Data Mining & Data warehousing

BEG 476CO

Year: IV

Semester:II

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

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.

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

ENGINEERING PROFESSIONAL PRACTICE

BEG 459CI

Year: IV | Semester: II

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

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

1. Historical Background of Engineering and Professionalism **8 Hours**

1.1 History of engineering practice in eastern and western society
1.2 Professionalism and Engineering morals and ethics
1.3 Codes of ethics and guidelines for engineering profession
1.4 Individual freedoms vs societal goals
1.5 Duties of the engineer to its profession, science and technology, clients
1.6 Major ethical system that guide decision making: Eternal law, Universalism, utilitarianism, distributive Justice and personal Liberty

2. Engineering Profession Practices in Nepal **12 Hours**

2.1 The Engineering Council Act 2057
2.2 Contract law: valid, void and voidable contracts
2.3 Types of business forms and their features: private, partnership and company
2.4 Multinational Company and joint ventures
2.5 Preparation of Tender Document and Tendering process
2.6 Liability, tort and negligence
2.7 Business and labour laws
2.8 Trade Union Act

3. Issues on engineering profession **8 Hours**

3.1 Intellectual property rights: Copyright, Patent, Trademark and Industrial design
3.2 Industrialization vs. protection of the environment
3.3 Corporate Social Responsibility (CSR)
3.4 Role of engineering in development

4. Engineering Professional Practice in Other Countries: **2 Hours**

4.1 Other Asian countries
4.2 The USSR and Eastern Europe
4.3 Western Europe
4.4 North America

Recommended Books:

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

Cryptography
BEG 477 CO

Year: IV

Semester: II

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

Objectives: To understand differentcryptography schemes and security related issues.

1. **Introduction** **(4 hours)**
   a. Basic Terms In cryptography
   b. Generic Model of Secure Communication
   c. OSI Security Architecture
   d. Categories of Cryptographic systems
   e. Conventional Encryption model

2. **Classical Cipher schemes** **(4 hours)**
   a. Classical Substitution Ciphers : Caesar Cipher, Mono-alphabetic Cipher
   b. Hill Cipher
   c. Staganography

3. **Mathematical Foundations** **(4 hours)**
   a. Group, Ring , Integral Domain and Field
   b. Modular Arithmetic
   c. Residue Classes
   d. Primes and Co-Primes
   e. Eulicd's algorithm

4. **Modern Symmetric Ciphers** **(10 hours)**
   a. Binary Block Substitution
   b. Shannon's theory of diffusion and confusion
   c. Fistel cipher
   d. Data Encryption Standard
   e. Modes of Block / Stream Cipher
   f. International data encryption algorithm (IDEA)
   g. Advanced Encryption Standard (AES)

(8 hours)

5. **Public-Key Cryptography**
   a. Data Confidentiality using Public-Key Cryptography
   b. RSA Algorithm
   c. Diffie-Hellman Algorithm for Key Distribution

(9 hours)

6. **Authentication Schemes**
   a. Types of Authentication services
   b. Techniques of Authentication
   c. Digital Signatures
   d. Message Authentication Code and Authentication
   e. Hash Function
   f. Message Digest Algorithm
   g. Secure Hash Algorithm
   h. Centralized authentication Schemes

(6 hours)

7. **Network Security**
   a. Types of Attack
   b. Security Model
   c. Email Security (PGP)
   d. Internet Protocol Security (IP Sec)
   e. Secure Socket Layer(SSL)
   f. 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

Advanced Computer Architecture
BEG478CO

Year: IV

Semester: II

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

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

1. Concept [5 Hrs]

1.1. Basic computational model
1.2. Key concept relating to computational models
1.3. Concept of Computer Architecture with interpretations and descriptions

2. Introduction to Parallel Processing [6 Hrs]

2.1. Introduction, architectural classification schemes.
2.2. Evolution of parallel processors, current & future trends towards parallel processors.
2.3. Principles of pipelining and array processing.
2.4. Scalar and vector pipelines.

3. Vectorand pipelined processors [6 Hrs]

3.1. Classification of pipelined processors, performance evaluation factors.
3.2. Vector processing concepts, pipelined vector processors, Cray type vector processor
-design example.
3.3. Array processors, an example of data routing in array processor.
3.4. Systolic arrays and their applications.

4. Differentparallelprocessingarchitectures [6 Hrs]

4.1. IntroductiontoAssociativememoryprocessors.
4.2. Multithreaded arch –principles of multithreading, Latency hiding
4.3. Scalable coherent multiprocessor model with distributed shared

5. DistributedMemoryArchitecture [6 Hrs]

5.1. Loosely coupled and tightly coupled architectures.
5.2. Cluster computing as an application of loosely coupled architecture. Examples – CM* and Hadup.

6. **ProgrammabilityIssues** [3 Hrs]
   6.1. Types and levels of parallelism.
   6.2. Operating systems for parallel processing, Models of parallel operating systems - Master-slave configuration, Separate supervisor configuration, Floating supervisor control.

7. **ProgramandNetworkProperties** [5 Hrs]
   7.1. Conditionsofparallelism
      7.1.1. DataandResourceDependences.
      7.1.2. Datadependencyanalysis- Bernstein'scondition
      7.1.3. Hardware and Software Parallelism.
      7.1.4. The role of Compilers.
   7.2. ProgramPartitioningandScheduling
      7.2.1. GrainSizesandLatency.
      7.2.2. GrainPackingandScheduling.
      7.2.3. StaticMultiprocessorScheduling.
   7.3. SystemInterconnectArchitectures
      7.3.1. Network Properties and Routing.
      7.3.2. Static Connection Networks.
      7.3.3. Dynamic Connection Networks.

8. **ParallelModels,LanguagesandCompilers** [8 Hrs]
   8.1. ParallelProgrammingModels
      8.1.1. Shared-Variable Model.
      8.1.2. Message-Passing Model.
      8.1.3. Data-Parallel Model.
      8.1.4. Object Oriented Model.
      8.1.5. Functional and Logic Models. f.
      8.1.6. Study of Open MP.
   8.2. ParallelLanguagesandCompilers
      8.2.1. Language Features for Parallelism.
      8.2.2. Parallel Language Constructs.
      8.2.3. Optimizing Compilers for Parallelism.
   8.3. DependenceAnalysisofDataArrays
      8.3.1. Iteration Space and Dependence Analysis.
      8.3.2. Subscript Separability and Partitioning.
      8.3.3. Categorized Dependence Tests.
   8.4. CodeOptimizationandScheduling
      8.4.1. Scalar Optimization with Basic Blocks.
      8.4.2. Local and Global Optimizations.
      8.4.3. Vectorization and Parallelization Methods.
      8.4.4. Code Generation and Scheduling.
      8.4.5. 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
			Theory	Practical	Theory	Practical	
-	3	6	-	120*		80**	200

*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
5. Project budget
6. 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)**
   1.1 Heading2 (14 pt, Bold)
   1.1.1 Heading3 (13 pt, Bold)
   1.1.1.1 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