-Key Cryptography** **(8 hours)**
   1. Data Confidentiality using Public-Key Cryptography
   2. RSA Algorithm
   3. Diffie-Hellman Algorithm for Key Distribution
6. **Authentication Schemes** **(9 hours)**
   1. Types of Authentication services
   2. Techniques of Authentication
   3. Digital Signatures
   4. Message Authentication Code and Authentication
   5. Hash Function
   6. Message Digest Algorithm
   7. Secure Hash Algorithm
   8. Centralized authentication Schemes
7. **Network Security ( 6 hours)**
   1. Types of Attack
   2. Security Model
   3. Email Security (PGP)
   4. Internet Protocol Security ( IP Sec)
   5. Secure Socket Layer(SSL)
   6. Secure Electronic Transaction(SET)

Course References

* William Stallings : Cryptography & Network Security, 3e, Pearson Education
* Kaufamn, C., Perlman, R., &Speciner, M.,Network Security- PRIVATE Communication in Public World, Second Edition, Pearson
* Alfred Menezes : Handbook of Applied Cryptography
* Wenbo Mao : Modern Cryptography : Theory and Practice, Pearson Education
* P S Gill : Cryptography and Network Security