

**Course Title: Project II (2 Cr.)**  
**Course Code: CAPJ356**  
**Year/Semester: III/VI**  
**Class Load: 4 Hrs. / Week (Practical: 4 Hrs.)**

### Course Description

To develop small scale project based on the application development platforms and tools (JAVA, visual c++, PHP , Python or plate form of any current trend. This course provides practical skill based knowledge.

### Course objectives

The objectives of this course are to provide project management skills (developing, implementing, managing collaboration) and to learn working as a team. The student will also learn about formulating project documentation.

### Course Contents

<b>Unit 1: Project Ideas and proposal guidance</b>	<b>4</b>
1.1 Project concept and Scope	
1.2 Proposal writing techniques	
<b>Unit 2: Application Development</b>	<b>8</b>
2.1 Object oriented programming	
2.2 Frameworks and APIs	
2.3 Programming design patterns	
2.4 Data collection for project	
2.5 Application of GPUS	
<b>Unit 3: Project management, team work and collaboration</b>	<b>8</b>
3.1 Project management techniques	
3.1.1 Develop project management plan	
3.1.2 Project implementation, monitor and control	
3.2 Collaborative development environment	
3.2.1 Communications planning process	
3.2.2 Organizing and conducting effective meeting,	
<b>Unit 4: Project Guidance</b>	<b>5</b>
<b>Unit 5: Project work</b>	<b>30</b>



## Unit 6: Project documentation guidance

5

- 4.1 documentation format
- 4.2 Table writing format
- 4.3 Figure writing format
- 4.4 Writing equation
- 4.5 References and citation techniques
- 4.6 Abstract writing

### Reference Books:

1. The Project Manager's Guide to Software Engineering's Best Practices, M. C. Christensen and R.H. Thayer, IEEE computer Society
2. Angelika H. Hofmann, " Scientific Writing and Communication: Papers, Proposals, and Presentations Oxford University Press; 3 edition (November 17, 2016)



# Tribhuvan University

Faculty of Humanities and Social Sciences

## Bachelor of Computer Application (BCA)

**Course Title: Project II**

**Course Code: CAPJ356**

**Credit Hours: 2 Cr.**

**Year/Sem.: III/VI**

**Class Load: 4 Hrs./Week (Practical: 4Hrs)**

**FM: 100/ PM: 40**

**Course Description:** This is fully practical course and expects the practical implementation of the concept learnt by students during first three years of their study. However, it should not be limited to the boundary of syllabus. So, the students can go beyond this and make their project work more realistic and technically sophisticated.

**Course Objectives:** The general objectives of this project work are to make student able in implementing concepts learnt by sixth semester so that they will be able to develop applications of their own choice. The specific objectives are to make students able to:

- Lead a software project development
- Use CASE tools
- Implement algorithms to solve problems
- Write programs and improve programming skill
- Write test cases for software testing and improve QA skill
- Improve problem solving skill
- Improve report writing skill
- Improve presentation skill

### **Thematic Details:**

**Nature of Project:** This is an academic project focused on development of computer applications. Although the students can work in group of at most two members (justifying the individual effort in project), students are encouraged to develop project individually. Students should be encouraged to develop web based, mobile based or desktop based applications using the language technologies of their expertise and comfort. Students can develop the applications using database operations and sophisticated algorithms. The students can rely on the appropriate language technologies that they have learnt till sixth semester, however it is not limited. Students should use appropriate CASE tools. Students may work on projects like Web applications, Information systems, E-Commerce Portals, Game applications etc. While implementing the project, students should be encouraged to write their own modules rather than relying on APIs or Plugins (except in some unavoidable circumstances). The application/system developed should contains reporting and other related advanced features (Decision making, Business Intelligence, based on algorithms or any appropriate statistical tools) in addition to CRUD operations. It should be bit more sophisticated than the project done in fourth semester. Significant amount of literatures/papers has to be reviewed and included in the report.

### **Phases of the Project:**

The following are the three phases which should have to go through:

1. **Proposal submission and defense:** Students must submit and present project proposal within 20 days from their first class of the sixth semester.
2. **Mid-Term defense:** Students must submit progress report and defend midterm progress of their project work in the 12<sup>th</sup> week of the sixth semester.

3. **Final submission and defense:** Students must submit and orally defend the project work during last week of the sixth semester, before final board examination. Students must have to submit the project final report to their respective department before 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 expert before a week of presentation date. The final presentation will be followed by the demonstration session, where students have to illustrate/simulate the project. A viva-voce will be conducted by evaluation committee.

**Focus of the Study:** Each student should have equal participation in every phase of the project. The students should focus on the following different software development phases during the development of their project work:

1. Problem Identification
2. System Analysis
  - a. Feasibility study
  - b. System Requirement specification (SRS)
3. System Design
  - a. Architecture Design
  - b. Interface Design
  - c. Database/Procedure/Algorithm Design
4. Implementation and Testing

**Provision of Supervision:** There should be a regular faculty of the campus/college assigned as a supervisor. The role of supervisor is to guide the students throughout the project and provide constructive suggestions. A supervisor can supervise at most four groups of the project in a class section. The supervisor should rigorously supervise, monitor and feedback the project groups under supervision.

#### **Evaluation Scheme:**

- a. Term wise marks distribution:

**First Stage (Proposal Defense)** of 10% of total marks based on project proposal and presentation.

**Second Stage** of 70% of total marks based on:

- **Work done** 50% (System analysis and design, implementation, understanding of methods used in project, ability to identify problems, amount of work performed)
- **Documentation** 20% (Report organization, writing style, completeness of report, readability, organization and analysis of data and results)

**Third Stage (Viva-voce)** of 20% of total marks based on presentation, project demonstration and viva-voce. Each student must present about the project followed by the demonstration of project developed. The project should be ready to run for the demo session.

The 10 marks (first stage of evaluation) will be evaluated by the research committee formed by HoD/Coordinator as a part of proposal defense. The 70 marks (second stage of evaluation) will be evaluated by the supervisor and internal examiner as a part of midterm defense and final defense. Out of 70 marks, the supervisor will evaluate for 50 marks and internal examiner will evaluate for 20 marks. The remaining 20 marks (third stage of evaluation) will be evaluated by the external examiner from the university.

Out of 100 marks, the 80 marks will be considered as internal assessment while the 20 marks will be considered as external assessment. Individual student in the project should get passed in each of the internal and external assessments separately. Any student failing to pass each of the assessments will be counted as fail.



- b. Evaluation committee
  - Project Supervisor
  - HoD/Coordinator
  - Internal Examiner (Regular Faculty)
  - External Examiner
- c. Focus of the evaluation
  - Presentation skills
  - Viva/Question answer
  - Project demonstration
  - Project work
  - Level of Work completed

### **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
    - ii. Literature Review
    - iii. Requirement Analysis
  - b. Feasibility Study
    - i. Technical
    - ii. Operational
    - iii. Economic
  - c. High Level Design of System (Methodology of the proposed system/ Flow Chart/Working Mechanism of Proposed System / Description of Algorithms)
5. Gantt Chart (showing the project timeline)
6. Expected outcome
7. References

#### **2. Prescribed content flow for the project report**

1. Cover and Title page
2. Certificate
3. Abstract
4. Acknowledgement
5. Table of contents
6. List of abbreviations, list of figures, list of tables
7. Main report (details below)
8. Appendices (screen shots, source code, supervisors visit log sheet)
9. References
10. Bibliography (if any)

### 3. Prescribed chapters in the main report

#### 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

#### 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 projects, theories done by other researchers)

#### Chapter 3: System Analysis and Design

##### 3.1 System Analysis (Structured Approach/Object Oriented Approach)

- 3.1.1 Requirement Analysis
  - i. Functional requirements (illustrate using Use-case diagram/Use-case description)
  - ii. Non-functional requirements
- 3.1.2 Feasibility Analysis (Technical, operational, economic)

##### System Modelling (Structured Approach/Object Oriented Approach)

Structured Approach	Object Oriented Approach
3.1.3 Data modelling: ER Diagram	3.1.3 Object Modelling: Object & Class Diagram
3.1.4 Process Modelling: DFD	3.1.4 Dynamic Modelling: State & Sequence diagram
	3.1.5 Process modelling: Activity Diagram

##### 3.2 System Design (Structured Approach/Object Oriented Approach)

Structured Approach	Object Oriented Approach
3.2.1 Architectural design	3.2.1 Refinement of Classes and Object
3.2.2 Database Schema design	3.2.2 Component diagram
3.2.3 Interface design (UI/UX)	3.2.3 Deployment diagram
3.2.4 Physical DFD	

##### 3.3 Algorithm details (if used)

#### Chapter 4: Implementation and Testing

##### 4.1 Implementation

- 4.1.1 Tools used (CASE tools, programming languages, database platforms)
- 4.1.2 Implementation details of modules (description of procedures/ functions/ classes/ methods)

##### 4.2 Testing

- 4.2.1 Test cases for Unit Testing
- 4.2.2 Test cases for System Testing

#### Chapter 5: Conclusion and Future Recommendations

- 5.1 Conclusion
- 5.2 Lesson learnt/Outcome

### 5.3 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 that are cited in the document. The books, articles, and other 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 accordingly. The IEEE referencing standard can be found in the web at [www.ieee.org](http://www.ieee.org).

#### **Report Format Standards**

**1. Page Number**

The pages from certificate page to the list of tables/figures 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.

**2. Page Size and Margin**

The paper size must be a page size corresponding to A4. The margins must be set as Top = 1, Bottom = 1, Right = 1, Left = 1.25.

**3. Paragraph Style**

All paragraphs must be justified and having spacing of 1.5.

**4. 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.

**5. Section Headings**

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

**6. Figures and Tables**

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

#### **Final Report Binding and Submission:**

Number of Copies: 3 (College Library, Self, and 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, FOHSS.

(A typical Specimen of Cover Page & Title Page)



**Tribhuvan University**  
**Faculty of Humanities and Social Sciences**

# TITLE OF PROJECT REPORT

# A PROJECT REPORT

**Submitted to**  
**Department of Computer Application**  
**Name of the College**

*In partial fulfillment of the requirements for the Bachelors in Computer Application*

Submitted by  
Names and Roll of the Candidates  
Month and Year

Under the Supervision of  
**Supervisor Name**

(A typical Specimen of Certificate)



**Tribhuvan University**  
**Faculty of Humanities and Social Sciences**  
**College Name**

**Supervisor's Recommendation**

I hereby recommend that this project prepared under my supervision by NAME OF THE STUDENT entitled “**TITLE OF THE PROJECT**.....” in partial fulfillment of the requirements for the degree of Bachelor of Computer Application is recommended for the final evaluation.

<<Signature of the Supervisor>>

**SIGNATURE**

<<Name>>

**SUPERVISOR**

<<Academic Designation>>

<<Department>>

<<Full address of the Dept. & College>>

(A typical specimen of Approval)



**Tribhuvan University**

**Faculty of Humanities and Social Sciences**

**College Name**

**LETTER OF APPROVAL**

This is to certify that this project prepared by NAME OF THE STUDENT entitled “**TITLE OF THE PROJECT** .....” in partial fulfillment of the requirements for the degree of Bachelor in Computer Application has been evaluated. In our opinion it is satisfactory in the scope and quality as a project for the required degree.

<b>SIGNATURE of Supervisor</b>  Name and Academic designation  Department name and full address of the College	<b>SIGNATURE of HOD/Coordinator</b>  Name and Academic designation  Department name and full address of the College
<b>SIGNATURE of Internal Examiner</b>  <b>Internal Examiner</b>	<b>SIGNATURE of Internal Examiner</b>  <b>External Examiner</b>

**Course Title: Applied Economics (3 Cr.)**

**Course Code: CAEC353**

**Year/ Semester: III/VI**

**Class Load: 3 Hrs./Week (Theory: 3 Hrs.; Tutorial: 1Hr.)**

### **Course Description**

This course of Applied Economics consists of the introduction to economic theories and application. It consists of theory of demand and supply, theory of consumer's behavior, theory of production, cost and revenue curves, theory of product pricing and factor pricing as well as contemporary macroeconomics like national income accounting, money banking and international trade with reference to Nepal.

### **Course Objective**

This course of Applied Economics aims to enhance understanding of the economic theories and application to develop skills of students in personal and professional decision making related to business, IT and management.

#### **Unit 1: Introduction**

**6 Hrs.**

- Concept and types of microeconomics and macroeconomics
- Distinction between microeconomics and macroeconomics
- Goals and instruments of macroeconomics

#### **Unit 2: Elasticity of Demand and Supply**

**6 Hrs.**

- Concept and types of price, income and cross elasticity of demand
- Measurement of price, income and cross elasticity of demand: Total outlay method and Point method
- Uses of price, income and cross elasticity
- Concept of elasticity of supply and its measurement  
(Numerical exercise using excel)

#### **Unit 3: Theory of Consumer Behavior**

**6 Hrs.**

- Concept of cardinal and ordinal utility analysis
- Cardinal utility analysis: assumptions, consumer's equilibrium, criticisms and derivation of demand curve
- Ordinal utility Analysis: Concept, properties of Indifference curve, marginal rate of substitution, Price Line and consumer's equilibrium, Price effect: Derivation of PCC, Income effect: Derivation of ICC, Substitution effect, Decomposition of price effect into income and substitution effect, Derivation of demand curve (Hicksian approach)  
(Numerical exercise)

#### **Unit 4: Cost and Revenue Curves**

**6 Hrs.**

- Concept of cost: actual cost and opportunity cost, implicit cost and explicit cost, accounting and economic cost.
- Derivation of short run and long run cost curves (total, average, marginal) and shape of short run and long run average cost curves.
- Relationship between short run and long run AC and MC curves



- d. Concept of revenue: total revenue, average revenue, and marginal revenue, revenue curves under perfect and imperfect competition, relation between average and marginal revenue

(Numerical exercise using excel)

#### Unit 5: Market Structure

9 Hrs.

- Perfect competition**- meaning and characteristics of perfect competition, short run and long run equilibrium of the firm and industry (TR-TC approach and MC-MR approach), derivation of short run and long run supply curve of a firm and industry.
- Monopoly**: Meaning and characteristic of monopoly; pricing under monopoly: equilibrium of firm in short run and long run (TR-TC approach and MC-MR approach); Price discrimination and degree of price discrimination.
- Monopolistic Competition**: Meaning and characteristics of monopolistic competition; Pricing under monopolistic competition: equilibrium of firm in short run and long run; equilibrium of firm under product variation and selling expenses
- Oligopoly**: Meaning and characteristic of oligopoly; Pricing under cartel (aiming at joint profit maximization)

(Numerical exercise using excel)

#### Unit 6: National Income Accounting

6 Hrs.

- Circular flow of income and expenditure in two sector, three sector and four sector economy
- Meaning and different concept of national income: GDP, NDP, GNP, NNP, national income at factor cost (NI), personal income (PI), disposable personal income (DI), per capita income (PCI)
- Real and nominal GDP, GDP deflator
- Computation of National income: Product, Income and Expenditure method

(Numerical exercise using excel)

#### Unit 7: Money, Banking and International Trade

6 Hrs.

- Concept and functions of money- value of money-money supply –components of money supply ( $M_1$ ,  $M_2$ , etc.)
- Inflation : Types, causes and effects of inflation
- Banking: role and functions of commercial banks , role and functions of central bank with reference to Nepal Rastra Bank
- International Trade: Distinction between internal and international trade, balance of trade and balance of payment.





### Reference Books

Ackley, Gardener. (1978). Macroeconomics: Theory and Policy. New York: Mac Milan Publishing Co.

Caves, Frankel, Jones, World Trades and Payments: (9th Ed.) Pearson Education

Dominick Salvatore, International Economics: (8th Ed.) . Wiley India.

Dwivedi, D.N. (2001). Macroeconomic Theory and Policy. Tata McGraw-Hill Publishing Company Limited, New Delhi

G, Mankiw. (2007). Economics: Principles and Applications. South Western of Cengage Learning.

Gupta, S.B. Monetary Economics, S.Chand & Co;New Delhi.

Koutsoyianis, A. (1991). Modern Microeconomics. Hongkong: ELBS

Lipsey and Chrystal. Economics. Oxford University Press. (eleventh edition or latest one).

Mankiw, N. Gregory. (2009). Principles of Microeconomics. Cengage Learning India Private Limited, New Delhi (4<sup>th</sup> edition)

P. Samuelson and W. Nordhaus. Economics, Mc GrawHill International Editions. (14th edition or latest one)

Paul R. Krugman, Maurice Obstfeld, International Economics: (8th Ed.) Pearson Education

Pindyck, Robert S. and Daniel, Rubinfeld. (2001). Microeconomics. New Delhi: Prentice Hall of India

Salvatore, Dominic. (2009). Principles of Microeconomics. Publish in India Oxford University Press, New Delhi

Shapiro, Edward. (2004). Macroeconomic Analysis. New Delhi: Galgotia Publication (P) Ltd.

### Practical Works

Excel or other relevant statistical software should be used to compute numerical exercise.

### Teaching Methods:

The general teaching pedagogy includes class lectures, presentations, group works, case studies, guest lectures research works, project works, assignments ( Theoretical and practical). The teaching faculty will determine the choice of teaching pedagogy and statistical tools as per the requirements of topics.



## Evaluation

Examination Scheme				Total
Internal Assessment (40)		External Assessment (60)		100
Theory	Practical	Theory	Practical	
30	10	40	20	



**Course Title: Network Programming (3 Cr.)**

**Course Code: CACS355**

**Year/Semester: III/VI**

**Class Load: 5 Hrs. / Week (Theory: 3Hrs. Practical: 2 Hrs.)**

**Course Description**

This course is designed to extend students' knowledge and practice in analysis and design of computer networks by focusing on computer network programming. It includes introduction, Internet Address, URLs and URIs, HTTP, URLConnections, Socket Programming, IP Multicast and RMI. The JAVA programming language will be used throughout the course. It does not entirely focus on theoretical concept but also strongly focuses on practical skill based knowledge.

**Course objectives**

The general objectives of this course are to provide theoretical as well as practical knowledge of network programming to make students capable of developing, implementing, managing and troubleshooting the issues of network programming in their personal as well professional life.

**Course Contents**

- Unit 1: Introduction** 3 Hrs.
- 1.1 Network Programing Features and Scope
  - 1.2 Network Programming Language, Tools & Platforms
  - 1.3 Client and Server Applications
  - 1.4 Client server model and software design
- Unit 2: Internet Addresses** 4 Hrs.
- 2.1 The InetAddress Class: Creating New InetAddress Objects, Getter
  - 2.2 Methods, Address Types, Testing Reachability and Object Methods
  - 2.3 Inet4Address and Inet6Address
  - 2.4 The Network Interface Class: Factory Method & Getter Method
  - 2.5 Some Useful Programs: SpamCheck, Processing Web Server Logfiles
- Unit 3: URLs and URIs** 5 Hrs.
- 3.1 URIs: URLs and Relative URLs
  - 3.2 The URL Class: Creating New URLs, Retrieving Data From a URL, Splitting a URL into Pieces, Equality & Comparison and Conversion
  - 3.3 The URI Class: Constructing a URI, The Parts of the URI, Resolving Relative URIs, Equality & Comparison and String Representation
  - 3.4 x-www-form-urlencoded: URL Encoder and URL Decoder
  - 3.5 Proxies: System Properties, The ProxyClass and The ProxySelector Class
  - 3.6 Communicating with Server-Side Programs Through GET
  - 3.7 Accessing Password-Protected Sites: The Authenticator Class, The PasswordAuthentication Class and The JPasswordField Class
- Unit 4: HTTP** 2 Hrs.
- 4.1 The protocol: Keep-Alive
  - 4.2 HTTP Methods
  - 4.3 The Request Body



#### 4.4 Cookies: CookieManager and CookiesStore

5 Hrs.

### Unit 5: URLConnections

- 5.1 Opening URLConnections
- 5.2 Reading Data from Server
- 5.3 Reading Header: Retrieving specific Header Fields and Retrieving Arbitrary Header Fields
- 5.4 Cache: Web Cache for Java
- 5.5 Configuring the Connection: protected URL url, protected boolean connected, protected boolean allowUserInteraction, protected boolean doInput, protected boolean doOutput, protected boolean ifModificationSince, protected boolean useCaches and Timeouts
- 5.6 Configuring the Client Request HTTP Header
- 5.7 Security Considerations for URLConnections
- 5.8 Guessing MIME Media Types
- 5.9 HttpURLConnection: The Request Methods, Disconnecting from the Server, Handling Server Responses, Proxies and Streaming Mode

### Unit 6: Socket for Clients

5 Hrs.

- 6.1 Introduction to Socket
- 6.2 Using Sockets: Investigating Protocols with telnet, Reading from Servers with Sockets, Writing to Servers with Sockets
- 6.3 Constructing and connecting Sockets: Basic Constructors, Picking a Local Interface to Connect From, Constructing Without Connecting, Socket Addresses and Proxy Servers
- 6.4 Getting Information about a Socket: Closed or Connected?, toString()
- 6.5 Setting Socket Options: TCP\_NODELAY, SO\_LINGER, SO\_TIMEOUT, SO\_RCVBUF and SO\_SNDBUF, SO\_KEEPALIVE, OOBINLINE, SO\_REUSEADDR and IP\_TOS Class of Services
- 6.6 Socket in GUI Applications: Whois and A Network Client Library

### Unit 7: Socket for Servers

5 Hrs.

- 7.1 Using ServerSockets: Serving Binary Data, Multithreaded Servers, Writing to Servers with Sockets and Closing Server Sockets
- 7.2 Logging: What to Log and How to Log
- 7.3 Constructing Server Sockets: Constructing Without Binding
- 7.4 Getting Information about Server Socket
- 7.5 Socket Options: SO\_TIMEOUT, SO\_RCVBUF and Class of Service
- 7.6 HTTP Servers: A Single File Server, A Redirector and A Full-Fledged HTTP Server

### Unit 8: Secure Socket

4 Hrs.

- 8.1 Secure Communication
- 8.2 Creating Secure Client Sockets
- 8.3 Event Handlers
- 8.4 Session Management
- 8.5 Client Mode
- 8.6 Creating Secure Server Socket



8.7 Configure SSLServerSockets: Choosing the Cipher Suits, Session Management and Client Mode

**Unit 9: Nonblocking I/O**

3 Hrs.

9.1 An Example Client and Server

9.2 Buffers: Creating Buffers, Filling and Draining, Bulk Methods, Data Conversion, View Buffers, Compacting Buffers, Duplicating Buffers, Slicing Buffers, Marking and Resetting, Object Methods

9.3 Channels: SocketChannel, ServerSocketChannel, The Channels Class, Asynchronous Channels, Socket Options

9.4 Readiness Selection: The Selector Class, The SelectionKey Class

**Unit 10: UDP**

5 Hrs.

10.1 UDP Protocol

10.2 UDP Clients

10.3 UDP Servers

10.4 The DatagramPacket Class: The Constructor, The get Methods, The setter Methods

10.5 The DatagramSocket Class: The Constructor, Sending and Receiving Datagrams, Managing Connections

10.6 Socket Options: SO\_TIMEOUT, SO\_RCVBUF, SO\_SNDBUF, SO\_RCVTIMEO, SO\_BROADCAST and IP\_TOS

10.7 UDP Applications: Simple UDP Clients, UDPServer and A UDP Echo Client

10.8 DatagramChannel: Using DatagramChannel

**Unit 11: IP Multicast**

2 Hrs.

11.1 Multicasting: Multicast Address and Groups, Clients and Servers, Routers and Routing

11.2 Working with Multicast Sockets: The Constructor, Communicating with a Group

**Unit 12: Remote Method Invocation (RMI)**

2 Hrs.

12.1 Defining and Implementing RMI Service Interface

12.2 Creating an RMI Server and Client

12.3 Running the RMI System

**Laboratory Work**

Laboratory work should be done covering all the topics listed above and a small project work should be carried out using the concept learnt in this course using Java programming Language.

**Teaching Methods**

The teaching faculties are expected to create environment where students can update and upgrade themselves with the current scenario of computing and information technology with the help of topics listed in the syllabus. The general teaching pedagogy that can be followed by teaching faculties for this course includes class lectures, laboratory activity, group discussions, case studies,



guest lectures, research work, project work, assignments (Theoretical and Practical), and written and verbal examinations.

### Evaluation

Examination Scheme				
Internal Assessment		External Assessment		Total
Theory	Practical	Theory	Practical	
20	20 (3 Hrs.)	60 (3 Hrs.)	-	

### Reference Books:

1. Elliotte Rusty Harold, "Java Network Programming", O'Reilly, 2014.
2. Douglas E. Comer, David L. Stevens, "Internetworking with TCP\_IP, Vol. III\_ Client-Server Programming and Applications, Linux\_Posix Sockets Version" Addison-Wesley, 2000.
3. David Reilly, Michael Reilly, "Java Network Programming and Distributed Computing", Addison-Wesley Professional, 2002
4. Kenneth L. Calvert, Michael J. Donahoo, "TCP-IP Sockets in Java. Practical Guide for Programmers", Morgan Kaufmann, 2008.
5. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks, 5/e", Prentice Hall, 2011.
6. Kurose, Ross, "Computer Networking: A Top-Down Approach", Pearson Education Limited, 2017.



Course Title: **Advanced Java Programming (3 Cr.)**

Course Code: **CACS354**

Year/Semester: **III/VI**

Class Load: **6 Hrs. / Week (Theory: 3 Hrs., Practical: 3 Hrs.)**

**Course Description:**

This course covers advanced features of Java programming language including, GUI programming, database programming, JavaBeans, JSP, Servlet, and Remote Method Invocation (RMI).

**Course Objectives:**

The primary objective of this course is to provide concepts of advanced features of Java programming and make students familiar with their uses and applications.

**Course Contents:**

**Unit 1: GUI Programming (12 Hrs.)**

Introducing Swing; Creating a Frame; Displaying Information in a Component; Working with 2D Shapes; Using Color; Using Special Fonts for Text; Displaying Images; Event Handling: Event Handling Basics, Event Classes, Event Listeners and Adapter Classes; Swing and the MVC Design Pattern; Layout Management; Basic Swing Components

**Unit 2: Database Programming (7 Hrs.)**

The Design of JDBC: JDBC Driver Types and Typical Uses of JDBC; the Structured Query Language; JDBC Configuration; Working with JDBC Statements; Query Execution; Scrollable and Updatable Result Sets; Row Sets

**Unit 3: JavaBeans (7 Hrs.)**

What Is a Java Bean? Advantages of Java Beans; Introspection; Properties, Events, and Methods Design Patterns; Using BeanInfo Interface; Bound and Constrained Properties; Persistence; Customizers; the Java Beans API; Writing JavaBeans

**Unit 4: Servlets and JSP (14 Hrs.)**

Background; The Life Cycle of a Servlet; A Simple Servlet; The Servlet API; The javax.servlet Package; Reading Servlet Parameters; The javax.servlet.http Package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking; Introduction to JSP; Using JSP; Comparing JSP with Servlet; Java Web Frameworks

**Unit 5: RMI (5 Hrs.)**

What is RMI? The Roles of Client and Server; Remote Method Calls; Stubs and Parameter Marshalling; the RMI Programming Model; Interfaces and Implementations; the RMI Registry; Parameters and Return Values in Remote Methods; Remote Object Activation; Simple Client/Server Application using RMI; Comparing RMI with CORBA

**Laboratory Work:** The laboratory work includes writing Java programs

- To create GUI applications using swing, event handling, and layout management
- To create applications to work with databases
- To create JavaBeans



- To create server side web programs using Servlet and JSP
- To create distributed applications using RMI

#### Text Books:

1. Core java Volume I – Fundamentals, Tenth Edition, Cary S. Horstmann, Prentice Hall
2. Core java Volume II – Advanced Features, Tenth Edition, Cary S. Horstmann, Prentice Hall
3. Java: The Complete Reference, 10<sup>th</sup>, Herbert Schildt, McGraw-Hill

#### Reference Books:

1. Advanced Java Programming, Uttam K. Roy, Oxford University Press
2. Java: Advanced Features and Programming Techniques, Nathan Clark

#### Teaching Methods:

The teaching faculties are expected to create environment where students can update and upgrade themselves with the current scenario of computing and information technology with the help of topics listed in the syllabus. The general teaching pedagogy that can be followed by teaching faculties for this course includes class lectures, laboratory activity, group discussions, case studies, guest lectures, research work, project work, assignments (Theoretical and Practical), and written and verbal examinations.

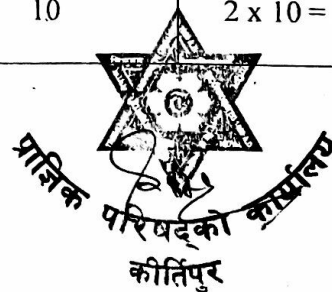
#### Evaluation:

Internal Assessment Format [FM = 20] – Subject Teacher						
Term Examination		Assignment	Attendance	Total		
Mid-Term	Pre-Final					
5	5	5	5	20		
Practical Assessment Format [FM = 20] – External Examiner will be assigned by Dean Office, FOHSS.						
Practical	Viva	Lab Reports	Total			
10	5	5	20			

Note: Assignment may be subject specific case study, seminar paper preparation, report writing, project work, research work, presentation, problem solving etc.

#### Final Examination Questions Format [FM = 60, Time = 3 Hrs.]

SN	Question Type	Number of Questions	Marks per Question	Total Marks
1	Group – 'A' Objective Type Questions (Multiple Choice Questions) Attempt all the questions.	10	1	10 x 1 = 10
2	Group – 'B' Short Questions (Attempt any SIX questions.)	7	5	6 x 5 = 30
3	Group – 'C' Long Questions (Attempt any TWO questions.)	3	10	2 x 10 = 20





Course Title: **Advanced Java Programming (3 Cr.)**

Course Code: **CACS354**

Year/Semester: **III/VI**

Class Load: **6 Hrs. / Week (Theory: 3 Hrs., Practical: 3 Hrs.)**

**Course Description:**

This course covers advanced features of Java programming language including, GUI programming, database programming, JavaBeans, JSP, Servlet, and Remote Method Invocation (RMI).

**Course Objectives:**

The primary objective of this course is to provide concepts of advanced features of Java programming and make students familiar with their uses and applications.

**Course Contents:**

**Unit 1: GUI Programming (12 Hrs.)**

Introducing Swing; Creating a Frame; Displaying Information in a Component; Working with 2D Shapes; Using Color; Using Special Fonts for Text; Displaying Images; Event Handling: Event Handling Basics, Event Classes, Event Listeners and Adapter Classes; Swing and the MVC Design Pattern; Layout Management; Basic Swing Components

**Unit 2: Database Programming (7 Hrs.)**

The Design of JDBC: JDBC Driver Types and Typical Uses of JDBC; the Structured Query Language; JDBC Configuration; Working with JDBC Statements; Query Execution; Scrollable and Updatable Result Sets; Row Sets

**Unit 3: JavaBeans (7 Hrs.)**

What Is a Java Bean? Advantages of Java Beans; Introspection; Properties, Events, and Methods Design Patterns; Using BeanInfo Interface; Bound and Constrained Properties; Persistence; Customizers; the Java Beans API; Writing JavaBeans

**Unit 4: Servlets and JSP (14 Hrs.)**

Background; The Life Cycle of a Servlet; A Simple Servlet; The Servlet API; The javax.servlet Package; Reading Servlet Parameters; The javax.servlet.http Package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking; Introduction to JSP; Using JSP; Comparing JSP with Servlet; Java Web Frameworks

**Unit 5: RMI (5 Hrs.)**

What is RMI? The Roles of Client and Server; Remote Method Calls; Stubs and Parameter Marshalling; the RMI Programming Model; Interfaces and Implementations; the RMI Registry; Parameters and Return Values in Remote Methods; Remote Object Activation; Simple Client/Server Application using RMI; Comparing RMI with CORBA

**Laboratory Work:** The laboratory work includes writing Java programs

- To create GUI applications using swing, event handling, and layout management
- To create applications to work with databases
- To create JavaBeans



- To create server side web programs using Servlet and JSP
- To create distributed applications using RMI

#### Text Books:

1. Core java Volume I – Fundamentals, Tenth Edition, Cary S. Horstmann, Prentice Hall
2. Core java Volume II – Advanced Features, Tenth Edition, Cary S. Horstmann, Prentice Hall
3. Java: The Complete Reference, 10<sup>th</sup>, Herbert Schildt, McGraw-Hill

#### Reference Books:

1. Advanced Java Programming, Uttam K. Roy, Oxford University Press
2. Java: Advanced Features and Programming Techniques, Nathan Clark

#### Teaching Methods:

The teaching faculties are expected to create environment where students can update and upgrade themselves with the current scenario of computing and information technology with the help of topics listed in the syllabus. The general teaching pedagogy that can be followed by teaching faculties for this course includes class lectures, laboratory activity, group discussions, case studies, guest lectures, research work, project work, assignments (Theoretical and Practical), and written and verbal examinations.

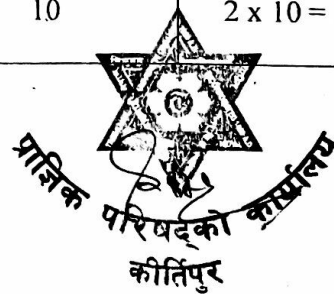
#### Evaluation:

Internal Assessment Format [FM = 20] – Subject Teacher					
Term Examination		Assignment	Attendance	Total	
Mid-Term	Pre-Final				
5	5				
Practical Assessment Format [FM = 20] – External Examiner will be assigned by Dean Office, FOHSS.					
Practical	Viva	Lab Reports	Total		
10	5	5	20		

Note: Assignment may be subject specific case study, seminar paper preparation, report writing, project work, research work, presentation, problem solving etc.

#### Final Examination Questions Format [FM = 60, Time = 3 Hrs.]

SN	Question Type	Number of Questions	Marks per Question	Total Marks
1	Group – 'A' Objective Type Questions (Multiple Choice Questions) Attempt all the questions.	10	1	10 x 1 = 10
2	Group – 'B' Short Questions (Attempt any SIX questions.)	7	5	6 x 5 = 30
3	Group – 'C' Long Questions (Attempt any TWO questions.)	3	10	2 x 10 = 20



**Course Title: Distributed Systems (3 Cr.)**

**Course Code: CACS352**

**Year/Semester: III/VI**

**Class Load: 4 Hrs. / Week (Theory: 3Hrs. Tutorial: 1 Hr.)**

**Course Description**

The course introduces basic knowledge to give an understanding how modern distributed systems operate. The focus of the course is on distributed algorithms and on practical aspects that should be considered when designing and implementing real systems. Some topics covered during the course are causality and logical clocks, synchronization and coordination algorithms, transactions and replication, and end-to-end system design. In addition, the course explores recent trends exemplified by current highly available and reliable distributed systems.

**Course objectives**

The objective of the course is to make familiar with different aspect of the distributed system, middleware, system level support and different issues in designing distributed algorithms and finally systems.

**Course Contents**

<b>Unit 1. Introduction</b>	<b>4 Hrs.</b>
1.1 Characteristics	
1.2 Design Goals	
1.3 Types of Distributed Systems	
1.4 Case Study: The World Wide Web	
<b>Unit 2. Architecture</b>	<b>4 Hrs.</b>
2.1 Architectural Styles	
2.2 Middleware organization	
2.3 System Architecture	
2.4 Example Architectures	
<b>Unit 3. Processes</b>	<b>6 Hrs.</b>
3.1 Threads	
3.2 Virtualization	
3.3 Clients	
3.4 Servers	
3.5 Code Migration	
<b>Unit 4. Communication</b>	<b>5 Hrs.</b>
4.1 Foundations	
4.2 Remote Procedure Call	
4.3 Message-Oriented Communication	
4.4 Multicast Communication	
4.5 Case Study: Java RMI and Message Passing Interface (MPI)	
<b>Unit 5. Naming</b>	<b>5 Hrs.</b>
5.1 Name Identifiers, and Addresses	
5.2 Structured Naming	



5.3 Attribute-based naming	
5.4 Case Study: The Global Name Service	
<b>Unit 5. Coordination</b>	<b>7 Hrs.</b>
6.1 Clock Synchronization	
6.2 Logical Clocks	
6.3 Mutual Exclusion	
6.4 Election Algorithm	
6.5 Location System	
6.6 Distributed Event Matching	
6.7 Gossip-based coordination	
<b>Unit 7. Consistency and Replication</b>	<b>5 Hrs.</b>
7.1 Introduction	
7.2 Data-centric consistency models	
7.3 Client-centric consistency models	
7.4 Replica management	
7.5 Consistency protocols	
7.6 Caching and Replication in Web	
<b>Unit 8. Fault Tolerance</b>	<b>5 Hrs.</b>
8.1 Introduction to fault tolerance	
8.2 Process resilience	
8.3 Reliable client-server communication	
8.4 Reliable group communication	
8.5 Distributed commit	
8.6 Recovery	
<b>Unit 9. Security</b>	<b>4 Hrs.</b>
9.1 Introduction to security	
9.2 Secure channels	
9.3 Access control	
9.4 Secure naming	
9.5 Security Management	

### Teaching Methods

The teaching faculties are expected to create environment where students can update and upgrade themselves with the current scenario of computing and information technology with the help of topics listed in the syllabus. The general teaching pedagogy that can be followed by teaching faculties for this course includes class lectures, laboratory activity, group discussions, case studies, guest lectures, research work, project work, assignments (Theoretical and Practical), and written and verbal examinations.

### Evaluation System

Examination Scheme		
Internal Assessment	External Assessment	Total
40%	60% (3 Hrs.)	100%



## References:

1. A.S. Tanenbaum, M. VanSteen, "Distributed Systems", Pearson Education.
2. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems Concepts and Design", Third Edition, Pearson Education.
3. Mukesh Singhal, "Advanced Concepts in Operating Systems", McGraw-Hill Series in Computer Science.
4. Ajay D. Kshemkalyani, Mukesh Singhal, "Distributed Computing: Principles, Algorithms, and Systems", Cambridge University Press
5. Christian Cachin, Rachid Guerraoui, Luís, "Introduction to Reliable and Secure Distributed Programming", Springer



**Course Title: Mobile Programming (3 Cr.)**

**Course Code: CACS351**

**Year/Semester: III/VI**

**Class Load: 6Hrs. /Week (Theory: 3Hrs, Practical 3Hrs.)**

### **Course Description**

This course provides the comprehensive knowledge related to the Mobile programming, which encompasses integrated development environment, infrastructure, design, and develop and testing of mobile application, which communicate with database to solve real word problem.

**Objectives:** The general objectives of this course is to develop mobile application that solve real word problem with use of current mobile technology.

### **Unit -1**

#### **Introduction to Mobile and Mobile Programming [2 HRS]**

Mobile Device (Features, Categories, History, Brands, Models and Platforms), Introduction to Mobile Programming.

### **Unit -2**

#### **Introduction to Android Programming [4 HRS]**

Android Platform, History of Android, Environment Setup, Creating an android project, Laying out the user interface (The view hierarchy, widget attributes, creating string resources, previewing the layout), Creating a new class, Setting up the project, Running on the Emulator.

### **Unit -3**

#### **Designing the User Interface [5 HRS]**

Android layout types (Linear, Relative, Table, Absolute, Constraint), Layout attributes, Android widgets (Textview, Edittext, Checkbox, Radiobutton, Spinner etc.) and its attributes, Event Handling, working with string, string array and colors, working with resources and drawable, adding icon to the project.

### **Unit -4**

#### **Android Activity [4 HRS]**

The Activity life cycle, Creating multiple activities, Declaring activities in the manifest, Connecting activities with intents, Passing data between activities, Getting a result back from a child activity, Getting and setting data to/from the layout file.

### **Unit -5**

#### **UI Fragments, Menus and Dialogs [6 HRS]**

The need for UI flexibility, Introduction to fragments, Lifecycle of fragment, Creating a UI fragment, Creating a fragment class, Wiring widgets in fragment, Introduction to fragment manager, Difference between Activity and Fragments. Menus (Introduction, Types, Implementing menu in an application) Dialogs (Introduction, Creating a dialog fragment, Setting a dialog's content)



## Unit -6

### **Listview, Gridview and Recyclerview [6 HRS]**

Listview (Introduction, Features, Implementing listview in an application)

Gridview (Introduction, Features, Implementing gridview in an application)

Recyclerview (Introduction, Features, Implementing recyclerview in an application)

## Unit -7

### **Advance Android Concepts [10 HRS]**

Local database with SQLite (Establishing connection, creating database and tables, data manipulation), Introduction to API, API Types, Introduction to JSON, Retrieving contents from remote server, Sending contents to remote server, Implementing Google Maps in android application, Procedure for publishing application on Google Play Store.

## Unit -8

### **Introduction to ios Programming [8 HRS]**

Introduction to ios and ios programming, ios platform, Environment setup, Creating an Xcode project, Building the interface, Making connections, Running on the simulator.

Introduction to Swift language, Views and the view hierarchy, Storyboard and view controllers, working with widgets and its attributes, Creating a simple ios application.

## Laboratory Works

Laboratory works should be done covering all the topics listed above and a small project work should be carried out using the concept learnt in this course. Project should be assigned on individual basis.

## Teaching Methods

The general teaching pedagogy includes class lectures, group discussions, case studies, guest lectures, research work, project work, assignments (theoretical and practical), and examinations (written and verbal), depending upon the nature of the topics. The teaching faculty will determine the choice of teaching pedagogy as per the need of the topics.

## References

1. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, *Android Programming: The Big Nerd Ranch Guide*, Big Nerd Ranch LLC, 2nd edition, 2015.
2. Christian Keur and Aaron Hillegass, *iOS Programming: The Big Nerd Ranch Guide*, 5th edition, 2015.
3. Brian Fling, *Mobile Design and Development*, O'Reilly Media, Inc., 2009.
4. Maximiliano Firtman, *Programming the Mobile Web*, O'Reilly Media, Inc., 2nd ed., 2013.

