Purbanchal University

Bachelor in Information Technology (BIT)

Year: I **Semester: I**

S.N	Course Code	Course description	Credits	Lecture (Hrs)	Tutorial (Hrs)	Practical (Hrs)	Total (Hrs)
1	BIT101SH	Mathematics- I	3	3	2	-	5
2	BIT170CO	Fundamentals of Information Technology	3	3	1	2	6
3	BIT105SH	Technical Communication (English)	2	3	1	-	4
4	BIT120EL	Basic Electrical System & Circuit	3	3	1	2	6
5	BIT190MS	Principles of Management	3	3	1	-	4
6	BIT175CO	Computer Programming-I	3	3	1	2	6
7	BIT178CO	Project-I	2	-	-	3	3
		Total	**19**	**18**	**7**	**9**	**34**

Mathematics I

BIT101SH

Year : I Semester : I

Teaching schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final Assessment		Total
			Theory	Practical	Theory	Practical	
3	2	-	20	-	20		100

1. **Coordinate Systems** **[3 Hrs]**
   - 1.1 Rectangular coordinates in a plane
   - 1.2 Polar coordinates
   - 1.3 Rectangular coordinates in space
   - 1.4 Cylindrical polar coordinates
   - 1.5 Spherical polar coordinates
   - 1.6 Transformation of one coordinate system into another system
2. **Elementary Coordinates Geometry** **[5 Hrs]**
   - 2.1 The conic sections
   - 2.2 Translation of Axes
   - 2.3 Equation of a conic in polar coordinates
3. **Vectors and Solid Geometry** **[10 Hrs]**
   - 3.1 The concept of a vector
   - 3.2 Addition & Subtraction of vectors
   - 3.3 Resolution of vectors
   - 3.4 Scalar Dot product of two vectors
   - 3.5 Vector Cross product of two vectors
   - 3.6 Equation of Line and Plane
   - 3.7 Product of three or more vectors
   - 3.8 Sphere, Cylinder and Cone
   - 3.9 Quadratic Surfaces
4. **Application of Differentiation** **[8 Hrs]**
   - 4.1 Geometric Applications
   - 4.2 Related Rates
   - 4.3 Roll's and Mean – Value theorems
   - 4.4 Indeterminate forms
   - 4.5 Maxima and Minima
   - 4.6 Taylor's and Maclaurin's series
   - 4.7 Curvature
   - 4.8 Asymptotes

5. **Applications of the Definite Integral** **[5 Hrs]**
   - 5.1 Area bounded by a curve
   - 5.2 Volume and surface area of solids of revolution
   - 5.3 Length of an arc of a curve
   - 5.4 Area and volume in polar coordinates
6. **Functions of several variables** **[4 Hrs]**
   - 6.1 Functions of several variables
   - 6.2 Limits and continuity
   - 6.3 Partial derivatives First and Second Order
   - 6.4 Homogenous functions, Euler's Theorem
7. **Multiple Integrals** **[4 Hrs]**
   - 7.1 Definition and Evaluation of Double Integrals
   - 7.2 Area by Double Integration
   - 7.3 Introduction to triple integrals & some simple applications
   - 7.4 Change of variables
8. **Matrix algebra** **[6 Hrs]**
   - 8.1 Definition, Equality of matrices, Addition & Scalar Multiplication of a matrix
   - 8.2 Product of matrices
   - 8.3 Some special types of matrices
   - 8.4 Matrices & Determinants (simple cases only)
   - 8.5 Adjoint & Inverse of a matrix
   - 8.6 Cramer's rule
   - 8.7 Use of matrices in solving a system of linear equation (Homogenous & Non-homogeneous system)

Text Book

1. Engineering Mathematics Vol: S.S Sastry Prentic Hall of India

References:

1. Fraleight J.B. Calculus with analytic grometry, Addisen Wesley pub. Community, Inc(1980)
2. Bajpai, A.C Calus LM. And fairley, J.A Mathematics for Engineering & scientists, Vol I John wiley & sons (1973)
3. Goldstain, I.J Lay D.C. and Schneider, D.I Calculus and its Applications prentice Hall Inc. (1977)
4. Spiegel, M.R Theory and problems of advanced calculus schaum publish.
5. Srivastava, R.S.L. Engineering Mathematics, Vol I, Tata, Mc Graw hillpub (1980)
6. N. Saran & J.K. Goyal, Introduction to matrices pragmatic Prakashan (1990)

Fundamentals of Information Technology

BIT170CO

Year : I **Semester : I**

Teaching schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final Assessment		Total
			Theory	Practical	Theory	Practical	
3	1	2	20	20	60		100

Objectives: to provide fundamental concepts of information technology and its application in various fields.

Course Contents:

1. **History of Computers:** **[2Hrs]**
   Abacus, Pascaline, Different Engine, Colossus, Generation of Computer Turing machine, ENIAC, UNIVAC, EDVAC, IBM Machines, Microprocessor, LSI, VLSI, Pentium fifth generation computing.
2. **Introduction to computer systems:** **[8 Hrs]**
   Introduction to computer, classification of digital computer systems, Anatomy of digital computers, computer architecture, Memory units, Auxiliary storage devices Input devices, Output devices.
3. **Computer Software**
   Introduction to computer software, operating system, programming language, general software features and trends.
4. **Data and Database management systems:** **[4Hrs]**
   Data processing, Introduction to database management systems
5. **Telecommunications:** **[6 Hrs]**
   Introduction to telecommunications, Computer networks, Communication systems, Distributed systems.
6. **Internet and Intranet** **[6 Hrs]**
   Internet & World Wide Web, Electronic mail, Internets
7. **Multimedia & Virtual reality** **[3 Hrs]**
   Introduction to multimedia, Multimedia tools, Introduction to virtual reality
8. **New technologies in Information Technology** **[6 Hrs]**
   Electronic commerce, Hypermedia, Data Warehouse and Data Marts, Data Mining, On-Line Analytical Processing (OLAP)
9. **Applications of Information Technology:** **[4 Hrs]**
   Computer in business and industry, Computers in home, Computer in education and training, Computer in entertainment, science, medicine and engineering.
10. **Information Security** **[2Hrs]**
    Cyber laws, Computer crime, Information privacy and security.

References

1. Alexis Leon, Mathews Leon, “Fundamentals of Information Technology”, Leon TCHWORI.
2. Peter Norton “Peter Norton’s Introduction to Computers” Tat McGraw-Hill Publishing Company Ltd.
3. Robert Cowart, “Mastering Windows- Premium Editing”, BPB Publication
4. Ron Mansfield,”Mastering Word” BPB Publication.
5. Thomas Mansfield,” Richard A. Alden, Mastering Excel”, BPB Publication.
6. Katherine Murray,” Mastering Power Point”, BPB Publication.
7. Shankar N. Adhikary, Ajay K. Shah, “Business Application of Computers”, Buddha Publication

Lab Works:

To familiarize students with operating systems and desktop application using current version of windows.

Course Contents

A. Microsoft Windows

Part Introductory

Chapter 1 Introduction to OS, Interface, GUI vs CUI

Chapter 2 Introduction to windows, features, Elements of Windows

Part II Using Windows

Chapter 3 Taskbar, Using menus and sub menus to search items, opening program, opening multiple programs.

Chapter 4 Short cuts and Using short cuts, using my computer, switching off the system

Part III Customizing Windows

Chapter 5 Desktop and custom wall papers, Screen Server

Chapter 6 Using Help for Interactive learning

Part IV Using Application

Chapter 7 Using general accessories- Notepad Paint Clipboard Character map, Calculator etc.

Chapter 8 Using Multimedia, Using Compact Disk, Using Audio/Video.

Chapter 9 Searching Files and Folders

Part V Managing Information

Chapter 10 Using explorer to manage files and folders- Copy/Delete/Rename/Shortcuts, Sharing information with other storage media

B. Microsoft Word

Chapter 18 Using Charts and Graphs

Chapter 19 Concepts of OLE Linking and embedding

Chapter 20 Creating and Using Macros

Chapter 21 Personalizing Word

Part VI Printing Document

Chapter 22 Setting up Document for Printing-Page Setup

Chapter 23 Previewing and Printing

C. DOS 4

Part 1: Internet & External Commands of DOS

Chapter 1 Introduction to Computers Introduction to DOS

Chapter 2 Basic DOS Commands Managing Your Hard Disk

Chapter 3 Advance DOS Commands, DOS 6 & 6.2 Commands, Troubleshooting DOS Errors

D. Microsoft Excel

Part I Introductory

Chapter 1 Introduction to Excel: Excel Environment, Elements of Excel window

Chapter 2 Managing Workbooks, Worksheets and Windows

Chapter 3 Working Inside Worksheet

Part II Basic Skills

Chapter 4 Using Formulas and Functions

Chapter 5 Formatting/Conditional Formatting Data and Worksheet

Chapter 6 Using Paste Special

Part III Tapping Excel's Power

Chapter 7 The power of Range Names

Chapter 8 Essential Worksheet function

Chapter 9 Using Templates

Chapter 10 Protecting the files Worksheet with Passwords

Part IV Graphics and Charts

Chapter 11 Working with Graphic Object-Clip Art, Word Art, Map

Chapter 12 Charting Basics

Chapter 13 Creating Custom Charts

Chapter 14 Constructing, Complex Chart Using Advanced Techniques

Part V Introductory

Chapter 15 Getting More Power from Worksheet Databases

Chapter 16 Accessing External Databases

Part VI Cell Referencing

Chapter 17 Cell Referencing Excel: Relative, Absolute and Mixed.

Chapter 18 Loan Amortization Scheduling and Calculation

Part VII Exercising What-If Analysis

Chapter 19 Consolidation and Outlining

Chapter 20 Using What-If Analysis Data Table, Goal Seek and Scenario Manager

Part VIII Pivot Tables

Chapter 21 Understanding Pivot Tables

Chapter 22 Construction and Analyzing Pivot Tables

Part IX Customizing Excel

Chapter 23 Using Custom Controls on Worksheets

Chapter 24 Effectively Using Macro Recorder

Part X Printing Worksheet

Chapter 25 Setting up the Worksheet

Chapter 26 Printing Worksheets

E. Microsoft Power Point:

Part I Introductory

Chapter 1 Introduction to Power Point: Creating and Saving Presentation

Chapter 2 Entering, Editing and Enhancing Text

Chapter 3 Editing in different views-Outline views, Slide Sorter View

Part II Graphics in Presentation

Chapter 4 Creating Graphs

Technical Communication (ENGLISH)

BIT105SH

Year : I **Semester : I**

Teaching schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final Assessment		Total
			Theory	Practical	Theory	Practical	
2	2	-	20	-	80	-	100

Objectives: This course intents to develop

- Skills needed for group discussion, meeting conduction and technical talk
- Intensive and extensive reading skills in technical and non-technical reading materials.
- Skills in writing description, official letters and letters of application, proposals and formal technical reports.

Course in detail:

Unit 1: Oral Communication **[12 Hrs]**

A. Fundamentals of effective speaking:
   Posture, gesture, facial expression, voice, eye contact, space distancing etc.
B. Group discussion on subjects of general and technical interest.
C. Meetings
   a. Notice preparation
   b. Agenda preparation
   c. Minutes preparation
   d. Meeting conduction
D. Technical talk
   a. Writing complete manuscript for technical talk.
   b. Presentation technical talk based on manuscript
   c. Preparing note for technical talk
   d. Presenting talks based on notes

Unit 2: Reading: Intensive and Extensive **[16 Hrs]**

A. Intensive Reading
   a. How to tackle intensive reading materials.
   b. Practicing comprehension on prescribed texts.
   c. Note making and summary writing.
   d. Practice on contextual grammar.
B. Extensive Reading:
   a. How to tackle extensive materials.
   b. Practicing extensive reading

Unit 3: Writing **[17 Hrs]**

A. Fundamentals of effective writing:
   Unity , coherence, conciseness , clarity.
B. Description Writing:
   Mechanical, electrical or electronic objects, tables, graphs, charts, landscape, technical process
C. Letters
   a. Official letters
      i. Standard letter formats.
      ii. Writing letters for asking and giving information giving instruction, letters of request, apology and explanation, complaint and order.
   b. Letters of application
      i. Standard format
      ii. Preparing Bio-data and Resume
      iii. Writing letters of application
D. Proposal Writing
   a. Format for technical proposals
   b. Writing technical proposals
E. Technical Report Writing
   a. Format for technical reports
   b. Writing technical reports

Prescribed Book:

1. English for Engineers and Technologist
   Orient Longman, Anna University, Chennai 1990,(Reading and language focus all and oral and writing as mentioned in the syllabus)

References:

1. Adhikary Usha, et, al. Communicative Skills in English, Research Training unit, Department of Science and Humanities, Institute of Engineering, Pulchowk Campus 2002.
2. Anne Eisenberg, effective Technical Communication , Mc Graw Hill, 1982.
3. K.W Houp and T.E Pearsall, Reporting Technical Information. 5th Edition, Macmillan Publishing Company, New York, 1984.
4. Leech G. Savartivk, J.,A Communicative Grammar of English, ELBS, 1975
5. Collins Cobuild English Dictionary, New Edition, Harper Collins Publishers, 1995

Basic Electrical System and Circuit

BIT120EL

Year : I **Semester : I**

Teaching schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final Assessment		Total
			Theory	Practical	Theory	Practical	
3	1	2	20	50	80	-	150

Objectives: The main objective of this course is to provide fundamental knowledge about DC. AC and magnetic circuits.

Course Contents:

1. Introduction to Electric System [6 Hrs]

1.1 Electric circuit and its constituent elements. Electric network.
1.2 Current flow in a circuit
1.3 Electrical sources (ideal and practical sources, voltage and current sources and dependent and independent sources)
1.4 Passive elements of electrical circuit, general concept of resistance, inductance and capacitance
1.5 Ohm's law, laws of resistance, resistivity, conductivity and temperature coefficient of resistance
1.6 Power and energy in resistance, inductance and capacitance
1.7 Sources transformation
1.8 Resistance color codes and tolerance

2. **DC circuit and Network Theorems [16 Hrs]**

2.1 series, parallel and mixed circuits involving resistances, equivalent resistance calculation.
2.2 Star-delta and delta-star transformation
2.3 Kirchhoff's law and its application in network solution-nodal analysis and mesh analysis
2.4 Thevenin's and Norton's theorem involving independent sources, dependent sources and both sources.
2.5 Maximum power transfer theorem.
2.6 Superposition theorem.
2.7 Reciprocity theorem

3. **Alternating Quantities [3 Hrs]**

3.1 Faraday's law of electromagnetic induction concept of statically and dynamically induced emf
3.2 Generation of alternating voltage, equation of alternating voltage
3.3 Waveform, terms and definitions
3.4 Average and rms values waveforms, form factor, crest factor

3.5 Phasor diagram

4. **AC Circuit Analysis** **[16 Hrs]**

4.1 AC in purely resistive, inductive and capacitive circuits

4.2 Concept of complex impedance and complex admittance

4.3 Single phase series circuits: Impedance, admittance, power, power factor, Q factor and power triangle of RL, RC, and RLC series circuit, Resonance in series RLC circuits

4.4 Single phase parallel circuits: Admittance method: Phasor diagram, Power, Power factor and power triangle; Resonance in parallel circuits

4.5 Power factor improvement

4.6 Three phase AC circuits: Basic concept and advantages, Line and Phase relation for Star and Delta connection, Power relations, Analysis of balanced 3 phase circuits.

5. **Magnetic Circuits** **[4 Hrs]**

5.1 Ampere's circuital law and its application

5.2 Ohm's law for magnetic circuits

5.3 Series and parallel magnetic circuits

5.4 Electromagnet

5.5 Ferromagnetic materials, hysteresis and eddy current

5.6 Core loss in ferromagnetic materials

Laboratory works:

1. Introduction to sources, breadboard, resistance color code, multimeter and oscilloscope.
2. Measurement of voltage, current and power in DC circuit, Verification of ohm's law
3. Verification of series and parallel combination of resistance.
4. Verification of Kirchhoff's laws.
5. Verification of Superposition theorem.
6. Verification of Thevenin's and Norton's Theorem.
7. Verification of reciprocity theorem.
8. Measurement of amplitude, frequency nad time with oscilloscope.
9. Measurement of voltage, current and power in single phase ac circuit, Verification of impedance of the circuit.
10. Electric circuit simulation study, simulation of circuits using workbench or p-spice or MATLAB or other software.

Reference books:-

1. B.L Theraja, A.K. Theraja- "A text book of electrical technology vol. I", S.Chand & Company, New Delhi
2. Vincent Del Toro- " Electrical Engineering Fundamentals", PHI
3. Hughes- "Electrical Technology", Pearson Education Asia

Principles of Management
BIT115 MS

Year : I **Semester : I**

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

Objectives: This course aims at familiarizing the students with the various aspects of management and helps them understand major aspects to be performed by managers.

Course Contents:

1. **Introduction** **[4 Hrs]**
   - 1.1 Meaning/ Concept of Management
   - 1.2 Elements of Management
   - 1.3 Levels of Management
   - 1.4 Significance Management
     - 1.4.1 General Significance
     - 1.4.2 Special Significance to BIT students
2. **Approaches to Management** **[5 Hrs]**
   - 2.1 Rule of thumb Approach
   - 2.2 Mechanistic Approach
   - 2.3 Behavioral Approach
   - 2.4 System Approach
   - 2.5 Contingency Approach
3. **Function of Management**
   - 3.1 **Managerial Planning** **[4 Hrs]**
     - 3.1.1 Meaning and Significance
     - 3.1.2 Types of Plans
     - 3.1.3 Steps in Plans
     - 3.1.4 Factors Affecting Process
   - 3.2 **Organizing** **[5 Hrs]**
     - 3.2.1 Meaning/ Concept of Organization
     - 3.2.2 Basis of Organization
     - 3.2.3 Organization design, line/ staff; pyramidical/ hierarchical; flat and matrix
     - 3.2.4 Principles of organization, span of control; Hierarchy, unit of command; centralization decentralization of authority
   - 3.3 **Staffing/ Human Resource Management** **[5 Hrs]**
     - 3.3.1 Importance/ significance of H.R.M
     - 3.3.2 Procurement function

3.3.3 Maintenance function
3.3.4 Development function
3.3.5 Motivation function

3.4 **Directing and Controlling** **[2 Hrs]**
3.4.1 Meaning and significance of directing functions
3.4.2 Management as control system

3.5 **Coordinating** **[2 Hrs]**
3.5.1 Meaning and significance of coordination
3.5.2 Techniques of coordination

3.6 **Reporting** **[2 Hrs]**
3.6.1 Meaning and significance of Reporting
3.6.2 Methods of reporting

3.7 **Decision Making and Monitoring** **[5 Hrs]**
3.7.1 Meaning of decision making
3.7.2 Relational decision making
3.7.3 Incremental decision making
3.7.4 Mixed scanning decision making
3.7.5 Meaning and significance of monitoring

3.8 **Communication** **[3 Hrs]**
3.8.1 Concept/ significance of management communication
3.8.2 Types of communication: horizontal and vertical: one way and Two ways
3.8.3 Barriers to effective communication

3.9 **Leadership** **[3 hrs]**
3.9.1 Meaning and significance of leadership
3.9.2 Theories of leadership

4. Managerial Technique **[5 hrs]**
4.1 Job Analysis
4.2 Job Evaluation
4.3 Job Description
4.4 SWOT Analysis
4.5 Quality Circle
4.6 Total Quality Management
4.7 Kaizen (Continuous performance improvement)

Basic Text Books:

1. Koontz, H. and Wehrich, Essential of Management, New Delhi; Tata MCGrwhill publishing Community, Ltd, 2000
2. Stephen P. Robbins and coulter, Mary, Management, New Delhi, Prentice Hall of India Ltd 2000
3. Agrawal, Dr. G.R Organization and Management in Nepal, Kathmandu, M.K. Publishers and Distributors, 2000

Reference Books

1. Stoner, J.A., Freeman, R.E. and Gilbert, D.R Management, New Delhi Prentice Hall of India Ltd, 1996
2. Stephen P. Robbins and David A. Cenzo, Fundaments of Management, Prentices Hall INC., New Jersey, 1995

Computer Programming - I
BIT75 CO

Year : I **Semester : I**

Teaching schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final Assessment		Total
			Theory	Practical	Theory	Practical	
3	1	2	20	50	80		150

Objectives: To provide the concept of programming methodology using C.

Course Contents:

1. **Problem Solving with computer** **(3 Hrs)**
   - 1.1 Problem Analysis, Algorithms and Flowchart
   - 1.2 Coding, Complication and Execution
   - 1.3 History of C
   - 1.4 Structure of C program
   - 1.5 Debugging, Testing and Documentation
2. **Elements of C** **(4 Hrs)**
   - 2.1 C Tokens
   - 2.2 Escape sequence
   - 2.3 Delimiters
   - 2.4 Variables
   - 2.5 Data types
   - 2.6 Constants/ Literals
   - 2.7 Expressions
   - 2.8 Statement and Comments
3. **Input and Output** **(2 Hrs)**
   - 3.1 Conversation Specification
   - 3.2 I/O operation
   - 3.3 Formatted I/O
4. **Operators and Expression** **(4 Hrs)**
   - 4.1 Arithmetic operator
   - 4.2 Relational operator
   - 4.3 Logical and Boolean operator
   - 4.4 Assignment operator
   - 4.5 Ternary operator
   - 4.6 Bitwise operator
   - 4.7 Increment and Decrement operator
   - 4.8 Comma operator
5. **Control statements** **(4 Hrs)**

5.1 Branching
5.2 Looping
5.3 Conditional Statement
5.4 Exit function
5.5 Difference between break and exit

6. Arrays (6 Hrs)

6.1 Introduction
6.2 Declaration of array
6.3 Initialization of arrays
6.4 Sorting
6.5 Multidimensional array

7. Functions (5 Hrs)

7.1 Library function
7.2 User-defined function
7.3 Recursion
7.4 Function declaration
7.5 Local and global variables
7.6 User of array in function
7.7 Passing by value, Passing by address

8. Pointers (6 Hrs)

8.1 Introduction
8.2 The & and * operator
8.3 Declaration of pointer
8.4 Pointer to pointer
8.5 Pointer arithmetic
8.6 Array and pointer
8.7 Pointer and array
8.8 Pointer with multidimensional array
8.9 Pointer nad strings
8.10 Array of pointer with string
8.11 Dynamic memory allocation

9. Structure and Union (5 Hrs)

9.1 Introduction
9.2 Array of structure
9.3 Passing structure to function
9.4 Passing structure to function
9.5 Structure within structure (Nested structure)
9.6 Union
9.7 Pointer to structure

10. Files and file handling in C (4 Hrs)

10.1 Concept of file
10.2 Opening and closing of file

10.3 Modes
10.4 Input/output function
10.5 Random access in file
10.6 Printing a file

11. Introduction to Graphics (2 Hrs)

11.1 Modes
11.2 Initialization
11.3 Graphics Function

Laboratory:

Laboratory exercises are necessary to be done in different chapters. At the end od each chapter, laboratory reports are required to be submitted to teacher for evaluation.

Reference:

1. Deitel C: How to program, 2/e(with CD), Pearson Education.
2. AI Kelley, Ira Pogl, “A book on C”, Pcarson Education.
3. Brian W.Keringhan & Dennis M. Ritchie, “The C Programming Language”, PH.
4. Bryons S. Gottfried, “ Programming with C, TMH.
5. Stephen G. Kochan, “Programming in C”, CBS publishers & distributors.
6. Yashvant Kanetker “Let Us C”, BPB Publication.
7. E. Balagurusamy “Programming in ANSI C”, Tata Mc Graw-Hill Publshing.

Project - I
BIT178 CO

Year : I **Semester : I**

Teaching schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final Assessment		Total
			Theory	Practical	Theory	Practical	
3	1	2	20	50	80		150

Objectives: To design and complete the software by using high-level language (C-Programming). On the completion of the project, student will be able to develop small sacle of software in C programming.

Course Contents:

A total 45 hours covering features of C programming techniques will be assigned to the students. Topic must be identified and instructed to each group, and at least students must prepare and submit written reports and give the oral presentation.

General Procedure:

1. Information Gathering
2. System requirements specifications
3. Algorithms and Flowcharts
4. Coding Techniques
5. Result
6. Documentation

The Project document shall include the following:

1. Technical description of Project
2. System aspect of the project
3. Implementation of project
4. Project tasks and time schedule
5. Project team members
6. Project Supervisor

Purbanchal University

Bachelor in Information Technology (BIT)

Year: I **Semester: II**

S.N	Course Code	Course description	Credits	Lecture (Hrs)	Tutorial (Hrs)	Practical (Hrs)	Total (Hrs)
1	BIT102SH	Mathematics - II	3	3	2	-	5
2	BIT130EC	Electronics Devices & Circuits	3	3	1	2	6
3	BIT173CO	Digital Logic	3	3	1	2	6
4	BIT176CO	Object Oriented Programming in C++	3	3	1	2	6
5	BIT179CO	Project – II	2	-	-	4	4
6	BIT191MS	Financial management & Accounting	3	3	1	1	5
		Total	**17**	**15**	**6**	**11**	**32**

Mathematics - II

BIT303SH

Year I **Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	2	-	Theory	Practical	Theory	Practical	100
			20	-	80	-	

Course Objective

The aim of this course is to expose students to theory of complex variables, differential equations, Laplace transform and Fourier series and integrals applied to signal processing.

Course contents

1. **Differential equation of the first order** **[8 Hrs]**
   - 1.1 Variable separable
   - 1.2 Exact differential equations
   - 1.3 Homogeneous equations
   - 1.4 Linear differential equation
   - 1.5 Simultaneous differential equations
   - 1.6 Equations of higher degree
   - 1.7 Some applications

2. **Linear differential equations** **[5 Hrs]**
   - 2.1 Homogeneous equation of second order
   - 2.2 Methods of determining particular integrals and application
   - 2.3 Vibrations of a particle (SHM)

3. **Laplace transforms** **[6 Hrs]**
   - 3.1 Definition
   - 3.2 Laplace transform of some elementary functions
   - 3.3 Properties of Laplace transforms
   - 3.4 Transforms of derivatives
   - 3.5 Definition of inverse Laplace transforms
   - 3.6 Properties of inverse transform
   - 3.7 Use of partial fractions
   - 3.8 Use of Laplace transforms in solving ordinary differential equations

4. **Fourier series and integrals** **[9 Hrs]**

4.1 Definitions and derivatives

4.2 Odd and even functions

4.3 Half range series

4.4 Change of scale

4.5 The Fourier integral and Fourier transforms

5. **Partial differential equations** **[8 Hrs]**

5.1 Basic concepts

5.2 Formation of P. D. equations

5.3 Solution of P. D. equations (simple cases)

5.4 The wave equation, Poisson's equation, Own dimensional heat flow & Laplace equation

6. **Functions of a complex variable** **[6 Hrs]**

6.1 Basic definitions

6.2 Functions of a complex variable

6.3 Limit, continuity and differentiation

6.4 Cauchy Riemann equations

6.5 Analytic functions

6.6 Harmonic functions

6.7 Complex exponential, trigonometric and hyperbolic function

7. **Complex series, residues and poles** **[3 Hrs]**

7.1 Taylor's theorem

7.2 Laurent's series

7.3 Zeros, singularities and poles

7.4 Residues

Reference books

- "*Engineering Mathematics*", Vol. II, S. S. Sastry, Prentice Hall of India
- Praleigh J. B., "*Calculus with Analytical Geometry*", Addison Wesley Pub, Co, Inc (1980)
- Bajpai A. C., Calus I. M. & Fairley J. A. "*Mathematics for Engineers & Scientists*", Vol-I. John Wiley & Son 91973)
- Goldstain I. J., Lay D. C. & Schinder D. I., "*Calculus and its Applications*", Prentice Hall Inc. (1977)
- Spiegel M. R., "*Theory & Problems of Advanced Calculus*", Scham Publishing Co.
- Srivastava R. S. L, "*Engineering Mathematics*", Vol.II, Tata McGraw Hill Publishing Co. (1980)
- Potter & Goldberg, "*Mathematical Methods*", Prentice Hall of India

Electronic Devices & Circuits

BIT130EC

Year I **Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective

The main objectives of this course are to understand working principles and basics of semiconductor devices, the method for analysis of semiconductor devices and introduction to IC and operational amplifier.

Course contents

1. **Two port network** **[4 Hrs]**

   Tow port circuit and circuit parameters

   Forward and reverse transfer functions

   Voltage and current controlled sources

   Gain (current and voltage gains), input and output resistances calculation of two port network

2. **Semiconductor diode** **[10 Hrs]**

   Semiconductor materials – elemental and compound

   p-n junction diode – biasing of p-n junction diode (no bias, forward bias, reverse bias)

   The V-I characteristics

   Zener diode and its characteristics

   Zener and avalanche breakdowns

   Applications of diode as half wave rectifier and full wave rectifier

   Clipping and claming circuits

3. **Bi-polar junction transistor (BJT)** **[5 Hrs]**

   Construction of a BJT

   CB, CE and CC configurations

   Input and output characteristics

   α's, β's and their relationships

4. **BJT biasing** **[6 Hrs]**

   Introduction, need, types of biasing

   Designing BJT as an amplifier in CE configuration with voltage divider bias

5. **The junction field effect transistor (JFET)** **[4 Hrs]**

   Construction and types
   The pinch-off voltage and its importance
   Biasing and load line
   V-I characteristics
   Configuration of JFET

6. **The metal oxide semiconductors FET** **[3 Hrs]**

   Construction and types
   Load line and biasing
   V-I characteristics

7. **Feedback and oscillator circuits** **[6 Hrs]**

   Feedback concepts, practical feedback circuits
   Feedback amplifier – phase and frequency consideration
   Oscillator principle
   Wein-bridge oscillator
   Crystal oscillator circuits

8. **Operational amplifier** **[7 Hrs]**

   Introduction
   Properties of an ideal OPAMP
   Applications of OPAMP: Adder, Sub-tractor, Comparator, Inverter, Integrator, Differentiator

Laboratory

- Familiarization with electronics components
- Characteristics of diode, zener diode
- Input and output characteristics of CB, CE and CC configurations
- Input and output characteristics of JFET
- Input and output characteristics of nMOS
- Input and output characteristics of CMOS
- Inverting and non-inverting OPAMP
- Integrator and differentiator design using OPAMP
- Design of comparator using OPAMP

Reference books

- R. Boylested & L. Nashelesky, “Electronics Devices & Circuit Theory”, 4th edition, Prentice Hall of India
- A. S. Sedra & K. C. Smith, “Microelectronic Circuits, 6th edition, Oxford University Press
- Theoderre S. Bogart, “Electronic Device & Circuits”
- Milliman & Halkais, “Electronic Device & Circuit”, McGraw Hill

Object Oriented Programming in C++

BIT176CO

Year I **Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
			Theory	Practical	Theory	Practical	
3	1	2	20	50	80	-	150

Course Objective

The objective of this course is to introduce students to the programming methodology using the C++ language. This module should be associated with laboratory experiments to augment the concepts taught in the class.

Course contents

1. **Introduction to object oriented programming** **[2 Hrs]**
   - 1.1 Procedural language vs OOP
   - 1.2 Characteristics of object-oriented languages
   - 1.2.1 Objects
   - 1.2.2 Classes
   - 1.2.3 Inheritance
   - 1.2.4 Reusability
   - 1.2.5 Polymorphism & overloading
   - 1.3 Applications of OOP

2. **C++ programming concept** **[3 hrs]**
   - 2.1 Introduction to programming in C++
   - 2.2 Extraction operator (>>)
   - 2.3 Insertion operator (<<)
   - 2.4 Type conversion: automatic conversion, cast
   - 2.5 Arrays and pointers in C++
   - 2.6 New and delete operators
   - 2.7 Manipulators
   - 2.8 Const
   - 2.9 Enumeration

3. **Functions used in C++** **[4 Hrs]**
   - 3.1 Introduction to functions
   - 3.2 Passing arguments to functions
   - 3.3 Returning values from functions

3.4 Reference arguments

3.5 Returning by reference

3.6 Functions overloading: different number of arguments, different kinds of arguments

3.7 Default arguments

3.8 Inline functions

4. **Classes and objects** **[6 Hrs]**

4.1 Introduction

4.2 Access specifier (public, private and protected)

4.3 Accessing class members

4.4 Defining member functions

4.4.1 Member function inside the class body

4.4.2 Member function outside the class body

4.5 “this” pointer

4.6 Constructor & destructor

4.6.1 Types of constructor

4.6.1.1 Default constructor

4.6.1.2 Parameterized constructor

4.6.1.3 Copy constructor

4.6.2 Overloaded constructors

4.7 Static data member

4.8 Static member functions

4.9 Passing objects as arguments

4.10 Friend functions & friend classes

5. **Operator overloading** **[6 Hrs]**

5.1 Introduction to operator overloading

5.2 General rules for overloading operator

5.3 Operator overloading restrictions

5.4 Overloading unary and binary operators

5.5 Operator overloading using friend functions

5.6 Data conversion

5.6.1 Conversion between basic types and object

5.6.2 Conversion between object and basic types

5.6.3 Conversion between objects of different classes

6. **Inheritance** **[6 Hrs]**

6.1 Introduction & benefits of inheritance

6.2 Types of inheritance

6.3 Inheritance: base classes & derived classes

6.4 Using constructors and destructors in derived classes

6.5 Abstract base class

6.6 Public, private and protected inheritance

6.7 Ambiguity in multiple inheritance

6.8 Containership

7. **Virtual functions and polymorphism** **[5 Hrs]**

7.1 Introduction

7.2 Early vs late binding

7.3 Virtual functions

7.4 Pure virtual functions and abstract classes

7.5 Virtual base classes

8. **File handling** **[6 Hrs]**

8.1 Introduction

8.2 Opening and closing file

8.2.1 Opening file using constructor

8.2.2 Opening file using open () and open() file modes

8.3 Basic functions of seekg(), seekp(), tellg(), tellp()

8.4 Sequential input/output operations

8.4.1 put() and get() functions

8.4.2 write() and read () functions

8.5 Reading and writing a class objects

9. **Templates** **[3 Hrs]**

9.1 Introduction to templates

9.2 Function templates

9.3 Class templates

10. **Namespaces** **[2 Hrs]**

10.1 Using namespace

10.1.1 Using the scope resolution operator

10.1.2 Through “using” keyword

11. **Exception handling** **[2 Hrs]**

11.1 Introduction to exceptions

11.2 Exception handling model

11.3 Exception handling construct: try, catch, throw

Reference books

- Robert Lafore, “Object-Oriented Programming in C++, Galgotia, Publication, India
- E. Dalagurusamy, “Object Oriented Programming with C++, McGraw Hill 4/e
- Deitel & Deitel, “C++ How to Program”, 3/e Prentice Hall
- Yashavant Kanetkar, “Let Us C++”, BPB Publication, New Delhi

Financial Management and Accounting

BIT191MS

Year I **Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
			Theory	Practical	Theory	Practical	
3	1	1	20	50	80	-	150

Course Objective

The basic objective of this course is to familiarize the students with the fundamentals of financial management and accounting so as to enable them to understand the financial decision making process and the need and use of accounting information in the process, and to develop an understanding of the financial and accounting aspects of information technology.

Course contents

1. **Nature of financial management** **[3 Hrs]**
   Meaning and importance objectives-profit vs wealth maximization, functions, financial management in new millennium-globalization of business and information technology

2. **Time value of money** **[3 Hrs]**
   Concept, present values and future values

3. **Capital budgeting** **[4 Hrs]**
   Importance, generating ideas for capital projects, projects classifications, capital budgeting decision rules-payback period, NPV and IRR, comparison of NPV and IRR

4. **Working capital** **[5 Hrs]**
   Concept of working capital, cash management, receivables management inventory management, financing working capital

5. **Capital structure** **[4 Hrs]**
   Meaning of capital structure, optimum capital structure, business and financial risks, determining optimum structure, factors affecting capital structure policies

6. **Dividends** **[4 hrs]**
   Dividends and retained earnings, optimum dividend policy, factor affecting dividend policies, types of dividend policy, other forms of dividend stock dividends-stock dividends, stock splits, stock repurchase

7. **Nature of accounting** **[4 Hrs]**

   Meaning, importance, basic accounting concepts, principles and standards: double entry system of accounting, rules of double-entry-equation rule and types of account rule

8. **Accounting process** **[5 Hrs]**

   Journalizing and subdivision of journal, ledger posting, preparation of trial balance

9. **Financial statement** **[5 Hrs]**

   Meaning types- income statement, B/S, preparation of financial statements

10. **Financial analysis** **[4 Hrs]**

    Meaning, types, ratio analysis, uses and limitation of ratio analysis

11. **Cash flow statement – direct method** **[4 Hrs]**

Laboratory

Emphasis should be on using accounting package (e.g. Tally, Facts etc) to prepare final accounts of any organization.

Reference books

- Eugene F. Brigham & Joel F. Houston, "*Fundamentals of Financial Management*", Harcourt Asia Pte, Singapore, Indian Edition, 2001.
- T. S. Gerewal, "*Introduction to Accounting*", S. Chand & Co, New Delhi.
- Lawrence J Gitman, "*Principles of Managerial Finance*", Addison Wesley Longman (Singapore) Pvt. Ltd, Indian Reprint, 2001.
- Surendra Pradhan, "*Basics of Financial Management*", Educational Enterprises, Kathmandu

Digital Logic

BIT173CO

Year I **Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective

To provide the concepts used in the design and analysis of digital systems and introduces the principles of digital computer organization and design.

Course contents

1. **Number systems** **[5 hrs]**

   Introduction

   Comparison between analog and digital system

   Number system and conversion, signed and unsigned numbers, fraction conversion

   Binary coded decimal, gray code, alphanumeric code and error codes

2. **Boolean algebra and logic gates** **[6 Hrs]**

   Introduction to Boolean algebra

   Basic theory and properties of Boolean algebra

   Boolean functions

   Logical operations

   Logic function and gates

   IC digital logic families

3. **Simplification of Boolean functions** **[6 hrs]**

   K-Map

   Two and three variable maps

   Four variable maps

   Product of sums, sum of product simplification

   NAND and NOR implementation

4. **Combinational logic** **[8 Hrs]**

   Design procedure

   Adders

   Substractors

   Code conversion

Analysis procedure

Multilevel NAND circuits
Multilevel NOR circuits

5. **Combinational logic with MSI and LSI** **[8 Hrs]**
   Binary parallel adder

   Decimal adder

   Magnitude comparator

   Decoders

   Multiplexers

   Read only memory

   Programmable logic array (PLA)

6. **Sequential logic** **[6 Hrs]**
   Difference between sequential and combinational circuit

   Concept of memory, flip-flop as 1-bit register

   RS, JK, T, D and master slave flip flops

   Design procedure

   Design with state equation and state reduction table

Laboratory

- Familiarization with logic gates
- De Morgan's law
- Multiplexer and de-multiplexer
- Encoder and decoder
- Half adder and half subtractor
- Full adder and full subtractor
- RS, JK, TD and master slave flip flops
- Shift registers
- Ripple counters and synchronous counters
- Simulation using suitable software

Reference book

- Floyd T. L & Jain R. P, "*Digital Fundamentals*", 8th edition
- Morris Mano, "*Logic & Computer Design Fundamentals*", Pearson education
- William I, Fletcher, "*An Engineering Approach to Digital Design*", Prentice Hall of India, New Delhi, 1990
- A.P. Malvino & Jerald A. Brown, "*Digital Computer Electronics*", 1995
- D. D. Hodegs & H.G. Jackson, "*Analysis & Design of Digital Integrated Circuits*", McGraw Hill, New York, 1983

Project - II

BIT179CO

Year I **Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
-	-	4	Theory	Practical	Theory	Practical	100
			-	60	-	40	

Course Objective

To design and complete the software project in an object oriented language. On the completion of the project, student will be able to develop small scale software in C++ programming language.

Course contents

There should be a total of 60 hours covering important features of object oriented programming. A software development project will be assigned to students in a group (up to 4). A relevant topic shall be identified and instructed to each group. Students must develop the assigned software, submit written report and give oral presentation.

General procedure

- Topic selection
- Information gathering
- System requirements and specifications
- Algorithms and flowcharts
- Coding
- Implementation
- Documentation

The project document shall include the following:

- Technical description of the project
- System aspect of the project
- Project tasks and time schedule
- Project team members
- Project supervisor
- Implementation of the project

Purbanchal University

Bachelor in Information Technology (BIT)

Year: II **Semester: III**

S.N	Course Code	Course description	Credits	Lecture (Hrs)	Tutorial (Hrs)	Practical (Hrs)	Total (Hrs)
1	BIT270CO	System Analysis & Design	3	3	1	-	4
2	BIT272CO	Microprocessor & Assembly Language	3	3	1	2	6
3	BIT273CO	Data Structure & Algorithm	3	3	1	2	6
4	BIT275CO	User Interface Design	3	3	1	2	6
5	BIT278CO	Project-III	2	-	-1	4	4
6	BIT280CO	Numerical Methods	3	3	1	2	6
		Total	**17**	**15**	**5**	**13**	**32**

System Analysis & Design

BIT270CO

Year: II **Semester: III**

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

Course Objective

This course helps to launch the careers of successful system analysts or of users assuming an active role in building systems that satisfy their organizations' information needs. The course also provides a solid foundation of systems.

Course contents

1. **Overview of system analysis and design** **[6 Hrs]**
   - 1.1 Introduction to system analysis and design
   - 1.2 Information systems and its types
   - 1.3 Stakeholders of information systems
   - 1.4 Systems development life cycle and life cycle models (waterfall, spiral, prototype)
   - 1.5 Introduction to CASE tools

2. **Process and conceptual modeling** **[8 Hrs]**
   - 2.1 Introduction to data flow diagram (DFD)
   - 2.2 Concepts used in drawings DFDs
   - 2.3 DFD design (up to level 2)
   - 2.4 Conceptual modeling
   - 2.5 Entity relationship diagrams

3. **Logic modeling** **[3 Hrs]**
   - 3.1 Decision table
   - 3.2 Decision tree
   - 3.3 Structured English
   - 3.4 Data dictionary

4. **Systems analysis** **[8 Hrs]**
   - 4.1 System planning and initial investigation
   - 4.2 Project scheduling

4.3 Requirement analysis
4.4 Types of requirements
4.5 Requirement gathering methods
4.6 Feasibility study and its types
4.7 Steps of feasibility study
4.8 Cost/benefits analysis (payback method, NPV method)

5. **Systems design** **[8 Hrs]**
5.1 Introduction to system design
5.2 The process and stages of system design
5.3 Logical and physical design
5.4 Introduction to structured design (modular system design, functional strength, structure chart, cohesion, coupling)
5.5 Database design and overview of file organization
5.6 Input/output and forms design

6. **System implementation** **[6 Hrs]**
6.1 Introduction to system implementation
6.2 System installation and its types
6.3 System quality, software quality assurance (formal technical review, walkthrough, inspections)
6.4 System maintenance, types of maintenance and process of system maintenance
6.5 Introduction to system testing

7. **Object-oriented analysis and design** **[6 Hrs]**
7.1 Object-oriented development life cycle
7.2 The unified modeling language
7.3 Use-case modeling
7.4 Object modeling: class diagrams
7.5 Dynamic modeling: state diagrams
7.6 Dynamic modeling: sequence diagrams

Reference books

- Jeffery A. Hoffer, Joey F. George, Joseph S. Valacich, "*Modern System Analysis & Design*", Pearson Education, 2nd edition
- "*Introduction to System Analysis & Design*", Igor Hawrysjkiewycz, PHI, 4th edition
- Englewood Cliffs, New Jersey, "*System Analysis & Design*".
- Jeffrey L. Whitten, Loonnie D. Bentley, "*System Analysis & Design Methods*", 5th edition
- Grady Booch, "*Object Oriented Analysis & Design with Application*", Pearson eduction

Microprocessor & Assembly Language

BIT272CO

Year: II **Semester: III**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective

To be familiar with the operation, programming and application of 8 and 16 bits microprocessor.

Course contents

1. **Introduction** **[5 Hrs]**
   - 1.1 History of microprocessor
   - 1.2 Calculator and stored program computer
   - 1.3 Von Neumann and Harvard architecture
   - 1.4 Simple stored program computer architecture
   - 1.5 Applications of microprocessor

2. **Intel 8085 microprocessor** **[10 Hrs]**
   - 2.1 Pin diagram and pin functions
   - 2.2 Internal architecture
   - 2.3 Addressing modes
   - 2.4 Instruction set with classification
   - 2.5 Instruction format and programming
   - 2.6 Fetch and execution cycle
   - 2.7 Fetch execution overlap
   - 2.8 Timing diagram

3. **Bus structure and memory devices** **[4 Hrs]**
   - 3.1 Bus structure, synchronous and asynchronous data bus, address bus, bus timing
   - 3.2 Memory devices
   - 3.3 Static and dynamic RAM, ROM
   - 3.4 Address decoding, memory interface (8, 16, 32, 64 bits)

4. **Input/output interfaces** **[6 Hrs]**
   - 4.1 Serial communication
     - 4.1.1 Asynchronous and synchronous interface

4.1.2 8251 programmable communication interface (block diagram and modes only)

4.2 Parallel communication

4.2.1 8255 Programmable peripheral interface (block diagram and modes only)

4.3 RS-232 and IEEE 488-1978 general purpose interface standard

4.4 Keyboard and display controller (block diagram only)

5. **Interrupt (8 and 16 bits)** **[5 Hrs]**

5.1 Introduction

5.2 Basic interrupt processing

5.3 Types of interrupts

5.4 Interrupt service routing requirements

5.5 Interrupt priority

6. **DMA** **[3 Hrs]**

6.1 Introduction

6.2 Basic DMA operation

6.3 8237 DMA controller (block diagram and modes only)

7. **8086 instruction description and assembler directives** **[10 Hrs]**

7.1 Pin diagram and pin function

7.2 Internal architecture

7.3 Addressing modes

7.4 Assembler instruction format: opcodes, mnemonics and operands

7.5 Assembler operations: sample assembly language program and code generation, one-pass and two-pass assembly, assembler directives

7.6 Instruction set with classification and programming

8. **Introduction to higher series of Intel processors, A comparative study** **[2 Hrs]**

Laboratory

There shall be following laboratory exercises using the microprocessor trainer-kit and assembler.

- Familiarization with 8085 and 8086 microprocessor trainer-kit and their simulators
- Data transfer, arithmetic and logical instructions
- Subroutines and branching instructions
- Stack operation
- Timers and delay
- Code conversion

Reference books

- Ramesh S. Gaonkar, "Microprocessor – Architecture, Programming & Applications with 8085", Penram Intl. publisher, 5th edition, 2006.
- Ghose P. K., Sridhar P. R. "0000 to 8085: Introduction to Microprocessor for Engineers & Scienists", 2nd edition, PHI
- Barry B. Berry, "The Intel Microprocessor 8086, 8088, 80186, 80286, 80386 & 80486 (Architecture, Programming & Interface)", PHI
- Lance, A. Leventhal, "Introduction to Microprocessors: Software, Hardware & Programming", Eastern Economy Edition. PHI
- Yu Cheng Liu & Glenn A. Gibson, "Microprocessor Systems: The 8086/8088 Family", PHI
- Douglas V. Hall, "Microprocessors & Interfacing", PHI

Chapter wise marks distribution for questions:

Unit	Group A: Long Type (Attempt any 2 out of 3)	Group B: Short Type (Attempt any 7 out of 8-9)
1	-	1
2	1	2
3	-	1
4	1	1
5	1	1
6	-	1
7	1	2
8	-	1
	2 × 12 = 24	7 × 8 = 56

Data Structure & Algorithm

BIT273CO

Year: II **Semester: III**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective

To provide fundamental knowledge of data structure, various algorithms used and their implementations.

Course contents

1. **Introduction** **[2 Hrs]**
   - 1.1 Data and data types
   - 1.2 Data structure and its operations and importance
   - 1.3 ADT and its applications and importance
   - 1.4 ADT vs DS

2. **Algorithmic efficiency and its complexity** **[2 Hrs]**
   - 2.1 Time and space analysis
   - 2.2 Asymptotic notations – big O, big sigma, theta, omega

3. **Stack** **[4 Hrs]**
   - 3.1 Definition
   - 3.2 Primitive operations with examples representing stack in C
   - 3.3 Stack implementation (PUSH/POP) operations
   - 3.4 Stack as an ADT
   - 3.5 Prefix, infix and postfix expressions
     - 3.5.1 Definitions
     - 3.5.2 Algorithms for evaluation of infix and postfix expression
     - 3.5.3 Converting an expression from infix to postfix and vice versa

4. **Queue** **[3 Hrs]**
   - 4.1 Definition
   - 4.2 Primitive operations with examples representing queue in C
   - 4.3 Queue implementation (Enqueue/Dequeue) operations
   - 4.4 Queue as an ADT

4.5 Types of queue (linear, circular, priority queue and its types)

5. **List and linked list** **[6 Hrs]**

5.1 Introduction to list and linked list

5.2 Advantages of list over stack and queue

5.3 Types of lists (static and dynamic)

5.4 List and list operations

5.5 Array implementation of list

5.6 Linked list as an ADT

5.7 Linked list and its types

5.7.1 Linear linked list – singly linear and doubly linear

5.7.2 Circular linked list – singly circular and doubly circular

5.8 Linked list operations (insertion/deletion from the front node, from the last node, before a given node, after a given node)

5.9 Linked stack and linked queue

5.10 Doubly linked list and its advantages

6. **Recursion** **[4 Hrs]**

6.1 Definition and recursive functions

6.2 Recursion vs iteration with advantages and disadvantages

6.3 Application of recursion – factorial calculation, Fibonacci series, TOH, natural numbers multiplication with algorithms and examples

6.4 Efficiency of recursion

7. **Trees** **[6 Hrs]**

7.1 Concepts and definitions

7.2 Binary tree and its applications

7.3 Basic operations in binary tree – insertion/deletion, traversing

7.4 Binary tree traversals – pre-order, post-order and in-order

7.5 Height, depth and level of binary tree

7.6 Balanced trees and balancing algorithms (AVL balanced tree, Huffman coding)

8. **Sorting** **[5 Hrs]**

8.1 Definition and types of sorting (internal and external sort, insertion and selection sort, exchange/bubble sort, quick sort, merge sort, radix sort, shell sort, heap and heap sort)

8.2 Efficiency of sorting

9. **Searching and hashing** **[6 Hrs]**

9.1 Definition of search and concepts of keys, essentials of searching

9.2 Types of searching – sequential search, binary search, binary tree search

9.3 General search tree

9.4 Definition of hashing

9.5 Hash functions and hash table

9.6 Collision resolution technique

9.7 Efficiency comparisons of different search techniques

10. **Graphs** **[7 hrs]**

10.1 Definition and representation of graphs

10.2 Application of graphs

10.3 Graphs as an ADT

10.4 Adjacency matrix implementation, transitive closure, Warshall's algorithm

10.5 Types of graphs

10.6 Graph traversal – depth first search (DFS), breadth first search (BFS)

10.7 Spanning tree and spanning forest

10.8 Kruskal's algorithm, Round-Robin algorithm, Greedy algorithm, Dijkstra's algorithm

Laboratory

There shall be following lab exercises based on C or C++.

- Implementation of stack
- Implementation of linear and circular queues
- Solution of TOH and Fibonacci Recursion
- Implementation of linked list: singly and doubly linear and circular linked list
- Implementation of trees: AVL trees, balancing of AVL
- Implementation of merge sort
- Implementation of search: sequential, tree and binary
- Implementation of graphs: graph traversals
- Implementation of hashing
- Implementation of heap

Reference books

- "*Data Structure using C & C++*", Aarton M. Tenenbaum, Y. Langsam, M. J. Augenstein, PHI.
- "*Fundamental of Computer Algorithms*", H. Sahani
- "*Data Structure of Program Design in C*", Robert L. Kruse, B. P. Leung, C. L. TOndo, PHI
- "*The Art of Programming, Sorting & Searching*", Donald E. Knuti-I.
- "*Data Structure & Application*", Trebly & Sorenson
- "*Introduction to Data Structure & Algorithms with C & C++*", G. W. Rowe, PHI
- "*Fundamentals of Algorithms*", G. Brassand & P. Bratley, PHI

User Interface Design

BIT275CO

Year: II **Semester: III**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective

To provide the design knowledge of use interface and its environment.

Course contents

1. **The goal** **[8 Hrs]**
   - 1.1 Goal directed design
     - 1.1.1 User's goals
     - 1.1.2 Features of user interface design
   - 1.2 Software design
     - 1.2.1 Introduction
     - 1.2.2 Software design vs interface design
   - 1.3 Models of interface design
     - 1.3.1 Conceptual model
     - 1.3.2 Implementation model
     - 1.3.3 Manifest model
     - 1.3.4 Modeling from user's point of view
   - 1.4 Visual interface design
     - 1.4.1 Visual patterns
     - 1.4.2 The canonical vocabulary

2. **The form** **[8 hrs]**
   - 2.1 Interface paradigms
     - 2.1.1 Metaphor
     - 2.1.2 Idioms and branding
     - 2.1.3 Affordances
   - 2.2 Child forms
     - 2.2.1 Usage of window space
     - 2.2.2 Windows pollution
   - 2.3 File system
     - 2.3.1 Introduction

2.3.2 Unified file model

2.3.3 Document management

2.3.4 Storage and retrieval

2.4 Platform independence

2.4.1 Development platform

2.4.2 Multi-platform development

2.4.3 Inter-operability

3. **Software behavior** **[6 Hrs]**

3.1 Flow

3.1.1 Sensible interaction

3.1.2 Flow of states

3.1.3 Notion of MDI states

3.2 Overhead

3.2.1 Revenue tasks and excise tasks

3.2.2 Eliminating excise tasks

3.3 Task coherence

3.3.1 Decision-set streamline

3.3.2 Preference threshold

4. **User-computer interaction** **[8 Hrs]**

4.1 Mouse

4.1.1 Indirect manipulation

4.1.2 Mouse events

4.1.3 Focus and cursor hinting

4.2 Selection

4.2.1 Indicating selection

4.2.2 Insertion and replacement

4.2.3 Additive selection

4.2.4 Group selection

4.3 Gizmos manipulation

4.3.1 Repositioning

4.3.2 Resizing and reshaping

4.3.3 Visual feedback of manipulation

4.4 Drag and drop

4.4.1 Source and target

4.4.2 Problems and solutions

4.4.3 Drag and drop mechanisms

5. **The cast** **[8 Hrs]**

5.1 Menu design issues

5.1.1 Hierarchy of menus

5.1.2 Drop down menus

5.1.3 Pop up menus

5.2 Menus and its types

5.2.1 Standard menus

5.2.2 Optimal menus

5.2.3 System menu

5.2.4 Menu item variation

5.3 Dialog boxes

5.3.1 Dialog box basics

5.3.2 Suspension of interaction

5.3.3 Modal and modeless dialog boxes

5.3.4 Problems in modeless dialog boxes

5.3.5 Different types of dialog boxes

5.4 Dialog box conventions

5.4.1 Caption bar

5.4.2 Attributes

5.4.3 Terminating dialog box

5.4.4 Expanding dialog box

5.4.5 Cascading dialog box

5.5 Toolbars

5.5.1 Advantages over menus

5.5.2 Monetary button and latching button

5.5.3 Customizing toolbars

6. **The Gizmos** **[7 Hrs]**

6.1 Essential and selection Gizmos

6.1.1 Essential gizmos

6.1.2 Selection gizmos

6.1.3 Combo box

6.1.4 Tree view gizmo

6.2 Entry and display Gizmos

6.2.1 Entry gizmos

6.2.2 Bounded and unbounded fields

6.2.3 Validation

6.2.4 Edit fields

6.2.5 Display gizmos

6.2.6 Scroll bars

6.3 New Gizmos

6.3.1 Directly manageable gizmos

6.3.2 Visual gizmos

6.3.3 Adding visual richness to gizmos

Laboratory

There shall be lab exercises cover all the features of visual programming environment.

Reference books

- Alan Cooper, "*The Essential of User Interface Design*", Wiley DreamTech India P. Ltd.
- Evangelos Petroutsos, "*Mastering Visual Basic 6*", BPB Publication

Project - II

BIT278CO

Year: II **Semester: III**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
-	-	4	Theory	Practical	Theory	Practical	100
			-	60	-	40	

Course Objective

After finishing this project, students will be able to develop software using visual programming tool/API.

- Project can be initiated by the project teacher or proposal can be invited by the students.
- Groups of students (up to 4) will be assigned a project work related to any visual programming tool.

Course contents

The students should make the project which has practical significance and should spend four hours per week in the laboratory for 15 weeks. Students must develop the assigned software, submit written report and give oral presentation.

Project evaluation criteria

The practical marks allotted for the project should be evaluated based on the following criteria.

- Title presentation – 10 marks
- Mid-term presentation – 15 marks
- Pre-final submission and presentation – 35 marks

Numerical Methods

BIT280CO

Year: II **Semester: III**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective

This subject aims that enabling students to (a) solve nonlinear equation (b) use interpolation (c) fit curves (d) solve linear equations and (e) perform integration and differentiation, using numerical methods through computers.

Course contents

1. Errors in numerical computation **[3 Hrs]**
   - 1.1 Introduction to numerical method
   - 1.2 Introduction to error
   - 1.3 Sources of error
   - 1.4 General errors formula

2. **Solution of nonlinear equations** **[6 Hrs]**
   - 2.1 Introduction
   - 2.2 Bisection method
   - 2.3 Newton Raphson method
   - 2.4 Fixed point iteration method
   - 2.5 Secant method
   - 2.6 Horner's rule

3. **Interpolation** **[10 Hrs]**
   - 3.1 Introduction
   - 3.2 Finite differences
     - 3.2.1 Forward differences
     - 3.2.2 Backward differences
     - 3.2.3 Central differences
     - 3.2.4 Symbolic relations
   - 3.3 Newton's forward and backward formulae
   - 3.4 Central differences interpolation formula
     - 3.4.1 Gauss forward and backward formula

3.4.2 Stirling's, Bessel's and Everett's formulae

3.5 Lagrange interpolation

3.6 Method of least square method (LSM)

3.6.1 LSM for linear equation ($y = a + bx$)

3.6.2 LSM for quadratic equation ($y = a + bx + cx^2$)

3.6.3 LSM for $y = ax^b$

3.6.4 LSM for $y = ae^{bx}$

4. **System of linear equations** **[11 Hrs]**

4.1 Consistency of a linear system of equations

4.2 Solution of linear system – direct method

4.2.1 Gaussian elimination method

4.2.2 Gauss Jordan method

4.2.3 Matrix inversion

4.3 Solution of linear system – indirect method

4.3.1 Gauss Jacobi iteration method

4.3.2 Gauss Seidel iteration method

4.4 Method of factorization, LU decomposition method

4.5 Eigen vectors and Eigen values, power method

5. **Numerical differentiation and integration** **[8 Hrs]**

5.1 Numerical differentiation for 1^{st} and 2^{nd} order differentiation

5.1.1 Forward formula

5.1.2 Backward formula

5.1.3 Central difference formula

5.2 Numerical integration

5.2.1 Trapezoidal rule

5.2.2 Simpson's 1/3 rule and 3/8 rule

5.2.3 Romberg integration

5.2.4 Gaussian integration

6. **Numerical solution of ordinary differential equations** **[7 Hrs]**

6.1 Introduction

6.2 Euler's method and modified Euler's method

6.3 Rungekutta 2^{nd} order and 4^{th} order methods

6.4 Boundary value problem (finite difference method)

Laboratories

There shall be following lab exercise using high level language.

- Bisection method
- Newton Raphson method
- Fixed-point iteration method
- Secant method
- Horner's rule
- Langrange interpolation
- Newton interpolation
- Least square method for linear equations
- Gauss elimination method
- Gauss Seidel iteration method
- Integration (Trapezoidal rule, Simpson's 1/3 rule and 3/8 rule)
- Euler's method
- Rungekutta 4^{th} order methods

Reference books

- S. S. Sastry, "*Introductory Methods of Numerical Analysis*", PHI
- S. Yakowitz & F. Szidarovszky, "*An Introduction to Numerical Computations*".
- Dr. V. N. Vedamurthy, Dr. N. Ch. S. N. Iyengar, "*Numerical Methods*".
- S. S. Sastry, "*Engineering Mathematics Volume-II*", PHI
- E. Balagurusamy, "*Numerical Methods*".

Purbanchal University

Bachelor in Information Technology (BIT)

Year: II **Semester: IV**

S.N	Course Code	Course description	Credits	Lecture (Hrs)	Tutorial (Hrs)	Practical (Hrs)	Total (Hrs)
1	BIT231EC	Communication System	3	3	1	2	6
2	BIT271CO	Computer Organization	3	3	1	-	4
3	BIT274CO	Web Technology-I	3	3	-	3	6
4	BIT276CO	Database Management System	3	3	1	2	6
5	BIT279CO	Project – IV	2	-	-	3	3
6	BIT281CO	Discrete Mathematics	3	3	1	-	4
7	BIT292MS	Marketing Management	2	2	1	-	3
		Total	**19**	**17**	**5**	**10**	**32**

Communication System

BIT231EC

Year: II **Semester: IV**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective

To familiarize students of information technology with the basic principles of electronic communication.

Course contents

1. **Signals and systems** **[6 Hrs]**
   - 1.1 Definition, types and properties of signals used in communication systems
   - 1.2 Definition and block diagram of general communication system
   - 1.3 Basics of Fourier series and Fourier transform
   - 1.4 Noise and its effect on communication system

2. **Continuous wave linear modulation** **[8 Hrs]**
   - 2.1 Need for modulation
   - 2.2 Time domain expression, spectral representation, power, transmission bandwidth of DSB-AM, DSB-SC, SSB and VSB
   - 2.3 Generation method of DSB-AM, DSB-SC, SSB and VSB
   - 2.4 Demodulation of AM signals: square law, envelop and synchronous detectors
   - 2.5 Introduction of phase locked loop (PLL)
   - 2.6 Introduction to stereo FM
   - 2.7 The super-heterodyne receiver for standard AM radio

3. **Non-linear modulation** **[7 Hrs]**
   - 3.1 Definition, time domain representation and transmission bandwidth of single tone modulated FM and PM
   - 3.2 Transmission bandwidth for FM, Carlson's rule, narrow-band and wide-band FM
   - 3.3 Generation methods of FM: direct method and Armstrong method
   - 3.4 Demodulation of FM: limiter-discriminator method and PLL
   - 3.5 Introduction to stereo FM transmission and reception

4. **Introduction to digital communication system (DCS)** **[8 Hrs]**

4.1 Basic block diagram of digital communication system, advantages and disadvantages of analog communication system

4.2 Nyquist sampling theorem, sampling of band limited analog signals, spectrum of sampled signals, aliasing effect, reconstruction of original analog signal

4.3 Sampling theorem for band-pass signals

4.4 Pulse amplitude modulation (PAM), bandwidth requirement and reconstruction method

4.5 Pulse code modulation (PCM): sampling, quantization and encoding

4.6 Quantization noise in PCM

5. **Baseband digital communication system** **[4 Hrs]**

5.1 Introduction to information theory, definition of information, entropy, signaling rate and information rate

5.2 Shannon's channel capacity theorem: implications and limitations

5.3 Concept of baseband (BB) digital communication system

5.4 Inter symbol interference (ISI), zero conditions for ISI

6. **Modulated digital data communication system** **[4 Hrs]**

6.1 Line coding schemes: NRZ, RZ, Manchester and AMI

6.2 Digital carrier systems: ASK, FSK, PSK and DPSK

6.3 M-ary data communication system: QPSK

7. **Multiplexing systems** **[2 Hrs]**

7.1 Introduction to multiplexing

7.2 Basic principles of FDM and TDM

8. **Introduction to various communication systems** **[6 Hrs]**

8.1 Satellite communication system: block diagram and working principle

8.2 Terrestrial microwave links

8.3 Optical fiber links: block diagram, advantages and disadvantages

8.4 Cellular mobile communication: GSM system architecture and features

8.5 Communication systems in Nepal: past and present

Laboratory

There shall be 8 experiments related to basic principles of communication systems as decided by the course instructor.

Reference books

- S. Haykin, "*An Introduction to Analog & Digital Communication*".

- Leon W. Couch II, "*Modern Digital & Analog Communication Systems*", Pearson education Asia
- B. P. Lathi, "*Modern Digital & Analog Communication Systems*", Oxford University Press.
- J. Proakis & M. Salehi, "*Communication Systems Engineering*", Prentice Hall, New Jersey
- D. Roddy & J. Coolen, "*Electronic Communications*", PHI
- A. Sharma & R. Sinha, "*Modern Electronic Communication*", DRPC, New Delhi

Computer Organization

BIT271CO

Year: II **Semester: IV**

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

Course Objective

The main objective of this course is to provide the concepts of computer architecture as well as computer organization and design.

Course contents

1. **Introduction** **[2 Hrs]**
   - 1.1 Introduction to computer architecture
   - 1.2 Design principles for modern computers

2. **Computer organization and design** **[6 Hrs]**
   - 2.1 Instruction code
   - 2.2 Computer registers
   - 2.3 Computer instruction
   - 2.4 Timing and control
   - 2.5 Instruction cycle
   - 2.6 Memory reference instructions
   - 2.7 Input and output interrupt

3. **Control unit design** **[4 Hrs]**
   - 3.1 Microprogrammed control (control memory, address sequencing)
   - 3.2 Hardwired control

4. **Central processing unit** **[6 Hrs]**
   - 4.1 Instruction formats
   - 4.2 Addressing modes
   - 4.3 Data transfer and manipulation
   - 4.4 Program control
   - 4.5 RISC and CISC

5. **Pipeline and vector processing** **[6 Hrs]**
   - 5.1 Parallel processing
   - 5.2 Pipelining
   - 5.3 Arithmetic and instruction pipeline

5.4 RISC pipeline

5.5 Vector processing

5.6 Array processing

6. **Computer arithmetic** **[6 Hrs]**

6.1 Data types

6.2 Fixed-point operations

6.3 Floating-point operations

6.4 Addition and subtraction algorithms

6.5 Multiplication and division algorithms

7. **Input and output organization** **[6 Hrs]**

7.1 Peripheral devices

7.2 Input-output interfaces

7.3 Modes of transfer

7.4 Interrupt

7.5 Direct memory access

7.6 Input-output processor

8. **Memory organization** **[6 Hrs]**

8.1 Memory hierarchy

8.2 Main memory

8.3 Auxiliary memory

8.4 Cache memory

8.5 Virtual memory

8.6 Memory management hardware

9. **Multiprocessor** **[3 Hrs]**

9.1 Characteristics of multiprocessors

9.2 Interconnection structures

9.3 Cache coherence

Reference books

- M. Morris Mano, "*Computer System Architecture*".
- William Stalling, "*Computer Organization & Architecture*".
- M. Morris Mano, "*Digital Logic & Computer Design*".
- David A. Paterson & John L. Hennessy, "*Computer Organization & Design*".
- Vicent P. Heuring & Harry F. Jordan, "*Computer Systems Design & Architecture*".
- Andrew S. Tanenbaum, "*Structured Computer Organization*".
- John P. Hayes, "*Computer Architecture & Organization*".

Web Technology – I

BIT274CO

Year: II **Semester: IV**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
			Theory	Practical	Theory	Practical	
3	-	3	20	50	80	-	150

Course Objective

After finishing this subject, students will be able to develop web pages using HTML and JavaScript.

Course contents

1. **Introduction to web technology** **[5 Hrs]**
   - 1.1 Web basics: web browsers, web servers, Tier technology, static and dynamic web page
   - 1.2 Web protocols: HTTP, HTTPs, FTP
   - 1.3 Introduction to free and open source software
     - 1.3.1 Characteristics, advantages and disadvantages free software, open source software and proprietary software
     - 1.3.2 Difference between free software, open source software and proprietary software
     - 1.3.3 Licensing and its types: commercial license and open source license

2. **HTML, XHTML and HTML5** **[15 Hrs]**
   - 2.1 Introduction
   - 2.2 Document metadata
   - 2.3 Basic structure of HTML
   - 2.4 Sections
   - 2.5 Grouping content
   - 2.6 Text-level semantics
   - 2.7 Embedded content
   - 2.8 Tabular data
   - 2.9 Forms
   - 2.10 Interactive elements
   - 2.11 List
   - 2.12 Links
   - 2.13 Images
   - 2.14 Frames

3. **Page designing with CSS** **[10 Hrs]**

3.1 Introduction to designing approaches

3.1.1 Table based designs

3.1.2 Table-less designs

3.2 Cascading style sheet and its properties

3.2.1 Introduction

3.2.2 CSS vs CSS3

3.2.3 CSS properties – text and fonts, color and backgrounds, the box model (dimensions, padding, margin and borders), positioning and display, lists, tables. Media

3.2.4 Converting image design to HTML (slicing)

4. **Client-side scripting** **[15 Hrs]**

4.1 Introduction

4.2 JavaScript

4.2.1 Lexical structure

4.2.2 Variables, identifiers, data types and values, scope, literals, reserved words

4.2.3 Expression and operators, statements

4.2.4 Arrays, objects (math, string, date)

4.2.5 Functions

4.2.6 Regular expression

4.2.7 Garbage collection

4.3 Objects

4.3.1 Objects and properties

4.3.2 Constructors

4.3.3 Prototype and inheritance

4.3.4 Object as an associative array

4.4 DOM and event handling

4.5 Introduction to JSON, jQuery, jQuery integration

4.6 Saving state with cookies

Laboratories

These shall be flowing lab exercises covering all features of above chapters.

Lab 1- web basic: introduction to web browsers, static and dynamic web pages, web protocols

Lab 2- HTML structure, Meta data and formatting tags

Lab 3- section and grouping

Lab 4- text-level semantics, embedded content

Lab 5- embedded content (contd…..)

Lab 6- table and forms

Lab 7- interactive elements, lists and links

Lab 8- table based design and table less design

Lab 9- CSS properties

Lab 10- converting image design to HTML (slicing)

Lab 11- introduction to JavaScript-lexical structure, variables, identifiers, data types and values, scope, literals, reserved words, expression and operators, statements

Lab 12- arrays, objects (math, string, date)

Lab 13- functions, regular expression

Lab 14- events handling, DOM, form validation

Lab 15- form validation (contd….), cookies

Reference books

- "*Open Sources: Voices from the Open Source Revolution*", Chris DiBona, Sam Ockman, Mark Stone
- "*Perspective on Free & Open Source Software*", Joseph Feller, Brian Fitzgerald, Scott A. Hissam & Karim R. Lakhani, MIT press
- "*Open Sources: Voices from the Open Source Revolution*", Chris DiBona, Sam Ockman, O'Rielly Media
- "*Murach's HTML5 & CSS3*", Zak Ruvalcaba & Anne Boehm
- "*JavaScript: The Definitive Guide*", 6th edition, David Flanagan, O' Reilly Media
- "*Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript & Web Graphics*", Jennifer Niederst Robbins, O'Rielly
- "*HTML5 Programming with JavaScript*", John Paul Mueller, Wiley
- "*HTML5 & CSS3 for the Real World*", Estelle Weyl, Louis Lazaris, Alexis Goldstein, Sitepoint

Database Management System

BIT276CO

Year: II **Semester: IV**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
			Theory	Practical	Theory	Practical	
3	1	2	20	50	80	-	150

Course Objective

The basic objective of this course is to make them familiar at using SQL and help them design database systems.

Course contents

1. **Introduction** **[3 Hrs]**
   - 1.1 Definition of database, database system, and database management system (DBMS)
   - 1.2 Characteristics of database approach
   - 1.3 Advantages of DBMS
   - 1.4 Classification of DBMS

2. **Database systems concept and architecture** **[8 Hrs]**
   - 2.1 Data models
   - 2.2 Schemas and instances
   - 2.3 DBMS architecture and data independence
   - 2.4 Database language and interfaces
   - 2.5 Database users and functions of DBA
   - 2.6 ER modeling
   - 2.7 Entity types
   - 2.8 Attributes, keys and relationship

3. **Relational model** **[8 Hrs]**
   - 3.1 Introduction to relational databases
   - 3.2 Relational algebra
   - 3.3 Relational calculus (domain relational calculus, tuple relational calculus)

4. **SQL** **[8 Hrs]**
   - 4.1 Introduction to SQL
   - 4.2 Set operations
   - 4.3 Null values

4.4 DDL, DML, DCL, TCL

4.5 Nested queries

4.6 Introduction to PL-SQL, procedures and functions

5. **Integrity constraints** **[3 Hrs]**

5.1 Entity integrity constraints

5.2 Domain integrity constraints

5.3 Referential integrity constraints

5.4 Triggers and assertions

6. **Normalization** **[7 Hrs]**

6.1 Pitfalls of relational model

6.2 Functional dependencies

6.3 Introduction to database normalization (1NF, 2NF, 3NF and BCNF)

6.4 Introduction to multi-valued dependency (MVD) and 4NF

6.5 Introduction to join dependency and 5NF

7. **Database security** **[2 Hrs]**

7.1 Concept and needs of database security

7.2 Access control: discretionary access control and mandatory access control

7.3 Encryption and decryption

8. **Database transaction and concurrency control** **[6 Hrs]**

8.1 Transaction and its properties

8.2 Methods of transactions execution

8.3 Serializability

8.4 Needs of concurrency control

8.5 Methods of concurrency control

8.6 Introduction to deadlock handling

Laboratories

There shall be lab exercise using SQL covering all topics from chapter 4 and 5.

Reference books

- "*Database System Concept*", Silberschatz et. Al., McGraw Hill
- "*An Introduction to Database System*", C. J. Date, Addison Wesley
- "*Fundamentals of database Systems*", Ramez Elmasri, Shamkant B. Navathe

Project - IV

BIT279CO

Year: II **Semester: IV**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
-	-	3	Theory	Practical	Theory	Practical	100
			-	60	-	40	

Course Objective

After finishing this project, students will be able to develop database application using any RDBMS tool.

Course contents

A total of 45 lab hours covering all features of RDBMS will be assigned to every student. Every group of students (up to 3) will be assigned a project work related to developing application software using any RDBMS tool. Students must develop the assigned software, submit written report and give oral presentation.

Project evaluation criteria

The practical marks allotted for the project should be evaluated based on the following criteria.

- Title presentation – 10 marks
- Mid-term presentation – 15 marks
- Pre-final submission and presentation – 35 marks

- Project can be initiated by the project teacher or proposal can be invited by the students.
- Individual student will be assigned a project-work related to database application.
- The student should make the project, which should have practical significance and should spend three hours per week in the laboratory for 15 weeks.

Marketing Management

BIT292MS

Year: II **Semester: IV**

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

Course Objective

The main objective of this course is to enable students to learn and apply the fundamental concepts and practices of marketing and to help them to achieve a good understanding of prevailing marketing techniques.

Course contents

1. **Marketing perspective** **[3 Hrs]**
   - 1.1 Definition of marketing
   - 1.2 The core concepts of marketing management
   - 1.3 Marketing philosophies: production concept, product concept, selling concept, marketing concept and societal marketing concept

2. **The marketing environment** **[3 Hrs]**
   - 2.1 The company's microenvironment: suppliers, marketing intermediaries, customers, competition
   - 2.2 The company's macro environment: demographic, economic, natural, technological, political and cultural environment

3. **Consumers markets and consumer buyer behavior** **[6 Hrs]**
   - 3.1 Model of consumer behavior
   - 3.2 Characteristics affecting consumer behavior
   - 3.3 Types of buying decision behavior
   - 3.4 Buyer decision process
   - 3.5 Business markets and their characteristics
   - 3.6 Business buyer behavior
   - 3.7 Business buying process
   - 3.8 Institution and government markets

4. **Market segmentation, targeting and positioning** **[5 Hrs]**

4.1 market segmentation: levels of market segmentation, basis for segmenting markets, requirements for effective segmentation

4.2 Market targeting

4.3 Positioning

4.4 Marketing mix: concept of 4Ps and 4Cs

5. **Product and services strategy** **[6 Hrs]**

5.1 Definition of a product

5.2 Levels of product

5.3 Product classification: consumer products and industrial products

5.4 Individual product decisions, product line decision and product mix decisions

5.5 Product life cycle strategies

5.6 Services marketing: nature and characteristics of a service

6. **Pricing decisions** **[6 Hrs]**

6.1 Factors to be considered while setting prices: internal and external factors

6.2 General pricing approaches: cost-based pricing, value-based pricing, competition based pricing

6.3 Pricing strategies: new product pricing strategies (market skimming pricing, market penetration pricing), product mix pricing, price adjustment strategies

7. **Distribution channels and logistics management** **[4 Hrs]**

7.1 The nature of distribution channels

7.2 Functions of distribution channel

7.3 Number of channel levels

7.4 Channel behavior and organization

7.5 Channel management decisions

8. **Integrated marketing communication strategy** **[8 Hrs]**

8.1 marketing communication (promotion) mix

8.1.1 Advertising: nature of advertising, major decision in advertising

8.1.2 Sales promotion: nature and purpose of sales promotion, major decisions in sales promotion

8.1.3 Public relations: major public relations tools, major public relations decisions

8.1.4 Personal selling: nature of personal selling, principles of personal selling

8.1.5 Direct and online marketing: the nature of direct marketing, benefits of direct marketing, customers database and direct marketing, forms of direct marketing communication, online marketing and e-commerce

8.2 Individual online presentation

9. **E-business marketing and marketing in the 21st century [4 Hrs]**

   Paper development and presentation on "E-business marketing and marketing in the 21st century". The paper should contain not less than 2000 to 3000 words in suitable format.

Reference books

- Philip Kotler & Gray Armstrong, "*Principles of Marketing*", Prentice Hall of India
- William J. Stanton, Michael J. Etzel & Bruce J. Walker, "*Fundamentals of Marketing*", McGraw Hill, Inc. USA

Discrete Mathematics

BIT281CO

Year: II **Semester: IV**

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

Course Objective

The main objective of this course is to provide the concept of computation mathematics and provide the base for complier design.

Course contents

1. **Fundamentals** **[3 Hrs]**
   - 1.1 Sets and subsets
   - 1.2 Operation on sets
   - 1.3 Sequence
   - 1.4 Matrices
   - 1.5 Mathematical structure

2. **Logic** **[4 Hrs]**
   - 2.1 Proposition and logical operation
   - 2.2 Conditional statement
   - 2.3 Mathematical induction

3. **Counting** **[5 Hrs]**
   - 3.1 Permutation
   - 3.2 Combination
   - 3.3 The Pigeonhole principle
   - 3.4 Recurrence relation

4. **Relation and digraphs** **[8 Hrs]**
   - 4.1 Products set and partitions
   - 4.2 Relations digraphs
   - 4.3 Paths and in-relation and digraphs
   - 4.4 Properties of relations
   - 4.5 Equivalent relation
   - 4.6 Manipulation of relation

4.7 Transitive closure and Warshall's algorithms

5. **Function** **[4 Hrs]**
   5.1 Functions
   5.2 Function for computer science
   5.3 Permutation system

6. **Graphics theory** **[6 Hrs]**
   6.1 Graphs
   6.2 Euler path and circuit
   6.3 Hamilatonien path and circuit
   6.4 Transport network

7. **Order relation and structure** **[6 Hrs]**
   7.1 Partially ordered sets
   7.2 External element of a Posets
   7.3 Lattices
   7.4 Finite Boolean Algebra

8. **Trees** **[6 Hrs]**
   8.1 Trees
   8.2 Labeled tree
   8.3 Tree searching
   8.4 Undirected tree
   8.5 Minimal spanning tree

9. **Semi groups and groups** **[3 Hrs]**
   9.1 Binary operation
   9.2 Semi groups
   9.3 Groups

Reference books

- "*Discrete Mathematical Structure*", Bernard Kolman, Rober C, Busy, Sharman Ross, PHI India
- "*Applied Discrete Structure*", K. D. Joshi, New Age International Pvt. Ltd., New Delhi, India
- "*Discrete Mathematics*", B. P. Prashar, CBS Publishers & Distribution, New Delhi, India

Purbanchal University

Bachelor in Information Technology (BIT)

Year: III **Semester: V**

S.N	Course Code	Course description	Credits	Lecture (Hrs)	Tutorial (Hrs)	Practical (Hrs)	Total (Hrs)
1	BIT303SH	Probability & Statistics	3	3	1	1	5
2	BIT307SH	Society & Ethics in IT	2	2	1	-	3
3	BIT372CO	Data Communication	2	2	1	2	5
4	BIT374CO	Web Technology - II	3	3	-	3	6
5	BIT375CO	Computer Graphics	3	3	1	2	6
6	BIT377CO	Operating System	3	3	1	2	6
7	BIT378CO	Project - V	2	-	-	3	3
		Total	**18**	**16**	**5**	**13**	**34**

Probability & Statistics

BIT303SH

Year III **Semester: V**

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

Course Objective

After the completion of the subject, students are expected to be able to: (i) assemble data, (ii) analyze data and (iii) determine central tendency, distribution and make viable conclusion for decision making.

1. **Nature and scope of statistics** **[2 Hrs]**
   - 1.1 Definitions of statistics
   - 1.2 Descriptive and inferential statistics
   - 1.3 Scope of statistics
   - 1.4 Limitations and distrusts of statistics

2. **Data and its collection** **[2 Hrs]**
   - 2.1 Primary and secondary data
   - 2.2 Sources of primary and secondary data
   - 2.3 Methods of data collection: census method, sample method
   - 2.4 Compilation of administrative records

3. **Classification and tabulation of data** **[2 Hrs]**
   - 3.1 Classification procedure: qualitative and quantitative classification
   - 3.2 Tabulation of data

4. **Diagrammatic and graphic presentation of data** **[3 Hrs]**
   - 4.1 Importance and limitations
   - 4.2 Types of diagrammatic representations: bar diagram, pie diagram; pictogram
   - 4.3 Types of graphic representations: histogram, frequency polygon, frequency curve, cumulative frequency curve (Ogive)

5. **Measures of central tendency** **[4 Hrs]**
   - 5.1 Arithmetic mean
   - 5.2 Geometric mean

5.3 Harmonic mean

5.4 The median: quartiles; deciles and percentiles

5.5 The mode

5.6 Relation between mean, median and mode

6. **Measures of dispersion** **[4 Hrs]**

6.1 Absolute and relative measures

6.2 The range

6.3 Inter-quartile range

6.4 Quartile deviation

6.5 Mean deviation

6.6 Standard deviation

6.7 Coefficient of variation

6.8 Skewnwss and Kurtosis

7. **Probability** **[6 Hrs]**

7.1 Preliminaries

7.2 Classical, empirical, axiomatic approaches of probability theory

7.3 Conditional probability

7.4 Inverse probability

7.5 Probability distribution

7.6 Mathematical expectation

7.7 Variance of random variable

8. **Theoretical distribution** **[7 Hrs]**

8.1 Introduction

8.2 Binominal distribution and its chief features (without proofs)

8.3 Fitting a binominal distribution

8.4 Poisson distribution and its chief features (without proofs)

8.5 Fitting Poisson distribution

8.6 Normal distribution and its chief features

8.7 Areas under normal distribution

8.8 Hyper-geometric distribution

9. **Estimation theory and testing of hypothesis** **[7 Hrs]**

9.1 Idea of sample and population

9.2 Point estimation and internal estimation

9.3 Characteristics of a good estimator

9.4 Interval estimation of population parameters

9.5 Sampling distribution and standard error

9.6 Sampling of attribute

9.7 Test of significance for single proportion

9.8 Test of significance for difference between two proportions

9.9 Sampling of variables

9.10 Large samples test

9.11 Test of significance for single mean

9.12 Test of significance for difference between two means

9.13 Small sample test

9.14 Student's T-distribution and its applications

10. **Chi-Square distribution** **[3 Hrs]**

10.1 Introduction

10.2 Application

10.3 Test of goodness of fit

10.4 Test of independence of attributes

11. **Correlation and regression analysis** **[5 Hrs]**

11.1 Introduction

11.2 Correlation analysis

11.3 Various methods of calculating correlation coefficient

11.4 Regression analysis

Laboratory: There shall be 12 lab exercises covering all the features of statistical analysis based on SPSS or any other statistical software packages.

References:

- Sukhminder Singh Et. Al., "*Statistical Method for Research Workers*", Kalyani Publishers, New Delhi
- B. M. Clarke & D. Cooke, "*A Basic Course in Statistics*", Elbs. (UK)
- B. L. Agrawal, "*Basic Statistics*", Wiley Eastern
- Minimum & Clarke, "*Elements of Statistical Reasoning*", Johnwiley & Sons
- Levin, "*Statistics for Management*", Prentice Hall of India
- S. C. Gupta, "*Fundamentals of Statistics*".

Questions format

Questions type	Number of questions	Total marks	Chapters
Long questions	2 questions out of 3	2 x 12 = 24	All chapters
Short questions	7 questions out of 8 or 9	7 x 8 = 56	All chapters

Society & Ethics in IT

BIT307SH

Year III **Semester: V**

Teaching Schedule Hours/ Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
2	1	-	Theory	Practical	Theory	Practical	100
			20	-	80	-	

Course Objective

The basic objective of this course is to provide fundamental knowledge on the concept of sociology and to understand social, cultural, economic, political and technical aspects. The purpose is to enable them to apply those basic concepts in addressing the significant issues inherent in Nepalese society and culture.

Unit 1: Introduction **[3 Hrs]**

1.1 Definition and evolution of sociology

1.2 Relationship of sociology with economics, political science and computer science

1.3 Applications of sociology

Unit 2: Social and cultural change **[7 Hrs]**

2.1 Process

2.2 Theories of social change (evolution, functional, conflict)

2.3 Factors of social change (economics, technology, education, demography)

2.4 Role of media and communication in social and cultural change

2.5 Innovation and diffusion

2.6 Resistance of social change

2.7 Technological changes and its consequences

Unit 3: Understanding development **[5 Hrs]**

3.1 Definition and approaches of development

3.2 Indicators of development

3.3 Features of developing countries

3.4 Development planning

3.5 Role of national and international community and state

Unit 4: Process of transformation **[5 Hrs]**

4.1 Modernization, globalization and migration

4.2 E-governance

4.3 E-commerce

Unit 5: Characteristics of Nepali society and culture **[6 Hrs]**

5.1 Historical development of Nepal

5.2 Demography composition

5.3 Issue of gender

5.4 Caste and ethic group

5.5 National integration and differentiation

5.6 Social stratification, problems and control

Unit 6: Ethical issues in IT **[5 Hrs]**

6.1 Definition of profession

6.2 Profession ethics

6.3 code of conduct

6.4 Ethical dilemma and problems

6.5 Disciplinary action

6.6 Corporate social responsibility

Reference Books

- Alex Inkles, "*What is Sociology? Introduction in the Discipline & Profession*", Prentice Hall of India
- G. M. Foster, "*Traditional Culture & Impact of Technological Change*"
- Rishikeshav Raj Regmi, "*Dimension of Nepali Society and Culture*".
- C.N.S. Rao, "*Principle of Sociology with an Introduction of Social Thought*", S. Chand & Co. Ltd.
- Pratley Peter, "*The Essence of Business Ethics*", Prentice Hall of India, New Delhi
- A .Giddens & D. Mitchell, "*Introduction to Sociology*", 3rd Ed., London, W.W. Norton & company

Questions format

Questions type	Number of questions	Total marks	Chapters
Long questions	2 questions out of 3	2 x 12 = 24	All chapters
Short questions	7 questions out of 8 or 9	7 x 8 = 56	All chapters

Data Communication

BIT372CO

Year III **Semester: V**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
2	1	2	Theory	Practical	Theory	Practical	100
			20	20	60	-	

Course Objective

The main objective of this course is to provide the fundamental knowledge of data communication and various concepts.

1. **Data communication** **[1 Hr]**
   - 1.1 Introduction
   - 1.2 Data communication model
   - 1.3 Standers related to data communication
   - 1.4 Key element of protocol
   - 1.5 TCP/IP protocol architecture
   - 1.6 OSI model

2. **Data transmission** **[2 Hrs]**
   - 2.1 Concept and terminology
   - 2.2 Analog and digital transmission
   - 2.3 Transmission impairment
   - 2.4 Wireless propagation
   - 2.5 Life of straight transmission

3. **Signal encoding techniques** **[4 Hrs]**
   - 3.1 Digital data, digital signal
   - 3.2 Digital data, analog signal
   - 3.3 Analog data, digital signal
   - 3.4 Analog data, analog signal

4. **Digital data communication techniques** **[3 Hrs]**
   - 4.1 Asynchronous and synchronous transmission
   - 4.2 Type of error

4.3 Error detection and correction method

4.4 Line configuration

4.5 Interfacing

5. **Data link control** **[3 hrs]**

5.1 Flow control

5.2 Error control

5.3 HDLC

6. **Multiplexing** **[3 Hrs]**

6.1 FDM, TDM, STDM, ADSL

7. **Switching** **[3 Hrs]**

7.1 Circuit-switching and packet-switching

7.2 Switched communication network

7.3 Circuit switching concept

7.4 Packet switching principles and technique

8. **Congestion** **[2 Hrs]**

8.1 Congestion control in data network

8.2 Effect of congestion

8.3 Congestion control in packet switched network

9. **Cellular wireless network** **[2 Hrs]**

9.1 Principle of cellular network

9.2 First generation analog

9.3 Second generation CDMA

10. **LAN overview** **[3 Hrs]**

10.1 LAN protocol architecture

10.2 Bridge

10.3 Layer 2 and layer 3 switch

10.4 Ethernet

10.5 Fiber channel

10.6 Wireless LAN technology

10.7 IEEE 802.11

11. **Inter network protocol** **[2 Hrs]**

11.1 Internet protocol, ipv4 and ipv6

11.2 VPN and IP security

11.3 Routing protocol

11.4 Multicasting

12. **Data modems** **[2 hrs]**

12.1 Concept of modulation

12.2 AM, FM, PM

12.3 FSK, PSK, ASK

Laboratories: There shall be lab exercises covering the applicable chapter using software or communication devices.

Reference books:

- William Stalling, "*Data & Computer Communication*".
- Behrouz A. Forouzan, "*Data Communication & Networking*"

Questions format

Questions type	**Number of questions**	**Total marks**	**Chapters**
Long questions	2 questions out of 3	2 x 12 = 24	All chapters
Short questions	6 questions out of 7 or 8	6 x 6 = 36	All chapters

Web Technology - II

BIT374CO

Year III **Semester: V**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	-	3	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective

The main objective of this course is to provide the advance concepts of web applications and server side programming.

Unit 1: XML, AJAX and Web services **[10 Hrs]**

1.1 Introduction to XML

1.2 XML validation with DTD & schema

1.3 XSL and XSLT

1.4 XML processing with PHP

1.5 Asynchronous JavaScript and XML (AJAX)

Unit 2: Server side programming basics **[4 Hrs]**

2.1 Introduction to server side programming

2.2 PHP basics

2.3 Embedding PHP scripts

2.4 Basic syntax (variables, operators, expressions, constants)

Unit 3: Server side programming with PHP **[12 Hrs]**

3.1 Control structures

3.2 PHP functions

3.3 Recursion

3.4 String manipulation

3.5 Using regular expression

3.6 Exceptional handling with PHP

Unit 4: Database connectivity in PHP **[8 Hrs]**

4.1 Introduction to SQL

4.2 Basic SQL commands (CRUD)

4.3 HTML forms and methods

4.4 Database connectivity

4.5 MySQL functions

4.6 Executing DDL and DML queries using PHP

4.7 Login and authentication

4.8 Session and cookies

Unit 5: Object-oriented PHP **[4 Hrs]**

5.1 Review of object-oriented programming

5.2 Classes, objects and operations in PHP

5.3 Access modifiers: private, public and protected

5.4 Implementing inheritance

Unit 6: Responsive websites and advanced server side issues **[4 Hrs]**

6.1 Responsive website strategies and design

6.2 Smart device functionality

6.3 Testing and debugging

6.4 Overview to advance server side issues

6.5 MVC framework (code igniter)

Unit 7: Semantic web **[3 Hrs]**

7.1 Introduction to semantic web

7.2 Resource description framework (RDF)

7.3 Web ontology language (OWL)

Laboratories: There shall be lab exercises covering all features of above chapters.

Reference books:

- David Hunter, "*Beginning XML*", Wrox Publication
- Robin Nixon, "*Learning PHP, MySQL & JavaScript*", O'Reilly Media
- Rasmus Lerdorf, Kevin Tatroe & Peter MacIntyre, "*Programming PHP*", O'Reilly Media
- Deitel, Deitel, Goldberg, "*Internet & World Wide Web How to Program*", Pearson Education
- Paul S. Wang, "*Dynamic Web Programming & HTML 5*", Chapman & Hall/CRC
- Rahul Banerjee, "*Internetworking Technologies*", PHI Ltd
- Charles Ashbacher, "*SAMS Teach Yourself if XML in 24 Hours*".

Questions format

Questions type	Number of questions	Total marks	Chapters
Long questions	2 questions out of 3	2 x 12 = 24	All chapters
Short questions	7 questions out of 8 or 9	7 x 8= 56	All chapters

Computer Graphics

BIT375CO

Year III **Semester: V**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective

The main objective of this course is to provide the basic techniques used in computer graphics system.

1. **Introduction** **[2 Hrs]**
   - 1.1 History of computer graphics
   - 1.2 Application of computer graphics

2. **Graphics hardware** **[5 Hrs]**
   - 2.1 Keyboard, mouse (mechanical & optical), light pen, touch screen, tablet input hardware, joystick
   - 2.2 Raster and vector display architecture
   - 2.3 Architecture of graphical display terminals including frame buffer and color manipulation techniques RGB, CMYK

3. **Two dimensional algorithms** **[8 Hrs]**
   - 3.1 Direct and incremental line drawing algorithms
   - 3.2 Bresenham's line drawing algorithms for positive and negative slopes (DDA algorithm)
   - 3.3 Mid-point circle drawing and mid-point ellipse-drawing algorithms

4. **Two-dimensional transformations** **[10 Hrs]**
   - 4.1 Introduction to transformation
   - 4.2 Two-dimensional translation, scaling and rotation
   - 4.3 Successive and composite transformations
   - 4.4 Pivot-point rotation and fixed-point scaling
   - 4.5 Reflection and shearing
   - 4.6 Viewing transformation and windows-to-viewport transformation
   - 4.7 Clipping (The Cohen-Sutherland line-clipping algorithm, The Sutherland-Hodgman polygon clipping algorithm

5. **Three-dimensional graphics** **[12 Hrs]**

5.1 Projection (parallel and perspective)

5.2 3D transformations

5.2.1 Translation, scaling, reflection

5.2.2 Rotation (about axex, line parallel to cordinate axis, and line not parallel to cordinate axis)

5.2.3 Windows to viewpoint transformation

5.3 Hidden line and Hidden surface removal techniques (back face detection, Z-buffer, A-buffer, scan-line)

5.4 Introduction to non-planar surfaces (Bezier, Splines)

6. **Light, color and shading** **[5 Hrs]**

6.1 Introduction

6.2 Need for shading in engineering data visualization

6.3 Algorithms to stimulate ambient, diffuse and specular reflections

6.4 Constants, gouraud and phong-shading models

7. **Graphical languages** **[2 Hrs]**

7.1 Need for machine independent graphical languages (PHIGS, GKS)

7.2 Discussion of available languages and file formats (graphical file format)

8. **Introduction to animation** **[1 Hr]**

8.1 Introduction to open GL

8.2 Application & today's trends

Laboratories:

1. Introduction to graphics primitive and graphics drivers
2. Implementation of line drawing algorithms
   2.1 DDA
   2.2 Bresenham's algorithm
   2.3 Bresenham's general algorithm
3. Implementation of mid-point circle algorithm
4. Implementation of mid-point ellipse algorithm
5. Implementation of basic 2D and 3D transformation
6. Implementation of windows-to-viewport transformation
7. Implementation of line-clipping process

Reference books

- D. Harn & M.P. Baker, "Computer Graphics", PHI Edition
- T. I. James, D. Foley, A. Van Dam, S. K. Feiner & J. F. Hughes, "Computer Graphics, Principles and Practice", PHI Edition**Questions format**

Operating System

BIT377CO

Year III **Semester: V**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective

To provide fundamental concepts of operating system and its design.

1. **Introduction** **[3 Hrs]**
   - 1.1 Operating system as an extended machine & resource manager
   - 1.2 History and types of operating system
   - 1.3 Operating system concepts, functions, structures

2. **Processes and threats** **[9 Hrs]**
   - 2.1 Introduction
   - 2.2 Process model, process states, process control block
   - 2.3 Introduction to threads, kernel and user implementation of threads
   - 2.4 Inter-process communication (multiprocessing, parallel processing, critical sections, race condition, mutual exclusion with busy waiting, semaphores, monitors)
   - 2.5 Preemptive scheduling vs non-preemptive scheduling
   - 2.6 Process scheduling (FCFS, SJF, PR, priority, real time scheduling)

3. **Memory management** **[8 Hrs]**
   - 3.1 Memory management without swapping
   - 3.2 Swapping
   - 3.3 Virtual memory
   - 3.4 Paging, page replacement algorithms (FIFO, optimal, LRU, LFU, NRU, random, clock, second-chance)
   - 3.5 Predicting page faults
   - 3.6 Segmentation with paging

4. **File system** **[6 Hrs]**
   - 4.1 Files
   - 4.2 Directories
   - 4.3 File system implementation
   - 4.4 Protection mechanism and operating system securities

5. **Input/ output** **[7 Hrs]**
   5.1 Principles of input output hardware
   5.2 Principles of input output software
   5.3 Disks and disk scheduling algorithms (FSFS, SSTF, LOOK, SEEK, SCAN, C-SCAN, C-LOOK, N-SCAN)
   5.4 Clocks
   5.5 Terminals
6. **Deadlocks** **[7 Hrs]**
   6.1 Introduction
   6.2 Conditions of deadlock
   6.3 Resources and deadlock modeling using resources
   6.4 Deadlock detection and recovery
   6.5 Deadlock avoidance & prevention
   6.6 Banker's algorithm (single and multiple resources)
7. **Real time system** **[2 Hrs]**
   7.1 Introduction
   7.2 Types of RTS (soft real time, hard real time, firm real time)
8. **Distributed system** **[3 Hrs]**
   8.1 Introduction and characteristics
   8.2 Processes and processors in distribution system
   8.3 RPC in distributed system

Case study: UNIX/LINUX/Windows/Android / iOS / Cloud OS**.** (No classes are allotted to the case study; the students themselves referring various books should study this unit)

Laboratory: There shall be lab exercises covering various features of different operating systems.

1. General commands and programming in LINUX
2. Process scheduling
3. Page replacement algorithms
4. Deadlock modeling
5. Memory fitting algorithms

References:

- Andrew S. Tanenbaum, "*Modern Operating System*", PHI
- Silberscatz and Galvin, "*Operating System Concepts*", Addison Wesley
- Andrew S. Tanenbaum, "*Operating System, Design & Implementation*", PHI

Project – V

BIT378CO

Year III **Semester: V**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
			Theory	Practical	Theory	Practical	
-	-	3	-	60	-	40	100

Course Objective

After finishing this project, students will be able to develop web-based application using server-side scripting.

Course contents

A total of 45 lab hours covering all the features of server-side scripting will be assigned to every student. Every group of students (up to 3) will be assigned a project work. Students must develop the assigned application, submit written report and give oral presentation.

Project evaluation criteria

The practical marks allocated for the project should be evaluated based on the following criteria:

- Title presentation – 10 marks
- Mid-term presentation – 15 marks
- Pre-final submission and presentation – 35 marks

Purbanchal University

Bachelor in Information Technology (BIT)

Year: III **Semester: VI**

S.N	Course Code	Course description	Credits	Lecture (Hrs)	Tutorial (Hrs)	Practical (Hrs)	Total (Hrs)
1	BIT370CO	Embedded System Programming	3	3	-	3	6
2	BIT373CO	Computer Network	3	3	1	2	6
3	BIT371CO	Data Mining & Data Warehousing	3	3	1	2	6
4	BIT376CO	Advance Object-Oriented Programming	3	3	1	2	6
5	BIT379CO	Project-VI	3	-	1	4	5
6	BIT308SH	Research Methodology	2	2	1	-	3
		Total	**17**	**14**	**5**	**13**	**32**

Embedded System Programming

BIT370CO

Year: III **Semester: VI**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	-	3	Theory	Practical	Theory	Practical	150
			20	50	80	-	

*** Continuous**

**** Duration: 3 hours**

Course Objective

The objective of the course is to equip students with the knowledge of design and development process for dedicated computer systems in relation to the environment in which they operate.

1. **Introduction** **[8 Hrs]**
   Overview of dedicated and automated systems and their specific requirements (robust design, environmental issues, temporal constraints, technological constraints, software systems); the product design cycle

2. **System specification and integration** **[12 Hrs]**
   Development of a system specification, including case studies, evaluation and justification of the available levels of system integration (custom chip design through to turnkey-systems) and technological choice

3. **Software issues** **[11 Hrs]**
   Development environment: compliers, linkers, debuggers, emulators, real time operating systems and kernels, designing and implementing code for dedicated systems

4. **Hardware issues** **[14 Hrs]**
   Choice of processor: I/O, memory, speed, integration, development facilities, economics; DSP devices, interfacing to commonly used peripheral devices, backplane bus standards, transducers: sensors for measuring physical phenomena, output devices such as power actuators and motors, data transformation, signal conditioning, and data conversion, the impact of EMC regulations on design practice

Laboratory: The laboratory exercises should cover all the features mentioned above.

References:

- S Health, "*Embedded System Design*", Butterworth-Heinemann 1997, ISBNO-75063-237-2
- David E. Simon, "*An Embedded Software Primer*", Pearson Education, 2001

Computer Network

BIT373CO

Year: III **Semester: VI**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course objective

The course aims at providing a sound conceptual foundation in the area of computer networks with emphasis on the design aspects. The course attempts to provide a balance treatment of the state-of-the-art in the area and thus prepare the students for taking more rigorous and specialized courses in this and related field.

Course contents

1. **Network concepts, classification and components** **[7Hrs]**
   a. Introduction, features and advantages of network, networking criteria
   b. Types of network (LAN, MAN, WAN, Peer to Peer model, Client/Server model)
   c. LAN topologies (Bus, Ring, Star, Hybrid, etc)
   d. Wireless networks (Bluetooth, Wifi, WiMax, ect)
   e. Circuit switching, packet switching and message switching networks
   f. Network components (NIC, bridge, repeater, Hub, Switch, Router, Gateway)
   g. Layered architecture, interfaces, services and protocol hierarchies.
   h. ISO-OSI Reference model
   i. TCP/IP Reference model

2. **Data communication and services** **[8 Hrs]**
   a. Concepts of data, signal, channel and circuits, channel speed and bandwidth, throughput, bit rate and baud rate, maximum data rate of a channel, propagation time, transmission time.
   b. Analog and digital transmission
   c. Asynchronous and synchronous transmission
   d. Data encoding techniques
   e. Multiplexing and demultiplexing
   f. Transmission media
   g. Guided: coaxial, twisted-pair, fiber-optic; unguided: radio, microwaves, infrared, VSAT
   h. Transmission errors, error detection and correction codes; detection methods (VRC, LRC, CRC, Cheksum)

3. **Data link layer** **[8 Hrs]**
   a. Data link layer design issues
   b. Media access control. MAC address
   c. Farming methods
   d. Error control (detection and correction)
   e. Flow control, sliding window protocol
   f. Data link layer protocols: HDLC, SLIP, and PPP
   g. ALOHA, CSMA/CD, FDDI, Token ring, Token bus and IEEE802.3, 802.4, 802.5

4. **Network layer** **[8 Hrs]**
   a. Network layer design issues
   b. IP based networking (Mobile-IP, Subnet Mask, Private and Public address IP address, IPv4 addressing, Subnetting, VLSM, CIDO, Supernetting, multicasting, broadcasting, IPv6)
   c. Concept of routing (Static and dynamic routing)
   d. Routing algorithm (Shortest-path, Flooding, Flow-based, Distance-vector, Link-state)
   e. Congestion control and prevention, Leaky-bucket algorithm, Token-bucket algorithm
   f. Internetworking, Tunneling and routing, ATM internetworking, Mobile routing schemes
   g. Network layer protocols: IP, NAT, ICMP, IGMP, RIP, ARP, RARP, OSPF, IGRP, EIGRP, BGP

5. **Transport layer** **[5 Hrs]**
   a. Transport layer design issues
   b. Service primitive, QoS
   c. Connection-oriented and connectionless networks
   d. Transport layer protocols: TCP and UDP
   e. Elements of transport layer

6. **Application layer** **[5 Hrs]**
   a. Application layer and its function
   b. Electronic mail: SMTP
   c. File transfer: FTP, Telnet
   d. Dynamic host configuration protocol (DHCP)
   e. DNS, HTTP, WWW, SNMP

7. **Network security** **[4 Hrs]**
   a. Cryptography, digital signature
   b. Firewalls
   c. Virtual private network

Laboratory:

There shall be following laboratory exercises that cover the various features and concepts of computer networking. In practical, students should be able to set up small networks. Also, they should be able to configure network hardware and network software. Following lab exercises may be helpful.

- Installation of network interface card and various network devices like hub, switch, router
- Cabling: construction of straight-through and cross-over cable
- Installation and configuration of server and workstation in windows/Linux
- Setup client/Server and peer-to-peer networking and verify it
- Workgroup networking, domain networking
- Familiarization with basic network commands: observing IP address and MAC address, setting IP address and default gateway in PC
- File sharing and printer sharing
- Firewall configuration
- Configure HTTP, FTP, DHCP, Telnet server and verify it
- Configuration of DNS and e-mail server
- Basic network commands and network management and troubleshooting
- Static routing and dynamic routing (RIP and OSPF)
- Implement the data link layer farming methods such as character, character stuffing and bit stuffing
- Implementation of CRC
- Design of local area network (LAN)
- Case study; An existing network system of your college

Reference

- "*Computer Networks*", A. S. Tanenbaum
- "*Data Communications and Networking*", Behrouz A. Forouzan
- William Stallings, "*Data & Computer Communications*", Prentice Hall of India, New Delhi
- "*Computer Networking*", James F. Kurose, Keith W. Ross

Data Mining & Data Warehousing

BIT371CO

Year: III **Semester: VI**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course objective

This course aims at introducing advances aspects of data warehousing and data mining, encompassing the principles, research results and commercial application of the current technologies. It also provides knowledge to introduce students to the basic concepts and techniques of data mining, using recent data mining software for solving practical problems.

Contents

1. **Introduction to data mining** **[4 Hrs]**
   Basic concepts of data mining
   Use and benefits of data mining
   Application of data mining
   KDD environment: data selection cleaning, enrichment, coding and mining
   Problems in data mining

2. **Introduction to data warehousing** **[4 Hrs]**
   Basic concepts of data warehousing
   Use and benefits of data warehousing
   Application of data warehousing
   Problems in data warehousing

3. **Data warehouse logical and physical design** **[6 Hrs]**
   Data warehouse logical design: star schemas, fact tables, dimensions, other schemas. Multidimensional data models, materialized views
   Data warehouse physical design: hardware and I/O consideration, parallelism, indexes

4. **Data warehousing technologies and implementations** **[4 Hrs]**
   Data extraction, transportation, transformation, loading and refreshing

5. **Data warehouse to data mining** **[9 Hrs]**

Data mining architecture

Data warehouse architecture

OLAP architecture

Types of OLAP servers

OLAP operations in multidimensional data models

OLAP to OLAM

Stages of data mining process

6. **Data mining approaches and methods** **[10 Hrs]**

Models of data mining

Data mining techniques

Data mining tasks

Classification and predictions

- Decision tree, rule-based classification, back propagation, genetic algorithm, linear regression, non-liner regression

Association rules and mining frequent patterns

- Market basket analysis, A Priori algorithm, FP growth

Clustering

- Partitioning method (K means. K medoids)
- Hierarchical method (Agglomerative, Divisive)

7. **Mining complex types of data** **[3 Hrs]**

Multimedia data mining

Text mining

Web mining

- Web content mining, web usage mining, web structure mining

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

Integration of data mining tools with database system

Data mining in distributed heterogeneous database systems

Importance of data mining in marketing, e-commerce and CRM

Aspects of security and privacy in data mining

Social impact of data mining

Social impact of data mining

Trends in data mining

Laboratory works

The student must do the project work using data mining and data warehousing concept. Topics should be given by the course instructor and at the end of the semester student should present their project work.

Reference books

- "*Data Mining Concepts and Techniques*", Morgan Kaufmann J. Han, M Kamber, Second edition
- Sam Anahory, Dennis Murray, "*Data Warehousing in the Real World*", Pearson Education
- Adriaans, P. and D. Zatinge, "*Data Mining*", Addison Wesley, 1996
- Kimball, R. "*The Data Warehouse Toolkit*", Wiley, 1996
- W. H. Inmon, "*Building The Data Warehouse*", 3rd Edition, Wiley, 2003
- Margaret H. Dunham, "*Data Mining: Introductory and Advance Topics*", Pearson Education 2004

Prerequisite

- C. Data Structure, Database Management Systems

Research Methodology

BIT308SH

Year: III **Semester: VI**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
2	1	-	Theory	Practical	Theory	Practical	50
			10	-	40	-	

Course objective

After completion of this course, students will be able to:

- Perform individual research work on the field of information and communication technologies.
- Perform to research, select and organize information, as well as synthesize solution and anticipate their consequences.
- Acquire knowledge of research methods, procedures and processes, development of critical and self-critical assessment.
- Ability to sue knowledge in practice.

Course contents

1: **Introduction to Research** **[6 Hrs]**

Meaning of research, applied and fundamental research, scientific research process, management research methods: Action research, evaluation research, managerial research, meaning of project work, objectives of project work, methods of field and project work: Exploratory/descriptive, case study, feasible study

2: **Research Design** **[5 Hrs]**

Concept of research design, elements of research design, types of research design: historical, descriptive, development, case study, co-relational, causal-comparative and action research design

3: **Sampling process and data collection** **[7 Hrs]**

Sampling and its significance in research, types of sampling, probability and non-probability sampling: stratified, systematic, multistage, judgment, quota and convenience sampling, sampling error and non-sampling error, primary and secondary data, use of secondary data, methods of collecting primary data: interviewing, questionnaire and observation

4: **Testing of statistical hypothesis** **[6 Hrs]**

Statistical hypothesis, level of significance, difference between parametric and non-parametric tests. Use of z-distribution in hypothesis testing of population mean and population proportion in one-sample case

5: **Writing the research report** **[6 Hrs]**

Purpose of writing a report, contents and style of report, types of report: Descriptive and Analytical report, presenting data, table and figures in report, use of quotations, abbreviations, bibliography

Reference books

- Kerlinger, Fred N. “Foundation of Behavioral Research”

Project – VI
BIT 379CO

Full marks: 100
Internal: 40
Final: 60

Course objectives

After finishing this project, student will be able to develop professional application.

Course content

- There should be total of 45 hours covering important feature of software engineering practices, RDBMS and any object oriented programming.
- The application project will be assigned in a group of two/three students.
- An interested topic will be collected and instructed to each group.
- Students must develop the assigned application, submit written report and give oral presentation

Project evaluation criteria

The internal practical marks allotted for the project should be based on the following criteria:

- Mid-term presentation – 10 marks
- Pre-final submission and presentation – 20 marks
- Final presentation – 10 marks

The external marks should be given based on the following criteria:

- Presentation – 10 marks
- Project – 20 marks
- Documentation – 20 marks
- Viva – 10 marks

Purbanchal University

Bachelor in Information Technology (BIT)

Year: IV **Semester: VII**

S.N	Course Code	Course description	Credits	Lecture (Hrs)	Tutorial (Hrs)	Practical (Hrs)	Total (Hrs)
1	BIT472CO	Artificial Intelligence	3	3	1	2	6
2	BIT474CO	Network Programming	3	3	1	2	6
3	BIT475CO	Software Engineering	3	3	1	-	4
4	BIT476CO	MIS	3	3	1	-	4
5	BIT379CO	Elective I	3	3	1	2	6
6	BIT478CO	Project - VII	3	-	1	3	4
		Total	**18**				

List of electives I

1. GIS BIT477GI
2. Multimedia System BIT477MS
3. Cloud Computing BIT477CC
4. Distributed Processing BIT477DP
5. Theory of Computation BIT477TC
6. Internet and Intranet BIT477II
7. Simulation and Modeling BIT477SM

Artificial Intelligence

BIT472CO

Year: IV **Semester: VII**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course objective

The objective of this course is to provide basic knowledge of AI, machine learning, natural language, expert system and neural network.

Contents

1. **Introduction** **[3 Hrs]**
   - 1.1 Definitions and goals in AI
   - 1.2 History and challenges of AI
   - 1.3 Applications of AI

2. **Agents** **[3 Hrs]**
   - 2.1 Introduction to agents and agent programs
   - 2.2 Types of agent programs
   - 2.3 Properties and types of agent environment, PEAS

3. **Problem solving** **[9 Hrs]**
   - 3.1 Planning and its types
   - 3.2 Problem and its types
   - 3.3 Searching and its types
   - 3.4 Uniformed search algorithms (breadth-first, depth-first, depth-limited search, iterative-deepening, uniform-cost, bi-directional search)
   - 3.5 Informed search algorithms (best-first, A* search)
   - 3.6 Means-ends analysis
   - 3.7 Forward chaining and backward chaining
   - 3.8 Game playing
   - 3.9 Constraint satisfaction problem and crypt-arithmetic puzzles

4. **Knowledge representation** **[10 Hrs]**
   - 4.1 Knowledge and its types
   - 4.2 Logic, semantic nets, frames
   - 4.3 Propositional logic
   - 4.4 Predicate logic
   - 4.5 Clausal form, resolution

5. **Reasoning** **[4 Hrs]**

5.1 Inference theorems

5.2 Monotonic and non-monotonic reasoning

5.3 Probabilistic reasoning, Bayesian network

5.4 Case-based reasoning

5.5 Uncertainty in reasoning

6. **Learning** **[4 Hrs]**

6.1 Concepts and types of learning

6.2 Rote learning, learning by analogy, inductive learning

6.3 Explanation based learning

6.4 Supervised and unsupervised learning

6.5 Genetic algorithm

7. **Neural network** **[4 Hrs]**

7.1 Introduction to artificial neural network

7.2 Network structure

7.3 Back propagation

7.4 Hopfield network, Boltzmann machines

8. **Expert system** **[4 Hrs]**

8.1 Structure of expert system

8.2 Knowledge acquisition, knowledge elicitation

8.3 Applications and development of expert system

8.4 Examples of expert systems- DENDRAL, MYCIN, etc

9. **Natural language processing** **[4 Hrs]**

9.1 Concepts of natural language understanding and natural language generation

9.2 Steps in natural language processing

9.3 Parse tree representation in natural language

Laboratories

Students must do lab works on prolog or LISP to cover the following topics:

- Using Prolog or LISP to understand variables, functions, rules, input-output, arithmetic operations, recursion
- Solving family relation problems, GCD problem, Tower of Hanoi

Reference books

- E. Rich & K. Knight, "*Artificial Intelligence*", McGraw Hill
- E. Turban, "*Decision Support Systems & Expert Systems*", Macmillan
- P. H. Winston, "*Artificial Intelligence*", Addison Wesley

- D. Crookes, "*Introduction to Programming in Prolog*", Prentice Hall
- Stuart Russel & Peter Norvig, "*Artificial Intelligence*", Pearson Edition
- R. Singhal, "*Formal Concepts in Artificial Intelligence*", Chapman & Hall

Network Programming

BIT474CO

Year: IV **Semester: VII**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course objective

At the end of this course, students will be able to design and implement network client server applications.

Contents

1. **Introduction to network programming** **[5 Hrs]**

   Introduction to computer network: client/ server model, Protocol Suite (ISO/OSI, TCP/IP), Unix Standards (POSIX, Open Group, IETF), Network Utilities (telnet, route, ipconfig, ifconfig, ping, netstat, And ftp) Introduction to programming: wrapper functions, header files, libraries and ports numbers, IP address. Iterative server, concurrent server, networked servers

2. **Elementary operating system calls** **[6 Hrs]**

   System call, program, thread, process, Kernel, fork(), exec() and its family, waitpid(), wait(), pipe(), Fifo(), signals (SIGCHLD, SIGINT, SIGIO). IPC Names, creating and opening IPC channels, IPC names, creating and opening IPC channels, IPC permissions

3. **TCP/UDP transport layer protocols** **[4 Hrs]**

   TCP (Transmission Control Protocol): features, connection establishment and termination, states in communication (LISTEN, TIME_WAIT, ESTABLISHED, BLOCKED) UDP (user datagram protocol): features, uses, comparison with TCP. TCP and UDP buffer sizes and limitations. SCTP

4. **Elementary socket calls** **[5 Hrs]**

   Socket address structure: for IPV4, IPV6, UNIX domain socket and generic socket address structure, value-result argument. Byte ordering and manipulating function: htonl( ), htons(), ntohl(), ntohs(), inet_addr(), inet_aton(), inet_ntoa(), inet_pton()

5. **Elementary TCP-UDP socket** **[6 Hrs]**

   Socket(), connect(), bind(), listen(), accept(), read(), write(), close(), sendto(), recvfrom(),

6. **I/O multiplexing** **[4 Hrs]**

Introduction, I/O models: blocking I/O, non-blocking I/O, I/O multiplexing, signal driven I/O (SIGIO) and asynchronous I/O model. Select(), poll(), shutdown()

7. **Socket options** **[2 Hrs]**
   Getsockopt() and setsockopt() functions, IPV4, IPV6, TCP socket options

8. **Name and address conversion** **[2 Hrs]**
   Domain name system, gethostbyname(), gethostbyaddr(), uname(), getservbyname() and getservbyport(), gethostname() functions, socket timeouts

9. **Unix domain protocol** **[3 Hrs]**
   Introduction, Unix domain socket address structure, socket pair function, Unix domain stream client-server, UNIX domain datagram client/server

10. **Daemon processes, Inetd super servers** **[2 Hrs]**
    Introduction, Sysloged (syslog function), daemon_init function, inetd daemon

11. **Broadcast and multicast** **[3 Hrs]**
    Introduction, Broadcast and multicast addresses, comparison between broadcast, unicast and multicast socket options, Unicast versus Broadcast, multicasat versus broadcast on LAN

12. **IP layers and raw socket** **[3 Hrs]**
    Introduction, raw socket creation, input and output (ping example)

Lab exercise

There shall be lab strictly using c/c++/Java/Linux

- Linux commands
- IPC (Pipe(), Fifo(), Message Queue)
- TCP, UDP and Unix Domain socket client server program
- TCP echo server and client program
- Fork() System call
- Wait() and waitpid() system call
- Uname(), gethostbyaddr(), gethostbyname(), gethostname() system call
- Shell programming

Reference books

- Stevens W. R., "*Unix Network Programming*", Vol-1
- Stevens W. R., "*Unix Network Programming*", Vol-II
- Doglous E. Comer, "*Internetworking with TCP/IP*", Vol-III

Software Engineering

BIT475CO

Year: IV **Semester: VII**

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

Course objective

This course is intended to provide an introduction to SE concepts and practices focusing on industrial software development characteristics and processes, development models and the software life cycle for mid-scale system. It provides students a comprehensive introduction to software engineering, kinds of activities that are necessary for developing a software system and important phases of software development.

Contents

1. **Introduction to software engineering** **[4 Hrs]**

   Definition of software engineering, the evolving role of software, changing nature of software, characteristics of software, a generic view of software engineering, software engineering-layered technology

2. **Process models** **[6 Hrs]**

   The waterfall model, prototyping model, RAD model, Spiral model

3. **Software project management** **[7 Hrs]**

   Meaning people, product, process, project in software project management, activities of project planning, project estimation techniques, COCOMO, risk management, project scheduling, staffing

4. **Software requirements and specification** **[6 Hrs]**

   Functional and non-functional requirements, requirements engineering process (feasibility studies, requirements elicitation and analysis, requirements validation, requirements management), data modeling and flow diagram, software prototyping techniques, requirement definition and specification

5. **Software design** **[8 Hrs]**

   Introduction to software design, good software designs, design principle, design concepts, design strategy, design process and design quality, software architecture and its types

6. **Software testing** **[7 Hrs]**

   Software testing process, principle of testing, test case design, black-box testing (boundary value analysis, equivalence class portioning) white-box testing (statement coverage, path coverage, cyclomatic complexity) software verification and validation

7. **Metrics for process and products** **[5 Hrs]**

   Software measurement, metrics for software quality, software quality assurance, software reliability, The ISO9000 quality standards

8. **Object oriented software engineering** **[2 Hrs]**

   Concepts, modeling with UML

Reference books

- *Software Engineering*, A Practitioner's Approach Roger S. Pressman, 6th edition. McGraw Hill International edition
- *Software Engineering*, Sommerville, 7th edition, Pearson education, 2004

Management Information System

BIT476CO

Year: IV **Semester: VII**

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

Course objective

This subject aims at equipping students the knowledge of management information system and other different types of business oriented computer information systems. The course provides students with an introduction to information systems (IS) and information technology (IT) and their use in an increasingly competitive business world.

Contents

1. **Introduction to information system** **[3 Hrs]**
   Information system verses information technology, computer literacy verses information literacy, data verses information, need of MIS for students and organization

2. **Information system for managerial decision making** **[5 Hrs]**
   Transaction processing system, steps in processing a transaction, management information system, ISS, DSS, EIS, AI and ES, OAS, tapping the potential of information system

3. **DSS and EIS** **[6 Hrs]**
   Application of DSS, components of a DSS, functions DSS, GDSS, EIS, characteristics of an EIS, critical success factor of DSS/EIS

4. **ES and neural networks** **[5 Hrs]**
   Appropriate areas for an ES, application of ES, components of ES, knowledge representation, neural networks

5. **Office automation** **[3 Hrs]**
   The virtual corporation, types of OAS, importance of OAS in organizations, communication system

6. **Business information system** **[6 Hrs]**
   Functional information system, manufacturing information system, quality information system, financial and accounting information system, developing cross-functional system

7. **Strategic information system** **[4 Hrs]**

   Definition of strategic information system, characteristic of strategic information system, strategies for developing an SIS, potential barriers to developing an SIS, case studies in SIS

8. **Managing information resources** **[5 Hrs]**

   Definition of IRM, principle of managing information resources, objectives of IRM, IRM function and case studies

9. **Computer security** **[4 Hrs]**

   Definition of computer security, security control and disaster recovery plans, developing a disaster recovery plan

10. **Recent technologies in MIS** **[2 Hrs]**

    Commerce (E-business, E-learning, E-governances, E-medicine, virtual reality), internet and communication technologies

11. **Cyber law** **[2 Hrs]**

    Introduction to cyber law of Nepal, background, cyber crime (meaning and nature, types of cyber crime, role of computer and computer networks), cyber ethics

Reference books

- UMA G. Gupta, "*Management Information System, A managerial* Perspective", Galgotia publication Pvt. Ltd.
- Larry Long, "*Management Information System*", PHI

Project – VII
BIT 478 CO

Full marks: 100
Internal: 40
Final: 60

Course objectives

After finishing this project, student will be able to develop professional application.

Course content

- There should be total of 45 hours covering important feature of software engineering practices, RDBMS and any object oriented programming.
- The application project will be assigned in a group of two/three students.
- An interested topic will be collected and instructed to each group.
- Students must develop the assigned application, submit written report and give oral presentation

Project evaluation criteria

The internal practical marks allotted for the project should be based on the following criteria:

- Mid-term presentation – 10 marks
- Pre-final submission and presentation – 20 marks
- Final presentation – 10 marks

The external marks should be given based on the following criteria:

- Presentation – 10 marks
- Project – 20 marks
- Documentation – 20 marks
- Viva – 10 marks

Purbanchal University
Bachelor in Information Technology (BIT)

Year: IV **Semester: VIII**

S.N	Course Code	Course description	Credits	Lecture (Hrs)	Tutorial (Hrs)	Practical (Hrs)	Total (Hrs)
1	BIT470CO	E-commerce	3	3	1	2	6
2	BIT471CO	Wireless Communication System	3	3	1	2	6
3	BIT473CO	Software Project Management	3	3	1	-	4
4	BIT480SA	Elective II(System Administration)	3	3	1	2	6
5	BIT479CO	App. Project	4	-	1	4	5
		Total	**16**				

List of electives II

1. Remote Sensing BIT480RS
2. Multimedia Communication BIT480MC
3. E-Governance BIT480EG
4. System Administration BIT480SA
5. Design and Analysis of Algorithm BIT480DA
6. Network Security and Cryptography BIT480NS
7. Image Processing and Pattern Recognition BIT480IP

E-Commerce

BIT476CO

Year: IV **Semester: VIII**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course objective

- To introduce the concept, technologies and strategies of electronic commerce.
- To understand and familiarize with different models and infrastructures for implementing online business.
- To understand the community concept and development of e-commerce sites.

Contents

1. **Introduction to e-commerce** **[4 Hrs]**
   - 1.1 E-commerce fundamentals and media convergence
   - 1.2 Benefits of e-commerce
   - 1.3 Internet's influence on market and price
   - 1.4 Overview of Just in Time and Quick response retailing inventory system
   - 1.5 Overview of supply chain management system

2. **Internetworking and e-commerce** **[5 Hrs]**
   - 2.1 History of internet
   - 2.2 Overview of internet infrastructure
   - 2.3 IP suit
   - 2.4 Domain name service
   - 2.5 ISP's and connectivity options
   - 2.6 Firewalls and network security
   - 2.7 Types of security

3. **Web technologies** **[6 Hrs]**
   - 3.1 Importance of website design
   - 3.2 Introduction to dynamic web pages
   - 3.3 Properties of a good e-commerce site
   - 3.4 Common protocols like HTTP and FTP

4. **Business models** **[4 Hrs]**

4.1 fundamentals of business models
4.2 classification of business models
4.3 fundamentals of brokerages, advertising, infomediary, merchant, manufacturer, affiliate, community, subscription and utility models

5. **Electronic payment system** **[6 Hrs]**
5.1 Types of payment system
5.2 Properties of paper money
5.3 Electronic cash and its use
5.4 Electronic checks
5.5 Smart cards
5.6 Credit cards
5.7 Online credit card processing
5.8 Retailing in e-commerce

6. **Security and encryption** **[4 Hrs]**
6.1 E-commerce security threats
6.2 Fundamentals of symmetric and public key cryptography
6.3 Digital signature
6.4 Digital certificate and authority

7. **Marketing and advertisement** **[6 Hrs]**
7.1 How to be found and to find in the internet
7.2 Personalization
7.3 Virtual societies
7.4 Localization
7.5 Banner ads
7.6 User tracking and log file analyzing
7.7 Push and pull advertising
7.8 Launching a new product

8. **Other issues in e-commerce** **[3 Hrs]**
8.1 Intellectual properties
8.2 Governance: e-commerce laws, internet governing organizations and cross boarder legal issues

9. **Web application** **[7 Hrs]**
9.1 Basic concept of web application development
9.2 Website client and server side validation of control

9.3 Using different web application controls

9.4 Database connectivity with different DBMS

9.5 Building web application giving different features of e-commerce sites

The students are expected to complete an e-commerce based project implementing the strategies and technologies learnt in the theory classes and develop E-commerce websites using web based application.

Reference books

- Kalakota & Whinston, "*Frontiers of Electronic Commerce*", Pearson education (Addison Wesley) 2000, ISBN: 981-235-903-6.
- Daniel Amor, "*The E-Business (R) evolution*", Pearson education, 2000, ISBN:981-404-826-2

Wireless Communication

BIT471CO

Year: IV **Semester: VIII**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course contents

1. **Introduction** **[3 Hrs]**
   - 1.1 History and evolution of wireless communication: 1G, 2G, 3G, 4G
   - 1.2 Basic definitions related to mobile communication
   - 1.3 Paging system and cordless telephone system: simple concepts
   - 1.4 Cellular communication system: components and process

2. **Speech coding for wireless systems applications** **[5 Hrs]**
   - 2.1 Introduction: definition and importance
   - 2.2 Speech coders classification (hierarchy only)
   - 2.3 Characteristics of speech signals: PDF, ACF, PSD
   - 2.4 Frequency domain speech coding: sub-band coding, adaptive transformation coding
   - 2.5 Vocoders: speech generation model, types
   - 2.6 Linear predictive coders: LPC vocoders and residual-exited LPC

3. **Mobile communication concepts** **[8 Hrs]**
   - 3.1 Introduction: cellular concept and fundamentals, advantages
   - 3.2 Frequency reuse concept: hexagonal cells, cell cluster, channel capacity, reuse ratio, cellular layout
   - 3.3 Channel assignment strategies: fixed and dynamic
   - 3.4 Handoff strategies: introduction, factors affecting handoff, MAHO, prioritizing handoff, umbrella cell approach
   - 3.5 Interference and system capacity: adjacent and co-channel
   - 3.6 Improving coverage and capacity: cell splitting and cell sectoring

4. **Mobile radio propagation and models** **[8 Hrs]**
   - 4.1 Free space propagation model
   - 4.2 Fading: introduction; large scale, small scale
   - 4.3 Practical link budget design using path loss models: log-distance path loss, log-normal shadowing
   - 4.4 Indoor propagation model: partition losses (same floor and between floors)

4.5 Outdoor propagation model: Okumura model, Hata model, PCS extension to Hata model

4.6 Factors influencing small scale fading, Doppler shift: definition and derivation

4.7 Parameters of mobile multipath channels: time dispersion parameters, coherence bandwidth, Doppler spread and coherence time (definitions)

4.8 Types of small scale fading: flat vs frequency selective, fast vs slow

5. **Modulation techniques** **[6 Hrs]**

5.1 Overview of digital modulation: advantages and factors influencing it

5.2 BPSK: Relation, Transmitter, Receiver

5.3 MSK: Relation, Transmitter, Receiver

5.4 GMSK: Relation, Transmitter, Receiver

5.5 MPSK: Relation, Transmitter, Receiver

5.6 MFSK: Relation, Transmitter, Receiver

6. **Equalization and diversity techniques** **[5 Hrs]**

6.1 Introduction, importance and fundamentals of equalization

6.2 Diversity techniques: importance, practical space diversity considerations, frequency, time

6.3 RAKE receiver: introduction and basic blocks

7. **Multiple access techniques** **[4 Hrs]**

7.1 Overview of duplexing techniques: TDD and FDD

7.2 Types of multiple access techniques

7.3 FDMA: introduction and features

7.4 TDMA: introduction and features

7.5 CDMA: introduction and features

7.6 Comparison of multiple access techniques

8. **Wireless communication systems and standards** **[6 Hrs]**

8.1 Global system for mobile (GSM): services and features, system architecture, radio subsystem, channel types, frame structure, signal processing

8.2 IS-95: frequency and channel specifications, forward CDMA channel, reverse CDMA channel

8.3 Recent developments in GSM and CDMA technology

Laboratory

Visit to the nearest district telecom center for case study and preparation of the report for paper presentation. The prepared report must be submitted to the respective teacher for the evaluation of the mark.

Reference books

- K. Feher, "*Wireless Digital Communications*", PHI 2001
- W. Stallings, "*Wireless Communications and Networks*", PEA, 2002

- T. Rappaport. "*Wireless Communication: Principles and Practices*".
- J. Schiller, "*Mobile Communications*", PEA, 2000
- B. P. Lathi, "*Modem Digital and Analog Communication Systems*", third edition, Oxford University press, 1999
- J. Proakis, M. Salchi, "*Communication Systems Engineering*", Prentice Hall New Jersey, 1994

Software Project Management

BIT473CO

Year: IV **Semester: VIII**

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

Course objectives

- To know of how to project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software

Course contents

1. **Software project management concepts** **[9 Hrs]**

   Introduction to software project management: An overview of project planning: select project, identifying project scope and objectives, infrastructure, project products and characteristics, estimate efforts, identify activity risks and allocate resources

2. **Software evaluation and costing** **[9 Hrs]**

   Project evaluation: strategic assessment, technical assessment, cost-benefit analysis, cash flow forecasting, cost-benefit evaluation techniques, risks evaluation, selection of appropriate project approach: choosing technologies, choice of process models, structured methods

3. **Software estimation techniques** **[9 Hrs]**

   Software effort estimation: problems with over and under estimations, basis of software estimation, software estimation techniques, expert judgment, estimating by analogy, activity planning: project schedules, project and activities, sequencing and scheduling activities, networks planning models, formulating a network model

4. **Risk management** **[9 Hrs]**

   Risk management: nature of risk management, risk identification and analysis, reducing the risk, resource allocation: scheduling resources, critical paths, cost scheduling, monitoring and control: creating framework, cost monitoring, prioritizing monitoring

5. **Software quality management** **[9 Hrs]**

   TQM, six sigma, software quality: defining software quality, ISO9126, external standards, comparison of project management software's: dot project, launch pad, openProj, case study: PRINCE2

Reference books

- Boh Hughes & Mike Cotterell, "*Software Project Management*", Tata MGraw, Hill publications, fifth edition, 2012
- S. A. Kelkar, "*Software Project Management*", PHI, New Delhi, Third edition, 2013
- Richard H. Thayer, "*Software engineering Project Management*", IEEE computer society
- Futrell, "*Quality Software Project Management*", Pearson education India, 2008

System Administration

BIT480SA

Year: IV **Semester: VIII**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal Assessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course contents

1. **Network architecture and networking software** **[2 Hrs]**
   - 1.1 Mainframe architecture
   - 1.2 Client/server architecture
     - 1.2.1 Different client/server models
   - 1.3 File server architecture
   - 1.4 Upsizing
   - 1.5 Downsizing
   - 1.6 Integration

2. **Introduction to server hardware and OS** **[4 Hrs]**
   - 2.1 Investigating different types of servers
     - 2.1.1 Tower server
     - 2.1.2 Rack server
     - 2.1.3 Blade server
   - 2.2 Overview of network OS
     - 2.2.1 Linux server
     - 2.2.2 Windows server
     - 2.2.3 Solaris
   - 2.3 Emerging server hardware technologies
   - 2.4 Installation of Linux/Unix OS

3. **Data storing, fault-tolerance techniques and storage area network (SAN)** **[7 Hrs]**
   - 3.1 File system management
     - 3.1.1 Overview of file system
       - 3.1.1.1 FAT
       - 3.1.1.2 NTFS
       - 3.1.1.3 EXT3/4
       - 3.1.1.4 ZFS
     - 3.1.2 Making EXT3/FAT file system

3.1.3 Making Swap Disk

3.1.4 Mounting file system

3.2 Managing different file system in network (NFS, CIFS/Samba)

3.2.1 Overview of NFS

3.2.2 Configuration of NFS in Unix

3.2.3 Overview of CIFS/Samba

3.2.4 Installation and configuration of CIFS/Samba in Unix

3.3 Disk technologies

3.3.1 ATA

3.3.2 SATA

3.3.3 SAS

3.3.4 SCSI

3.4 Storage area network

3.4.1 Introduction

3.4.2 Protocols (Fiber Channel, iSCSI, FCoE)

3.5 Disk storage fault tolerance (RAID)

3.5.1 Types (RAID 1 to 6)

3.5.2 Configuration of RAID 0, 1 and 5

4. **Administrative and network operational models** **[5 Hrs]**

4.1 Concepts of administrative models

4.2 Domain

4.3 Tree

4.4 Forest

4.5 Global catalog

4.6 Schema master

4.7 Light Weight Directory Access Protocol (LDAP)

4.8 Basic installation and configuration of OpenLDAP server and client

5. **Configuration of basic network services** **[8 Hrs]**

5.1 Introduction of network protocols

5.2 TCP/IP

5.2.1 Configuration of network interface

5.2.2 Configuration of basic route

5.2.3 Using hosts file DNS and DHCP client tools

5.3 DHCP

5.3.1 Overview

5.3.2 Installation and configuration of DHCP server in Unix system

5.4 DNS

5.4.1 Overview
5.4.2 Iterative and recursive query
5.4.3 DNS record
5.4.4 Dynamic DNS
5.4.5 Installation and configuration of DNS in BIND

5.5 File server
5.5.1 Overview of FTP server
5.5.2 Installation and configuration of FTP server

5.6 Web server
5.6.1 Overview
5.6.2 IP based vs. virtual hosting
5.6.3 Configuration of web server in Apache or other open source web server
5.6.4 Installation and configuration secure web server

6. **Network monitoring and control** **[4 Hrs]**

6.1 Overview of network monitoring and management
6.2 Network monitoring architecture
6.3 Account monitoring and control
6.4 Security control
6.5 User environment configuration and protocol
6.6 Fault monitoring
6.7 Installation and configuration of SNMP daemon in Unix system
6.8 Installation and configuration open source network monitoring tools (MRTG and Nagios or any other open source tools)

7. **System startup, automation and scheduling jobs** **[3 Hrs]**

7.1 Configuration of services in startup
7.2 Scheduling jobs with cron and at commands in Unix
7.3 Shell scripting
7.3.1 Overview of variables and environmental variables
7.3.2 Basic structure
7.3.3 Control statement
7.3.4 Control statement and loops
7.3.5 Functions
7.3.6 Sample of real work scripts

8. **Disaster recovery** **[3 Hrs]**

8.1 Disaster recovery plan
8.2 Backup plan

8.2.1 Overview

8.2.2 Consideration of backup media

8.2.3 Types of backup (full, incremental, differential)

8.2.4 Installation and configuration of backup and recovery in Unix

8.3 Concepts of disaster recovery sites

8.4 Concepts of disaster recovery with the help of virtualization and cloud environment

9. **Virtualization and cloud infrastructure** **[4 Hrs]**

9.1 Virtualization

9.1.1 Overview

9.1.2 Advantages

9.1.3 Types of virtualization

9.1.4 Managing virtual machine with KVM/Xen

9.2 Cloud infrastructure

9.2.1 Overview

9.2.2 Types of cloud

9.2.3 Private cloud vs. public cloud

9.2.4 Introduction of OpenStack

9.2.4.1 Basic installation and configuration with packstack

9.2.4.2 Configuration of virtual machine with web interface (Horizon)

9.2.5 Overview of public loud

9.2.5.1 Amazon AWS EC2

9.2.5.2 Rackspace and more

10. **Network security** **[5 Hrs]**

10.1 Attack services and mechanisms and counter measures

10.1.1 SQL injection

10.1.2 Cross site scripting

10.1.3 IP and ARP spoofing

10.1.4 DOS and DDOS attack

10.1.5 Man in the middle attack

10.1.6 Hijacking

10.1.7 Virus, worms, Trojans

10.2 Cryptography

10.2.1 Conventional encryption and message confidential

10.2.2 Public-key cryptography and message authentication

10.2.3 Configuration of private key and public key cryptography in Unix

10.3 Network security application

10.3.1 Overview of Kerberos

10.3.2 Pretty good privacy assignment

10.4 IP security

10.4.1 Firewalls

10.4.1.1 Overview

10.4.1.2 Types of firewalls

10.4.1.3 Basic configuration of firewall with iptables (in Linux)

10.4.2 Virtual private network

10.4.2.1 Overview

10.4.2.2 Types of VPN

Laboratory

There shall be lab exercises covering all features of above chapters.

Reference books

- "*Essential System Administration*", 2nd edition, Eleen Frisch, publisher: O'Reilly media
- "*Principles of Network and System Administration*", Mark Burgess
- "*Backup and Recovery*", W. Curits Preston, O'Reilly media
- "*Network security with OpenSSL*", John Viega, Matt Messier and Pravir Chandra, O'Reilly media
- "*LDAP System Administration*", Gerald Carter, O'Reilly media
- "*Unix and Linux System Administration*" handbook (4th edition), Evi Nemeth, Garth Snyder, Trent R. Hein
- "*Comptia Security + Study Guide*" by Emmett Dulany, Sybex.

Project – VIII
BIT 479CO

Full marks: 100
Internal: 40
Final: 60

Course objectives

After finishing this project, student will be able to develop professional application.

Course content

- There should be total of 45 hours covering important feature of software engineering practices, RDBMS and any object oriented programming.
- The application project will be assigned in a group of two/three students.
- An interested topic will be collected and instructed to each group.
- Students must develop the assigned application, submit written report and give oral presentation

Project evaluation criteria

The internal practical marks allotted for the project should be based on the following criteria:

- Mid-term presentation – 10 marks
- Pre-final submission and presentation – 20 marks
- Final presentation – 10 marks

The external marks should be given based on the following criteria:

- Presentation – 10 marks
- Project – 20 marks
- Documentation – 20 marks
- Viva – 10 marks

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