Advanced Java Programming

Course Title: Advanced Java Programming
Course No: CSC409
Nature of the Course: Theory + Lab
Semester: VII

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course familiarizes students with basic as well as advanced features of Java Programming Emphasis will be given to GUI and event-driven programming, Database Connectivity, Socket Programming, Servlets and JSP Technology, and Distributed Programming.

Course Objectives:
The main objective of this course is to

- Introduce basic concepts of Java Programming.
- Exemplify the concept of GUI programming and JDBC
- Demonstrate socket programming. remote objects, and servlet and JSP Technology

Course Contents:

Unit 1: Programming in Java (8 Hrs.)

1.1. Java Architecture, Java Buzzwords, Path and ClassPath variables, Sample Java Program, Compiling and Running Java Programs.
1.2. Arrays, for each loop, Class and Object, Overloading, Access Privileges, Interface, Inner Class, Final and Static Modifiers, Packages, Inheritance, Overriding.
1.3. Handling Exceptions: Try, Catch, Finally, Throws, and Throw keywords, Creating Exception Class
1.4. Concurrency: Introduction, Thread States, Writing Multithreaded Programs, Thread Properties, Thread Synchronization, Thread Priorities
1.5. Working with Files: Byte Stream Classes, Character Stream Classes, Random Access File, Reading and Writing Objects.

Unit 2: User Interface Components with Swing (10 Hrs.)

2.1. Introduction: Concept of AWT, AWT vs Swing, Java Applets, Applet Life Cycle, Swing Class Hierarchy, Component and Containers
2.2. Layout Management: No Layout, Flow layout, Border Layout, Grid Layout, Gridbag Layout, Group Layout.
2.3. GUI Controls: Text Fields, Password Fields, Text Areas, Scroll Pane, Labels, Check Boxes, Radio Buttons, Borders, Combo Boxes, Sliders
2.4. Menu, Menu Item, Icons in Menu Items, Check Box and Radio Buttons in Menu Items, Pop-up Menus, Keyboard Mnemonics and Accelerators, Enabling and Disabling Menu Items, Toolbars, Tooltips
2.5. Option Dialogs, Creating Dialogs, File Choosers, Color Choosers, Internal Frames, Frames, Tables, Trees, and Tables.

Unit 3: Event Handling (4 Hrs.)

3.1. Event Handling Concept, Listener Interfaces, Using Action Commands, Adapter Classes

3.2. Handling Action Events, Key Events, Focus Events, Mouse Event, Window Event, Item Events

Unit 4: Database Connectivity (4 Hrs.)

4.1. JDBC Architecture, JDBC Driver Types, JDBC Configuration, Managing Connections, Statements, Result Set, SQL Exceptions

4.2. DDL and DML Operations using Java, Prepared Statements, Multiple Results, Scrollable Result Sets, Updateable Result Sets, Row Sets and Cached Row Sets, Transactions, SQL Escapes.

Unit 5: Network Programming (5 Hrs.)

5.1. Transmission control Protocol (TCP), User Datagram Protocol (UDP), Ports, IP Address Network Classes in JDK

5.2. Socket programming using TCP, Socket programming using UDP, Working with URL's, Working with URL Connection Class.

5.3. Java Mail API, Sending and Receiving Email

Unit 6: GUI with JavaFX (3 Hrs.)

6.1. Introduction, JavaFX vs Swing, JavaFX Layouts: FlowPane, BorderPane, Hbox, VBox, GridPane

6.2. JavaFX UI Controls: Label, TextField, Button, RadioButton, CheckBox, Hyperlink, Menu, Tooltip, FileChooser.

Unit 7: Servlets and Java Server pages (8 Hrs.)

7.1. Web Container, Introduction to Servlets, Life cycle of servlets, The servlet APIs, Writing Servlet Programs, Reading Form Parameters, Processing Forms, Handling HTTP Request and Response (GET / POST Request), Database Access with Servlets, Handling Cookies and Session.

7.2. Servlet vs JSP, JSP Access Model, JSP Syntax (Directions, Declarations, Expression, Scriplets, Comments), JSP Implicit Objects, Object Scope, Processing Forms, Database Access with JSP.

7.3. Introduction to Java Web Frameworks

Unit 8: RMI and CORBA (3 Hrs.)

8.1 Introduction of RMI, Architecture of RMI, Creating and Executing RMI Applications

8.2 Introduction to CORBA, RMI vs CORBA, Architecture of CORBA, IDL, Simple CORBA Program.

Laboratory Works:

The laboratory work includes writing programs related to basic java programming concepts, Designing GUI, Event Handling, JDBC, Network Programming, Web Programming, and Distributed Programming. They also learn to develop web applications using Java Web Frameworks.

Text Books:

1. Cay S. Horstmann, Core Java Volume I--Fundamentals, Pearson, Eleventh Edition, 2018
2. Cay S. Horstmann, Core Java Volume II-Advance Features, Pearson, Eleventh Edition, 2019
3. Herbert Schildt, Java: The Complete Reference, McGraw-Hill Education, Eleventh Edition, 2018

Reference Book:

1. D.T. Editorial Services, Java 8 Programming Black Book, Dreamtech Press, 2015

Data Warehousing and Data Mining

Course Title: Data Warehousing and Data Mining
Course No: CSC410
Nature of the Course: Theory + Lab
Semester: VII

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course introduces advanced aspects of data warehousing and data mining, encompassing the principles, research results and commercial application of the current technologies.

Course Objective:
The main objective of this course is to provide knowledge of different data mining techniques and data warehousing.

Course Contents:

Unit 1: Introduction to Data Warehousing (5 Hrs.)
Lifecycle of data, Types of data, Data warehouse and data warehousing , Differences between operational database and data warehouse, A multidimensional data model, OLAP operation in multidimensional data model, Conceptual modeling of data warehouse, Architecture of data warehouse, Data warehouse implementation, Data marts, Components of data warehouse, Need for data warehousing ,Trends in data warehousing

Unit 2: Introduction to Data Mining (2 Hrs.)
Motivation for data mining, Introduction to data mining system, Data mining functionalities, KDD, Data object and attribute types, Statistical description of data, Issues and Applications

Unit 3: Data Preprocessing (3 Hrs.)
Data cleaning, Data integration and transformation, Data reduction, Data discretization and Concept Hierarchy Generation, Data mining primitives

Unit 4: Data Cube Technology (4 Hrs.)
Efficient method for data cube computation, Cube materialization (Introduction to Full cube, Iceberg cube, Closed cube, Shell cube), General strategies for cube computation, Attribute oriented induction for data characterization, Mining class comparison, Discriminating between different classes

Unit 5: Mining Frequent Patterns (6 Hrs.)
Frequent patterns, Market basket analysis, Frequent itemsets, closed itemsets, association rules, Types of association rule (Single dimensional, multidimensional, multilevel, quantitative), Finding frequent itemset (Apriori algorithm, FP growth), Generating association rules from frequent itemset, Limitation and improving Apriori, From Association Mining to Correlation Analysis, Lift

Unit 6: Classification and Prediction (10 Hrs.)
Definition (Classification, Prediction), Learning and testing of classification, Classification by decision tree induction, ID3 as attribute selection algorithm, Bayesian classification, Laplace smoothing, Classification by backpropagation, Rule based classifier (Decision tree to rules, rule coverage and accuracy, efficient of rule simplification), Support vector machine, Evaluating accuracy (precision, recall, f-measure), Issues in classification, Overfitting and underfitting, K-fold cross validation, Comparing two classifier (McNemar's test)

Unit 7: Cluster Analysis (8 Hrs.)
Types of data in cluster analysis, Similarity and dissimilarity between objects, Clustering techniques: - Partitioning (k-means, k-means++, Mini-Batch k-means, k-medoids), Hierarchical (Agglomerative and Divisive), Density based (DBSCAN), Outlier analysis

Unit 8: Graph Mining and Social Network Analysis (5 Hrs.)
Graph mining, Why graph mining, Graph mining algorithm (Beam search, Inductive logic programming), Social network analysis, Link mining, Friends of friends, Degree assortativity, Signed network (Theory of structured balance, Theory of status, Conflict between the theory of balance and status), Trust in a network (Atomic propagation, Propagation of distrust, Iterative propagation), Predicting positive and negative links

Unit 9: Mining Spatial, Multimedia, Text and Web Data (2 Hrs.)
Spatial data mining, Spatial data cube, Mining spatial association, Multimedia data mining, Similarity search in multimedia data, Mining association in multimedia data, An introduction to text mining, natural language processing and information extraction, Web mining (Web content mining, Web structure mining, Web usage mining)

Laboratory Works:
The laboratory should contain all the features mentioned in a course, which should include data preprocessing and cleaning, implementing classification, clustering, association algorithms in any programming language, and data visualization through data mining tools.

Text Book:
1. Data Mining: Concepts and Techniques, 3rd ed. Jiawei Han, Micheline Kamber, and Jian Pei. Morgan Kaufmann Series in Data Management Systems Morgan Kaufmann Publishers, July 2011.

Reference Books:
1. Introduction to Data Mining, 2nd ed. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar. Pearson Publisher, 2019.
2. Mining of Massive Datasets by Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, 2014.

Principles of Management

Course Title: Principles of Management
Course No: MGT411
Nature of the Course: Theory
Semester: VII

Full Marks: 80 + 20
Pass Marks: 32 + 8
Credit Hrs: 3

Course Description:
This course contains The Nature of Organizations, Introduction to Management, Evolution of Management Thought, Environmental Context of Management, Planning and Decision Making, Organizing Function, Leadership, Motivation, Communication, Control and Quality Management, Global Context of Management, Management Trends and Scenario in Nepal.

Course Objective:
The basic objective of this course is to give a comprehensive knowledge to students about organization and help them understand the major functions, principles, and techniques of management. The course deals with basic functions like planning, organizing, leading, and controlling with special orientation to modern management practices which are essential to manage business successfully and other organizations.

Course Contents:

Unit 1: The Nature of Organizations (3 Hrs.)

Concept of organization. Organizational goals – concept, purposes, and types. Features of effective organizational goals. Goal formulation – processes and approaches. Goal succession and displacement. Problems of goal formulation. Changing perspectives of organization.

Unit 2: Introduction to Management (3 Hrs.)

Definition, characteristics, and principles of management. Process and functions of management. Managerial hierarchy. Types of managers. Managerial skills and roles. Emerging challenges for management.

Unit 3: Evolution of Management Thought (5 Hrs.)

Introduction, contribution and limitation of Classical theory, Human relations and Behavioural science theories, System theory, Decision theory, Management science theory, and Contingency theory. Emerging management concepts: workforce diversity, outsourcing, knowledge management, learning organization.

Unit 4: Environmental Context of Management (5 Hrs.)

Concept of business environment. Types of business environment – internal and external. Basic components of economic, socio – cultural, political, and technological environments. Social responsibility of business – concept and approaches. Areas of social responsibility. Business ethics – meaning and significance. Emerging business environment in Nepal.

Unit 5: Planning and Decision Making (5 Hrs.)

Concept, types, hierarchy of planning. Process and importance of planning. Strategic planning. Environmental scanning – concept and methods. SWOT analysis. Formulation and

implementation of strategic plans. Quantitative tools for planning. Decision making – definition and approaches. Types of decisions. Decision making under conditions of certainty and uncertainty. Problem solving – concepts, types of problem. Problem solving strategies.

Unit 6: Organizing Function (6 Hrs.)

Concept and principles of organizing. Approaches to organizing – classical, behavioural, and contingency. Process of structuring an organization. Departmentalization – meaning and types. Delegation of authority – meaning, features, advantages, and barriers. Centralization and decentralization – meaning, advantages and disadvantages. Concept of organic and mechanistic views of organization. Types of modern organizational structures – matrix, team, and network.

Unit 7: Leadership & Conflict (3 Hrs.)

Concept and functions of leadership. Leadership styles. Approaches to leadership – trait, behavioral, and situational. Group formation. Types and characteristics of groups. Conflict – meaning and types. Managing conflicts in organization.

Unit 8: Motivation (3 Hrs.)

Concept. Theories of motivation – Need Hierarchy, and Motivation-Hygiene. Reward system to motivate performance. Motivation through employee participation – quality of work life, and self- managed teams.

Unit 9: Communication (3 Hrs.)

Concept, structure, and process. Types of communication – formal and informal. Interpersonal and nonverbal communication. Barriers to effective communication. Enhancing effective communication.

Unit 10: Control and Quality Management (3 Hrs.)

Concept, process, and types of control systems. Characteristics of effective control system. Quality control systems – concept of quality. Total Quality Management (TQM) – concept and tools. Deming management – principles and techniques.

Unit 11: Global Context of Management (3 Hrs.)

Concept of globalization. Methods of globalization. Effects of globalization. Multinational companies – meaning, types, advantages, and disadvantages.

Unit 12: Management Trends and Scenario in Nepal (3 Hrs.)

Growth of business sector in Nepal. Major industries in Nepal – manufacturing, export – oriented, import-substitution, and service sector. Existing management practices and business culture. Major problems of businesses in Nepal.

Recommended Books:

1. Griffin, Ricky W., ***Management***, AITBS Publishers and Distributors, Delhi.
2. Hitt, Michael A., J. Black, Stweart, and Porter, Lyman W., ***Management,*** Pearson, India.
3. Robbins, Stephen P., and Coulter, Mary, ***Management***, Prentice-Hall of India, New Delhi.

Project Work

Course Title: Project Work
Course No: CSC412
Nature of the Course: Project
Semester: VII

Full Marks: 80 + 20
Pass Marks: 32+ 8
Credit Hrs: 3

Course Description: This course covers theoretical and practical concepts needed to develop a real world software system. The course focuses on enabling students with the skills related to software development. The course includes practicing the abilities pertaining to the planning, analysis, design, implementation and testing of software applications.

Course Objectives: The objective of this course is to develop theoretical and practical skills needed to develop real world software applications using different software development tools and techniques.

Course Details:

Nature of Project:

The project work should include development of an application/system software. Students are highly recommended to implement relevant algorithms, theories and concepts that they have learned. The project should be practiced by following analysis, design, implementation and testing phases. The project can be done in group with at most **three members** in each group. For the implementation of the project, students can choose appropriate language technologies as per comfort and skills. While implementing the project, students should be able to write their own program modules rather than relying on predefined APIs or Plugins except in some unavoidable circumstances.

Phases of Project:

The following are the phases of project work:

1. **Proposal Submission and Presentation:** Students must submit and present project proposal on 3rd to 4th week of start of the seventh semester.

2. **Mid-Term:** Students must submit progress report and defend midterm progress of their project work on the 10th to 11th week of the seventh semester.

3. **Final Submission:** Students must submit and defend the project work during last week of the seventh semester but before final board examination. The final defense will include a viva voice followed by a demonstration of the project. The final defense will be conducted by an evaluation committee with an external from the university. Students must have to submit the project final report to their respective department of college/campus before at least 10 days of final defense date. The report should be

submitted in standard format as prescribed. The hard/soft copy of report should be made available to the external before a week of presentation date.

Provision of Supervision:

The supervisor should be a regular faculty of the campus/college. The role of supervisor is to provide appropriate guidance to the students throughout the project. A supervisor can supervise at most **three groups** of the project in a section. The supervisor should rigorously supervise, monitor, feedback and evaluate the project groups under his/her supervision.

Evaluation Scheme:

1. **Proposal Defense -** 10% Marks of 100 (2 Marks Head/Program Coordinator + 6 Marks Supervisor + 2 Marks Internal Examiner)
2. **Midterm -** 20% Marks of 100 (3 Marks Head/Program Coordinator + 14 Marks Supervisor + 3 Marks Internal Examiner)
3. **Final Defense -** 70% Marks of 100 (5 Marks Head/Program Coordinator + 40 Marks Supervisor + 5 Marks Internal Examiner + 20 Marks External Examiner)

The evaluation committee and evaluation criteria should be as follow;

a. Evaluation committee

- HOD/Coordinator of the campus/college
- Project Supervisor (Regular faculty of the campus/college)
- Internal Examiner (Regular faculty of the campus/college)
- External Examiner (Allocated from university at the final defense)

b. Marks Allocation:

- Head / Program Coordinator – 10
- Project Supervisor – 60
- Internal Examiner – 10
- External Examiner – 20

Total – 100

c. Focus of the evaluation:

- Presentation Skills
- Level of Work and Understanding(Level of Analysis, Design, Implementation, Testing, Result Analysis done for the project)
- Project Report
- Viva/Question Answer
- Demonstration of the project
- Teamwork and Contribution

Roles and Responsibilities:

- **HOD/Coordinator:** The role of HOD/Coordinator is to coordinate with supervisor, internal examiner, external examiner and students. The HOD/Coordinator should monitor the students' project progress in coordination with the respective supervisors. The HOD/Coordinator is responsible for arranging the proposal defense, midterm and final defense. The HOD/Coordinator should participate and evaluate proposal defense, midterm, and final defense.

- **Project Supervisor:** The role of project supervisor is to supervise students' project throughout the semester. The supervisor should rigorously feedback and guide the students. Supervisor is to participate and evaluate proposal defense, midterm, and final defense. The supervisor should monitor the progress of projects under supervision.

- **Internal Examiner:** The role of internal examiner is to evaluate the students' project during different evaluation phases of the project. The internal examiner should participate and evaluate proposal defense, midterm, and final defense.

- **External Examiner:** The role of external examiner is to evaluate the students' project during final defense evaluation. The examiner should participate and evaluate viva voce and demonstration session during the final defense.

- **Student:** The role and responsibilities of student include development of the project, project report preparation, and defending the project work throughout each evaluation phases. Despite of project work being group work, each student should have equal role and responsibilities in the project. Each student will be evaluated individually so student should be able to demonstrate his/her contribution in the project work individually. Students should maintain a log visits with their supervisors at different dates during their work. The log should include technical feedbacks from their supervisors.

Report Contents:

1. **Prescribed content flow for the project proposal**

    1. Introduction
    2. Problem Statement
    3. Objectives
    4. Methodology
        a. Requirement Identification
            i. Study of Existing System / Literature Review
            ii. Requirement Analysis
        b. Feasibility Study
            i. Technical
            ii. Operational
            iii. Economic
            iv. Schedule (Gantt chart showing the project timeline)

c. High Level Design of System (Methodology of the proposed system/ Flow Charts/ Working Mechanism of Proposed System / Description of Algorithms)

5. Expected Outcome
6. References

2. Prescribed content flow for the project report

1. Cover & Title Page
2. Certificate Page
   i. Supervisor Recommendation
   ii. Head / Program Coordinator, Supervisor, Internal and External Examiners' Approval Letter
3. Acknowledgement
4. Abstract Page
5. Table of Contents
6. List of Abbreviations, List of Figures, List of Tables
7. Main Report
8. References
9. Bibliography (if any)
10. Appendices (Screenshots + Snippets of major source code components + Log of visits to supervisor)

3. Prescribed chapters in the main report

1. Chapter 1: Introduction

1.1. Introduction
1.2. Problem Statement
1.3. Objectives
1.4. Scope and Limitation
1.5. Development Methodology
1.6. Report Organization

2. **Chapter 2: Background Study and Literature Review**

2.1. Background Study (Description of fundamental theories, general concepts and terminologies related to the project)
2.2. Literature Review (Review of the similar/relevant projects, theories and results by other researchers)

3. Chapter 3: System Analysis

3.1. System Analysis
   3.1.1. Requirement Analysis
      i. Functional Requirements (Illustrated using use case diagram/use case descriptions)
      ii. Non Functional Requirements
   3.1.2. Feasibility Analysis
      i. Technical

ii. Operational
iii. Economic
iv. Schedule

3.1.3. Analysis (May be Structured or Object Oriented)

If structured approach:

- Data modelling using ER Diagrams
- Process modelling using DFD

If object oriented approach:

- Object modelling using Class and Object Diagrams,
- Dynamic modelling using State and Sequence Diagrams
- Process modelling using Activity Diagrams

4. Chapter 4: System Design

4.1. Design (May be Structured or Object Oriented as per the approach followed in analysis chapter)

If structured approach:

- Database Design: Transformation of ER to relations and normalizations
- Forms and Report Design
- Interface and Dialogue Design

If object oriented approach:

- Refinement of Class, Object, State, Sequence and Activity diagrams
- Component Diagrams
- Deployment Diagrams

4.2. Algorithm Details

5. Chapter 5: Implementation and Testing

5.1. Implementation

5.1.1. Tools Used (CASE tools, Programming languages, Database platforms)

5.1.2. Implementation Details of Modules (Description of classes/procedures/functions/methods/algorithms)

5.2. Testing

5.2.1. Test Cases for Unit Testing

5.2.2. Test Cases for System Testing

5.3. Result Analysis

6. Chapter 6: Conclusion and Future Recommendations

6.1. Conclusion

6.2. Future Recommendations

While writing above chapters students should avoid basic definitions. They should relate and contextualize the above mentioned concepts with their project work.

Citation and Referencing:

The listing of references should be listed in the references section. The references contain the list of articles, books, urls, etc. that are cited in the document. The books, articles, and others that are studied during the study but are not cited in the document can be listed in the bibliography section. The citation and referencing standard should be IEEE referencing standard. The text inside the document should be cited in IEEE style. The IEEE referencing standard can be found in the web.

Report Format Standards:

A. Page Number

The pages from certificate page to the list of tables/figures/abbreviations/approvals should be numbered in roman starting from i. The pages from chapter 1 onwards should be numbered in numeric starting from 1. The page number should be inserted at bottom, aligned center.

B. Page Size and Margin

The paper size must be a page size corresponding to A4. The margins must be set as

- Top = 1 in (2.54 cm)
- Bottom = 1 in (2.54 cm)
- Left = 1.25 in (3.17 cm)
- Right = 1 in (2.54 cm)

C. Paragraph Style

- All paragraphs must be justified and have spacing of 1.5.

D. Text Font of Document

- The contents in the document should be in Times New Roman font
- The font size in the paragraphs of document should be 12

E. Section Headings

- Font size for the headings should be 16 for chapter headings, 14 for section headings, 12 for sub-section headings. All the headings should be bold faced.

F. Figures and Tables

- Position of figures and tables should be aligned center. The figure caption should be centred below the figure and table captions should be centred above the table. All the captions should be of bold face with 12 font size.

Final Report Binding and Submission:

No of Copies: 3 (College Library + Self + Dean Office)

Look and Feel: Golden Embracing with Black Binding

A final approved signed copy of the report should be submitted to the Dean Office, Exam Section, Institute of Science and Technology, Tribhuvan University

Text Book: None

Information Retrieval

Course Title: Information Retrieval
Course No: CSC413
Nature of the Course: Theory + Lab
Semester: VII

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course familiarizes students with different concepts of information retrieval techniques mainly focused on clustering, classification, search engine, ranking and query operations techniques.

Course Objective:
The main objective of this course is to provide knowledge of different information retrieval techniques so that the students will be able to develop information retrieval engine.

Course Contents:

Unit 1: Introduction to IR and Web Search (2 Hrs.)
Introduction, Data vs Information Retrieval, Logical view of the documents, Architecture of IR System, Web search system, History of IR, Related areas

Unit 2: Text properties, operations and preprocessing (5 Hrs.)
Tokenization, Text Normalization, Stop-word removal, Morphological Analysis, Word Stemming (Porter Algorithm), Case folding, Lemmatization, Word statistics (Zipf's law, Heaps' Law), Index term selection, Inverted indices, Positional Inverted index, Natural Language Processing in Information Retrieval, Basic NLP tasks – POS tagging; shallow parsing

Unit 3: Basic IR Models (5 Hrs.)
Classes of Retrieval Model, Boolean model, Term weighting mechanism – TF, IDF, TF-IDF weighting, Cosine Similarity, Vector space model , Probabilistic models (the binary independence model ,Language models; · KL-divergence; · Smoothing), Non-Overlapping Lists, Proximal Nodes Mode

Unit 4: Evaluation of IR (2 Hrs.)
Precision, Recall, F-Measure, MAP (Mean Average Precision), (DCG) Discounted Cumulative Gain, Known-item Search Evaluation

Unit 5: Query Operations and Languages (4 Hrs.)
Relevance feedback and pseudo relevance feedback, Query expansion (with a thesaurus or WordNet and correlation matrix), Spelling correction (Edit distance, K – Gram indexes, Context sensitive spelling correction), Query languages (Single-Word Queries, Context Queries, Boolean Queries, Structural Query, Natural Language)

Unit 6: Web Search (6 Hrs.)
Search engines (working principle), Spidering (Structure of a spider, Simple spidering algorithm, multithreaded spidering, Bot), Directed spidering (Topic directed, Link directed), Crawlers

(Basic crawler architecture), Link analysis (HITS, Page ranking), Query log analysis, Handling "invisible" Web – Snippet generation, CLIR (Cross Language Information Retrieval)

Unit 7: Text Categorization (4 Hrs.)
Categorization, Learning for Categorization, General learning issues, Learning algorithms: Bayesian (naïve), Decision tree, KNN, Rocchio)

Unit 8: Text Clustering (4 Hrs.)
Clustering, Clustering algorithms (Hierarchical clustering, k-means, k-medoid, Expectation maximization (EM), Text shingling)

Unit 9: Recommender System (3 Hrs.)
Personalization, Collaborative filtering recommendation, Content-based recommendation

Unit 10: Question Answering (5 Hrs.)
Information bottleneck, Information Extraction, Ambiguities in IE, Architecture of QA system, Question processing, Paragraph retrieval, Answer processing

Unit 11: Advanced IR Models (5 Hrs.)
Latent Semantic Indexing (LSI), Singular value decomposition, Latent Dirichlet Allocation, Efficient string searching, Knuth – Morris – Pratt, Boyer – Moore Family, Pattern matching

Laboratory Works:
The laboratory should contain all the features mentioned in a course. The Laboratory work should contain at least following tasks

1. Program to demonstrate the Boolean Retrieval Model and Vector Space Model
2. Tokenize the words of large documents according to type and token
3. Program to find the similarity between documents
4. Implement Porter stemmer
5. Build a spider that tracks only the link of nepali documents
6. Group the online news onto different categorize like sports, entertainment, politics
7. Build a recommender system for online music store

Recommended Books:

1. Modern Information Retrieval, Ricardo Baeza-Yates, Berthier Ribeiro-Neto.
2. Information Retrieval; Data Structures & Algorithms: Bill Frakes

Database Administration

Course Title: Database Administration
Course No: CSC414
Nature of the Course: Theory + Lab
Semester: VII

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course familiarizes students with different concepts of database administration including DBA Roles and responsibilities, tablespace and storage management, DB backup, restoration and recovery, security, multitenant, and performance tuning.

Course Objective:
The main objective of this course is to provide knowledge of different concepts of database administration so that the students will be able handle

- Install DBMS Software
- Create and manage databases
- Manage backup and recovery
- Control user security
- Managing database performance and multitenant architecture

Course Contents:

Unit 1: Introduction (5 Hrs.)
DBA Roles and Responsibilities; Database Architecture; ORACLE logical and physical database structure; Memory and Process Structure, SQLPLUS Overview, creating a database;

Unit 2: Tablespace and Storage management (5 Hrs.)
Working with Tablespaces and Data Files, Creating and adding tablespace and datafiles, Managing Control Files, Online Redo Logs and Archive logs; Multiplexing;

Unit 3: Managing Database Objects (8 Hrs.)
Working with Tables and Constraints; Working with Indexes, Views, Synonyms, and Sequences; Partitioning and Materialized Views, Introduction of PLSQL, Stored Procedure, Functions, Trigger, package.

Unit 4: Database Backup, Restore, and Recovery (10 Hrs.)
Backup and Recovery Overview, Database backup, restoration and recovery, defining a backup and recovery strategy, Backup and Recovery options; Data Dump; User-Managed Backup and Recovery; Configuring RMAN; RMAN Backups, Restore and Recovery; High Availability Features; Oracle Data Guard; Flashback operations.

Unit 5: Database Security and Auditing (7 Hrs.)
Database Security and Auditing; Database Authentication Methods; Database Authorization Methods; Data Encryption Techniques, Virtual Private Database; Managing Users and Security: Profiles, managing users, managing privileges, managing roles,

Unit 6: Multitenant Database Architecture (5 Hrs.)
Understanding the Multitenant Architecture, Pluggable Architecture; Creating CDB; Administrating Root Container; Creating Pluggable Databases (PDBs) within a CDB; Administrating Pluggable Databases; Backup and Recovery in multitenant Environment; Databases in the Cloud

Unit 7: Database Tuning (5 Hrs.)
Tuning Application Design; Tuning Memory Usage; Tuning Data Access; Tuning Data Manipulation; Reducing Network Traffic; Using Automatic Workload Repository(AWR); Automatic Database Diagnostic Monitor(ADDM), Tuning SQL; SQL Tuning Advisor, Performance Tuning in a Multitenant Environment; Distributed Databases and Networking Tool

Laboratory Works:
The laboratory work should include all the concepts mentioned in the course using any appropriate DBMS system.

Recommended Books:

1. Pro Oracle Database 18c Administration: Manage and Safeguard Your Organization's Data, Michelle Malcher and Darl Kuhn, Third Edition.
2. Oracle Database 12c DBA Handbook, Manage a Scalable, Secure Oracle Enterprise Database Environment, Bob Bryla.
3. Oracle DBA Mentor: Succeding as an Oracle Database Administrator, Brian Peasland.

Software Project Management

Course Title: Software Project Management
Course No: CSC415
Nature of the Course: Theory + Lab
Semester: VII

Full Marks: 60+20+20
Pass Marks: 24+8 + 8
Credit Hrs: 3

Course Description:
This course familiarizes students with different concepts of software project management mainly focusing on project analysis, scheduling, resource allocation, risk analysis, monitoring, control and software configuration management.

Course Objectives:
The main objective of this course is to provide knowledge of different concepts of software project management so that students will be able to understand and handle various projects including very high risky and innovative projects using different project management skills.

Course Contents:

Unit 1: Introduction to Software Project Management (5 Hrs.)
Software engineering problem and software product, software product attributes, Definition of a Software Project (SP), SP Vs. other types of projects activities covered by SPM, categorizing SPs, Project management cycle, SPM framework, types of project plan.

Unit 2: Project Analysis (8 Hrs.)
Introduction, strategic assessment, technical assessment, economic analysis: Present worth, future worth, annual worth, internal rate of return (IRR) method, benefit-cost ratio analysis, including uniform gradient cash flow and comparison of mutually exclusive alternatives.

Unit 3: Activity Planning and Scheduling (7 Hrs.)
Objectives of activity planning, Work breakdown structure, Bar chart, Network planning model: Critical path method (CPM), Program evaluation and review technique (PERT), Precedence diagramming method (PDM), Shortening project duration, Identifying critical activities.

Unit 4: Risk Management (4 Hrs.)
Introduction, nature and identification of risk, risk analysis, evaluation of risk to the schedule using Z-values.

Unit 5: Resource Allocation (4 Hrs.)
Identifying resource requirements, resource allocation, resource smoothening and resource balancing.

Unit 6: Monitoring and Control (4 Hrs.)
Introduction, collecting data, visualizing progress, cost monitoring, earned value analysis, project control.

Unit 7: Managing Contracts and people (5 Hrs.)
Introduction, types of contract, stages in contract, placement, typical terms of a contract, contract management, acceptance, Managing people and organizing terms: Introduction, understanding behavior, organizational behavior: a back ground, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures, conclusion, further exercises.

Unit 8: Software quality assurance and testing (5 Hrs.)
Testing principles and objectives, test plan, types and levels of testing, test strategies, program verification and validation, software quality, SEI-CMM,SQA activities, QA organization structure, SQA plan.

Unit 9: Software Configuration Management (3 Hrs.)
Introduction, need, basic configuration, management function, baseline, configuration management responsibilities.

Laboratory / Project Work:
Students should prepare a project report using different concepts of software project management. The project can be done in groups with at most four members in each group. Each group can select a case study and apply the concepts of software project management focusing on project analysis, scheduling, risk analysis, resource allocation, testing.

Text Book:
1. Software Project Management by Bob Hughes and Mike Cotterell, Latest Publication

Reference Books:
1. "Introduction to Software Project Management & Quality Assurance", Darrel Ince, I. Sharp, M. Woodman, Tata McGraw Hill
2. "Software Project Management: A Unified Framework", Walker Royce, Addison-Wesley, An Imprint of Pearson Education
3. "Managing the Software Process", Watts S. Humphrey, Addison-Wesley, An Imprint of Pearson Education

Network Security

Course Title: Network Security
Course No: CSC416
Nature of the Course: Theory + Lab
Semester: VII

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course covers the fundamental concepts of network security protocols, wireless security concepts, basics of security in cloud and IoT.

Course Objectives:
The main objective of this course is to provide knowledge of network security so that students will be able to implement a secure network architecture using different security protocols and technologies.

Course Contents:

Unit 1: Computer Network Security Fundamentals (3 Hrs.)
1.1. Introduction
1.2. Securing the Computer Network
1.3. Forms of Protection
1.4. Security Standards

Unit 2: User Authentication (4 Hrs.)
2.1. Remote User-Authentication Principles
2.2. Remote User-Authentication Using Symmetric Encryption
2.3. Remote User-Authentication Using Asymmetric Encryption
2.4. Federated Identity Management

Unit 3: Transport Level Security (6 Hrs.)
3.1. Web Security
3.2. Transport Layer Security (TLS)
3.3. HTTPS
3.4. Secure Shell (SSH)

Unit 4: Wireless Network Security (6 Hrs.)
4.1. Wireless Security
4.2. Mobile Device Security
4.3. IEEE 802.11 Wireless LAN Overview
4.4. IEEE 802.11i Wireless LAN Security

Unit 5: Electronic Mail Security (8 Hrs.)
5.1. Internet Mail Architecture
5.2. E-mail Formats
5.3. Email Threats and Comprehensive Email Security
5.4. S/MIME

5.5. Pretty Good Privacy (PGP)
5.6. DNSSEC
5.7. DNS-Based Authentication of Named Entities
5.8. Sender Policy Framework
5.9. Domain Keys Identified Mail
5.10. Domain-Based Message Authentication, Reporting, and Conformance

Unit 6: IP Security (6 Hrs.)
6.1. IP Security Overview
6.2. IP Security Policy
6.3. Authentication Header
6.4. Encapsulating Security Payload
6.5. Security Associations
6.6. Internet Key Exchange

Unit 7: Network Endpoint Security (5 Hrs.)
7.1. Firewalls
7.2. Intrusion Detection System
7.3. Malicious Software
7.4. Distributed Denial of Service Attacks

Unit 8: Cloud and Internet of Things (IOT) Security (7 Hrs.)
8.1. Cloud Computing
8.2. Cloud Security Concepts
8.3. Cloud Security Risks and Countermeasures
8.4. Cloud Security as a Service
8.5. Open-source Cloud Security Module
8.6. Internet of Things (IoT)
8.7. IoT Security Concepts and Objectives
8.8. Open-source IoT Security Module

Laboratory Works:
The laboratory work includes implementation and simulation of Network Security Protocols, Intrusion Detection Systems, DDoS Attacks, Cloud Security and IoT Security Systems.

Text Books:

1. William Stallings, Cryptography and Network Security: Principles and Practice, 8th Edition, Pearson, 2020
2. Joseph Migga Kizza, Computer Network Security Fundamentals, 5th Edition, Springer, 2020

Reference Books:

1. William Stallings, Network Security Essentials: Applications and Standards, 6th Edition, Pearson, 2017
2. Sarhan M. Musa, Network Security and Cryptography: A Self-Teaching Introduction, Mercury Learning and Information LLC, 2018

Digital System Design

Course Title: Digital System Design
Course No: CSC417
Nature of the Course: Theory + Lab
Semester: VII

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:
This course contains the introductory part of combinational Logic along with the clear concepts of K-Maps and Quine- Mc Cluskey Method. It also introduces sequential networks with flip flops and FSM. Another concept includes FPGA and VHDL and also testing and verification.

Course Objective:
The course objective is to provide ample knowledge on digital design process and to enhance the knowledge of hardware design in real scenarios.

Course Content:

Unit 1	Introduction of logic design, Digital System and Integration, Electronic Design Automation, IC Manufacturing, Logic Families, IC Design Techniques, IC characteristics: fan-out, power dissipation, propagation delay, and noise margin of TTL and CMOS integrated circuit logic devices	5Hrs
Unit 2	Review of Boolean Algebra and Combinational Logic, Canonical Form, Shannon's Expansion, Minterms, Maxterms, Prime Implication	4 Hrs.
Unit 3	Combinational Network Design: K – Map, Synthesis and Minimization with K – Maps (AND – OR, OR-AND, NAND-NAND, NOR-NOR), Standard Combinational Networks	5 Hrs.
Unit 4	Quine- Mc Cluskey Method, Minimization of Boolean expression with Quine-Mc Cluskey method, PROMs and EPROMs, Programmable Array Logic (PAL), Programmed Logic Array (PLA), Gate Arrays, Programmable Gate Array, Full Custom Design	7 Hrs.
Unit 5	Sequential Networks: Transition from combinational to sequential network, Direct command flip flop, Initialization of sequential network, Level Enabled Flip-Flops, Synchronization of sequential networks, Edge-triggered Flip Flops, Synchronous and Asynchronous Signals	8 Hrs.
Unit 6	Sequential Networks as Finite State Machines: Standard Models, Realization with ASM Diagrams, Synthesis of Synchronous FSM, Time	6 Hrs.

	Behavior of Synchronous FSM, Design of input forming, Logic and Output Forming Logic of state machine.	
Unit 7	Field Programmable Gate Arrays (FPGA), VHDL and its use in programmable logic devices (PLDs) like FPGA	4 Hrs.
Unit 8	Testing and Verification, Testing Logic Circuits, Combinational gate testing, Combinational network testing, Sequential Testing, Test vector generation, fault, fault model and fault detection, SA0, SA1, Design for Testability	6 Hrs.

Laboratory Works:
Laboratory Exercise should cover the implementation of combinational and sequential circuits, FSM, FPGA and VHDL. Testing and verification of circuits.

Project Work:
Design a sample of tool kit by using the design concepts of the course.

Reference Books:

1. Giuliano Donzellini, Luca Oneto, Domenico Ponta, Davide Anguita, Introduction to Digital System Design, Springer
2. Wolf, Wayne, Modern VLSI Design-System on Silicon, Third Edition, Pearson
3. Comer, David J. Digital Logic State Machine Design, Third Edition, Oxford University Press
4. Ashenden, Peter J, The Student's Guide to VHDL, Morgan Kaufman

International Marketing

Course Title: International Marketing
Course No: MGT418
Nature of the Course: Theory
Semester: VII

Full Marks: 80 + 20
Pass Marks: 32 + 8
Credit Hrs: 3

Course Objective:
This course aims to provide an understanding of the process and dynamism of marketing practiced across the international markets.

Course Description:
This is a comprehensive course that deals on the process and challenges of international marketing. The course includes topics such as scope and challenges of international marketing, dynamism in international trade, the cultural, political, and legal international environment, global marketing strategies, regional and multinational trade arrangements, and structure and dynamism in Nepal's international trade.

Course Contents:

Unit 1. Introduction (6 Hrs.)
Concept and growth of international marketing. International marketing tasks. Stages of international marketing involvement. Strategic orientations in international marketing. The dynamism in international trade – trade barriers, balance of payments, protectionism, tariffs, quotas, and embargoes. Movements against trade restrictions – GATT and WTO. Regional trading blocks.

Unit 2. International Marketing Environment (10 Hrs.)
Cultural environment: Concept and origins of culture. Elements of culture. Cultural barriers in international trade. Importance of international cultural knowledge and cultural change in marketing. Political environment: Sovereignty of nations. Political risks of international business. Political vulnerability assessment and risk minimization strategies. Legal environment: Bases of legal systems. Jurisdictions in international legal disputes and dispute resolution methods.

Unit 3: International Marketing Research Global Marketing Information System (8 Hrs.)
Concept and Scope of international marketing research. Process of research – problem identification and research objectives. Concept and components of marketing information system, sources of global marketing information.

Unit 4: International Marketing Management (11 Hrs.)
Product development for international markets – quality, green marketing, and adaptation issues. Marketing opportunities in services. Challenges of managing brands globally. International marketing channels – distribution patterns in international markets. Marketing intermediaries and choice factors. Communications – Integrated marketing communications in international marketing. International advertising goals and strategy. International pricing – approaches to international pricing, price escalation and its effects. Transfer pricing strategy.

Unit 5: Nepal's International Trade (10 Hrs.)

Structural dynamism in Nepal's foreign trade. Import and export sources. Import and export procedures and documentations. Institutional mechanism for international trade – Public, private, and non-governmental agencies for trade and export promotions. Key problems in Nepal's international trade. SAPTA and SAFTA.

Recommended Books:

1. Cateora, Philip, John Graham, and Prasant Salwan, International Marketing, Tata McGraw Hill.
2. Terpstra, Vern and Ravi Sarathy, International Marketing, Dryden Press.
3. Jain, Subhash, International Marketing Management, CBS Publications.