Purbanchal University

Bachelor of Information Technology (BIT)

Year:I **Semester:I**

Course Code	Course Title	Credits	Lecture (Hrs.)	Tutorial (Hrs.)	Laboratory (Hrs.)	Total (Hrs.)
BIT101CO	Fundamentals of Information Technology	3	3	1	2	6
BIT102HS	Mathematics-I	3	3	2	-	5
BIT103HS	Technical Communication	3	3	1	-	4
BIT104HS	Society and Ethics in IT	3	3	1	-	4
BIT105CO	Computer programming in C	3	3	1	3	7
BIT106CO	Project-I	2	-	-	3	3
	Total	**17**	**15**	**6**	**8**	**29**

Note :- Each semester of BIT program spans over a period of 15 weeks of class work and one week of internal examinations, such as internal tests, quizzes, and mid-term examination.

Fundamentals of Information Technology
BIT101CO

Year: I **Semester: I**

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 main objective of this course is to provide basic knowledge of IT and its components, and their applications in various fields.

Course Contents:

Unit 1: Introduction to Computer **(4 Hrs)**

Characteristics and components of computer, History and generation of computers, Classification of computer based on purpose, size and technology; Applications of Computers - Computer in business and Industry, Computers in home, Computer in education and training, Computers in entertainment, science, medicine and engineering.

Unit 2: Basic Computer Organization and Computer Peripherals **(4 Hrs)**

Block diagram of computer system; Input devices: Keyboard, mouse, and other types of input devices; Output devices: Monitor, printer, and other types of output devices.

Unit 3: Computer Storage **(4 Hrs)**

Concepts of memory and requirements of storage devices; Classification and types of storage devices; ROM and RAM with their types; Magnetic devices and Optical devices.

Unit 4: Computer Software **(4 Hrs)**

Introduction and types of software; Definition and functions and types of operating system; Programming languages and their types.

Unit 5: Introduction to Database **(4 Hrs)**

Meaning of data and information; Concepts and characteristics of database and DBMS; Database Models; Data Warehouse & Data Marts, Data Mining; On-Line Analytical Processing (OLAP).

Unit 6: Networks and Internet **(10 Hrs)**

Introduction to communication system and computer network; Uses of computer network; Types and topologies of network; Network media and network software; Introduction, features and applications of Internet; Intranet and extranet; World Wide Web, E-mail, E-commerce, E-Learning, E-Governance, E-Banking; Introduction to Network Protocols (TCP/IP, HTTP, HTTPs, FTP, SMTP, POP3, IMAP).

Unit 7: Information Security **(2 Hrs)**

Introduction to Information Security; Computer crime, viruses and threats; Cyber law and ethical issues.

Unit 8: Computer Hardware **(7 Hrs)**

Motherboard and its parts, slots, daughterboard, and expansion slots; BIOS, SMPS, CMOS, and Microprocessors.

Unit 9: Technological trends in Information Technology **(6 Hrs.)**

Cloud Computing, Artificial Intelligence, BIG Data, IoT, Robotics, Virtual Reality, Augmented Reality, Blockchain Technologies.

Laboratory Works:

1. Basics of Windows and User Interface

- Using mouse and moving icons on the screen
- The My Computer icon, the Recycle Bin icon, Status Bar, Start button, Menu Bar
- Opening, closing and running an application
- Using Windows Explorer to view files, folders and directories
- Creating and renaming files and folders
- Windows settings: control panel, wallpapers, screen savers, date and time, sound
- Advanced features: using right mouse button, shortcuts, notepad, accessories

2. Basic DOS Commands

- Comparison of DOS and Windows, switching between DOS and Windows
- Creating, renaming, copying, moving, and deleting files and directories

3. Word Processing:

- Basics: opening and closing documents, saving documents, page setup, printing, scrolling around a document
- Text manipulation and formatting: text selection, cut, copy and paste, font, Bold, Italic and Underline, text alignment, line and paragraph setting, changing font, size and color, bullets and numbering, changing case
- Table manipulation: drawing and inserting table, changing cell width and height, alignment of text in cell, inserting and deleting rows and columns, table borders

4. Spreadsheets:

- Basics: opening and closing of spreadsheet, multiple sheets, Menu Bar, cell inputting, cell addressing
- Manipulation of cells: entering texts, creating tables, setting cell width and height, copying of cells
- Formulas: sum, average, percentage, and other basic functions
- Preparing invoices/budgets, totaling of transactions, maintaining daily and monthly reports

5. Presentations:

- Basics: opening a PowerPoint presentation, using Wizard to create a presentation
- Slide presentation: title, text, picture, table, font color and font size, bullets and indenting, slide design, background, slide numbering, slide show, slide animation, slide sorting, printing slides

6. Computer Communication and Internet:

- Basics of computer network, WWW, and websites
- Web browsing, net surfing, chatting, using e-mails

7. Computer Hardware

- Assembling and disassembling of computer system
- Installation of operating system, utilities and application software
- Installation of printer
- Routine checks and troubleshooting
- Virus protection
- Network cabling and Internet connectivity

References:

1. Peter Norton, "Peter Norton's Introduction to Computer", Tata McGraw-Hill Publishing Company Limited
2. Robert Cowart, "Mastering Windows-Premium Edition", BPB Publication
3. Ron Mansfield, "Mastering Word", BPB Publication
4. Thomas Chester, "Richard A. Alden, Mastering Excel", BPB Publication
5. Katherine Murray, "Mastering Power Point", BPB Publication
6. Shankar N. Adhikary, Ajay K. Shah, "Business Application of Computers", Buddha Publication
7. Winn L. Rosch, "The Hardware Bible", 3rd Edition, PHI
8. Mark Minasi, "The Complete PC Upgrade & Maintenance Guide"
9. Scott Mueller, "Upgrading & Repairing PCs"
10. Alexis Leon & Mathews Leon, "Fundamentals of Information Technology", Leon Techworld
11. P. K. Sinha, "Computer Fundamentals", BPB Publication
12. V. Rajaraman, "Fundamentals of Computer"

Mathematics I
BIT102HS

Year : I **Semester : I**

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

Course Objective: The main objective of this course is to enable students to apply mathematical tools such as linear algebra, differential calculus and analytical geometry in information technology.

Course Contents:

Unit 1: Matrix Algebra **(7 hrs)**

Definition, Equality of matrices, Addition& Scalar Multiplication of a matrix; Product of matrices; Some special types of matrices; Matrices & Determinants (simple cases only); Adjoint & Inverse of a matrix; Cramer's rule; Use of matrices in solving a system of linear equations (Homogenous & Non- homogeneous system).

Unit 2: Coordinate Systems **(5 hrs)**

Rectangular coordinates in a plane; Polar coordinates; Rectangular coordinates inspace; Cylindrical polar coordinates; Spherical polar coordinates; Transformation of one coordinate system into another system.

Unit 3: Elementary Coordinate Geometry **(5 hrs)**

The conic sections; Translation of Axes; Equation of a conic in polar coordinates.

Unit 4: Vectors and Solid Geometry **(10 hrs)**

The concept of a vector; Addition & Subtraction of vectors; Resolution of vectors; Scalar Dot product of two vectors; Vector Cross product of two vectors; Equations of Line and Plane; Product of three or more vectors; Sphere, Cylinder and Cone; Quadratic Surfaces

Unit 5: Applications of Differentiation **(8 hrs)**

Geometrical Applications; Related Rates; Roll's and Mean – Value theorems; Indeterminate forms; Maxima and Minima; Taylor's and Maclaurin's series; Curvature; Asymptotes.

Unit 6: Applications of the Definite Integral **(5 hrs)**

Area bounded by a curve; Volume and surface area of solids of revolution; Length of an arc of a curve; Area and volume in polar coordinates.

Unit 7: Functions of Several Variables **(5 hrs)**

Function of several variables; Limits and continuity; Partial derivatives, First and Second Order; Homogenous functions, Euler's Theorem.

References:

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

2. Fraleight J. B. Calculus with analytic grometry, Addisen Wesley pub. Community. Inc(1980)
3. Bajpai, A.C Calus I.M. and fairley, J.A.Mathematics for Engineering & Scientist, Vol I john wiley & sons (1973).
4. Goldstain, I.J. Lay D.C. and Schneider, D.I Calculus and its Application,s Prentice Hall Inc. (1977)
5. Spiegel, M.R. Theory and problems of advanced calculus schaum publish.
6. Srivastava, R.S.L. Engineering Mathematics, Vol I, Tata, McGraw hill pub (1980)
7. N. Saran & J.K. Goyal, Introduction to matrices pragatic Prakashan (1990)

Technical Communication
BIT103HS

Year: I **Semester: I**

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

Course objective: The main objective of this course is to develop intensive and extensive skills needed for oral presentation and writing and presenting a seminar paper

Course Contents:

Unit 1: Oral Communication **(10 Hrs)**

Oral Presentation Skills: Introduction; Getting Started on Presentations; Planning; Organizing and Composing; Preparing; Rehearsing; Presenting; Organizing a Group Presentation; Writing and Presenting a Seminar Paper

Unit 2: Reading: Intensive and Extensive **(16Hrs)**

Intensive Reading: How to Tackle Reading Materials; Practice on Contextual Grammar (Prepositions; Active Voice and Passive Voice; Tense based Practice; Direct Speech and Indirect Speech; Subject Verb Concord; Error Analysis; Stress); Reading Techniques (Skimming; Scanning; Note Making; Summary Writing.

Extensive Reading: How to Tackle Extensive Reading Materials; Practicing Extensive Reading.

Unit 3: Writing **(19Hrs)**

Business Communication: Rules of Good Writing; Fax Message and Electronic Mails; Memos; Meetings (Notice Preparation, Agenda Preparation and Minutes Preparation).

Persuasive Communication: Notices, Advertisements and Leaflets.

Letters: Official Letters (Standard Letter Format; Writing Letters for Asking and Giving Instruction, Letters of Request, Apology and Explanation, Complaint and Order); Letter of Application (Standard Format; Preparing CV, Bio-data and Resume; Writing Letters of Application).

Proposals: Introduction; What Is a Proposal?; Getting Started on Proposal; Composing Informal; Proposals; Composing Formal Proposals.

Information Reports: Introduction; Getting Started on Informative Reports; Summary and Abstract; Mechanism and Description; Periodic Reports; Progress Reports; News Releases.

Recommendation Reports: Introduction; What Is a Recommendation Report? Starting a Recommendation Report; Formatting and Organizing Recommendation Reports; Composing Recommendation Reports.

Workshop/seminar(s) should be conducted to enhance the reading, writing, listening and speaking skills.

References:

1. Taylor, Shirely. Communication for Business: A Practical Approach. London: Longman, 2005.

2. Smith-Worthington, Daelene and Sue Jefferson. Technical Writing for Success. 3rd ed.USA: Cengage Writing, 2011.
3. Adhikari, Usha, et al. A Course Book of Communicative English. Kathmandu: Trinity Publications, 2012
4. Mohan, Krishna and Banerji, Meera. (1990). Developing Communication Skills. Macmillan: New Delhi.
5. Gerson, S. J. and Gerson S. M. (2007). Technical Writing. Pearson Education: New Delhi.
6. Leech, G. And Svartvik, J. (1975). A Communicative Grammar of English. ELBS: England.
7. Sinha, R. P. (1991). How to Write Correct English. BharatiBhawan: India.
8. Swan, Michael. (1980). Practical English Usage. OUP: Oxford.
9. Thakur, K. P. (1989). A Practical Guide to English Grammar. BharatiBhawan: India.

Society & Ethics in IT
BIT104HS

Year: I **Semester: I**

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

Course Objective: The main objective of this course is to provide students with technical and emotional aspects of sociology and its components.

Course contents:

Unit 1: Introduction **[4 Hrs]**

Definition and evolution of sociology; Relationship of sociology with economics, political science and computer science; Applications of sociology.

Unit 2: Social and Cultural Change **[6 Hrs]**

Process (Innovation,invention diffusion, and discovery); Theories of social change (evolution, functional, conflict); Factors of social change (economics, technology, education, demography); Role of media and communication in social and cultural change;Resistance of social change; Technological changes and its consequences.

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

Definition and approaches of development; Indicators of developmentand features of developing countries; Development planning; Role of national and international community and state.

Unit 4: Process of Transformation **[4 Hrs]**

Modernization, globalization and migration; E-governance & E-commerce.

Unit 5: Characteristics of Nepali Society and Culture **[5 Hrs]**

Historical development of Nepal; Demographic composition; Contemporary Issues(gender, caste and ethnicity); National integration and differentiation; Social stratification, problems and control.

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

Definition of profession and professional ethics; Code of conduct; Ethical dilemma and problems; Disciplinary action; Corporate social responsibility.

Unit 7: Introduction to Emotional Intelligence **[9 Hrs]**

Definition and benefits of Emotional Intelligence; Components of Emotional Intelligence; Self Management, Self Awareness, Self Regulation, Self Motivation, Empathy; Domains and competencies of Emotional Intelligence; Emotional leadership development; Skills in Emotional Intelligence: Accurately perceive emotions, Use emotions to facilitate thinking, Understand emotional meanings, Manage emotions; Optimism, Pessimism and the balance between optimism and pessimism.

Unit 8: Social Management and Responsibility **[7 Hrs]**

Social skills to make an impact in the society; Creating a powerful first impression; Assessing a situation in the society and workplace, understand Emotions and manage them; Role of Emotional Intelligence at Social Environment; Articulate the Emotions Using Language; Disagreeing Constructively.

Reference:

1. Alex Inkles, "What is Sociology? Introduction in the Discipline & Profession", Prentice Hall of India
2. Daniel Goleman ," Emtional Intelligence : Why it can matter more than IQ"
3. Giddens & D. Mitchell, "Introduction to Sociology", 3rd Ed., London, W.W. Norton &Company
4. M. Foster, "Traditional Culture & Impact of Technological Change"
5. N.S. Rao, "Principle of Sociology with an Introduction of Social Thought", S. Chand & Co. Ltd.
6. Pratley Peter, "The Essence of Business Ethics", Prentice Hall of India, New Delhi
7. Rishikeshav Raj Regmi, "Dimension of Nepali Society and Culture".

Computer Programming in C
BIT105CO

Year: I **Semester: I**

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

Course Objective: The main objective of this course is to enable students familiarize with writing algorithms and developing programs using C language.

Course Contents:

Unit 1: Problem Solving with Computer **(3 Hrs)**

Problem analysis, Algorithms and Flowchart; History and Importance of C; Structure of C program; Coding, Compilation and Execution; Debugging, Testing and Documentation.

Unit 2: Elements of C **(3 Hrs)**

C Tokens; Escape sequence; Variables; Data types; Constants/Literals; Expressions; Statements and Comments.

Unit 3: Input and Output **(4 Hrs)**

Conversion specification; I/O operation; Unformatted and Formatted I/O.

Unit 4: Operators and Expression **(3 Hrs)**

Arithmetic operator; Relational operator; Logical and Boolean operator; Assignment operator; Ternary operator; Bit-wise operator; Increment and Decrements operator.

Unit 5: Control Statements **(4 Hrs)**

Branching; Looping; Exit function, Break and Continue statement; Goto statement.

Unit 6: Arrays **(6 Hrs)**

Introduction; Declaration of array; Initialization of array; Sorting; Multidimensional array; String and String handling functions.

Unit 7: Functions **(5 Hrs)**

Local, global, static and Register variables; Library functions and User-defined functions; Pass by value and Pass by reference; Recursion; Use of array in function.

Unit 8: Pointers **(6 Hrs)**

Introduction and importance of Pointers; Reference and dereference operator; Pointer arithmetic; Pointer and array; Pointer with multidimensional array; Pointer and strings; Dynamic memory allocation.

Unit 9: Structure and Union **(5 Hrs)**

Introduction; Array of structure; Passing structure to function; Passing array of structure to function; Pointer to structure; Structure within structure (Nested structure); Union.

Unit 10: Files and File Handling in C **(4 Hrs)**

Introduction and Importance of files; Opening and closing a file; File Opening Modes; Input/output function; Sequential and Random access in file.

Unit 11: Introduction to Graphics **(2 Hrs)**

Modes; Initialization; Graphics Function.

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

LABORATORY EXERCISE FOR BCA104CO

Lab class will cover all above mentioned topics and shall include at least the following lab exercises.

1. Display messages as output
2. Simple interest calculation
3. Area and circumference of circle
4. Area and perimeter of rectangle
5. Character conversion from lower case
6. Character conversion from upper case to lower case and vice versa
7. Reading and writing a line of text
8. Averaging student exam scores
9. Compound interest calculation
10. Syntactic errors
11. Execution errors (Real root of a quadratic equation)
12. Debugging a program
13. Debugging with an interactive Debugger
14. Calculating total expenses
15. Calculating bonus
16. Calculating division of students
17. Generating consecutive integer quantities
18. Averaging a list of numbers
19. Converting Several lines of character to uppercase
20. Encoding a string of characters
21. Repeated compound interest calculations with error trapping
22. Solution of an algebraic equation
23. Calculating depreciation
24. Searching for palindromes
25. Largest of three integers quantities
26. Calculating factorials
27. Simulation of a game of chance
28. Printing backwards
29. The tower of Hanoi
30. Average length of several lines of text
31. Search for a maximum
32. Generating Fibonacci numbers
33. Deviation about an average
34. Reordering a list of numbers
35. A piglatin generator
36. Factors, prime Factors, LCM, HCF
37. Adding two tables of numbers

38. Recording a list of strings
39. Analyzing a line of text
40. Displaying the day of the year
41. Future value of monthly deposit (compound interest calculations)
42. Updating customer records
43. Locating customer records
44. Raising a number to a power
45. Creating a data file (lower case to upper case text conversion)
46. Reading a data file
47. Creating a file containing customer records
48. Updating a file containing customer records
49. Creating an unformatted data file containing customer records
50. Graphic programming- Displaying different shapes

References:

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

Project-I
BIT106CO

Year: I **Semester: I**

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

Course Objective: The main objective of this course is to enable students design and complete the software project by using high-level language (C-Programming).

Course Contents:
A Project group will be developing a software project by using high-level language (C-Programming / BIT105CO). Every student of the group should work at least for 45 lab hours under the supervision of the assigned supervisor. Students must develop the assigned software, submit written report, and give oral presentation.

General Procedure:
1. Information Gathering
2. System requirements specifications
3. Algorithms and Flowchart
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

Project Evaluation Criteria for Internal assessment:
The marks allocated for the project should be evaluated based on the following criteria:
- Title identification and Proposal Writing— 10 Marks
- Mid-term Presentation — 20 Marks
- Pre-final Submission and final Presentation — 30 Marks

Project Evaluation Criteria for External assessment:
The marks allocated for the project should be evaluated based on the following criteria:
- Project Documentation— 20 Marks
- Final Presentation — 10 Marks
- VIVA - 10 Marks

Project Group Size: 2 to 3 students in one group.

Purbanchal University
BACHELOR OF INFORMATION TECHNOLOGY (BIT)

Year: I **Semester: II**

Course Code	Course Title	Credits	Lecture (Hrs.)	Tutorial (Hrs.)	Laboratory (Hrs.)	Total (Hrs.)
BIT151HS	Mathematics-II	3	3	2	-	5
BIT152CO	Digital Logic	3	3	1	2	6
BIT153HS	Discrete Structure	3	3	1	-	4
BIT154CO	Object –Oriented Programming in C++	3	3	1	2	6
BIT155MS	Financial Management and Accounting	3	3	1	1	5
BIT156CO	Project-II	2	-	-	3	3
	Total	**17**	**15**	**6**	8	**29**

Note :- Each semester of BIT program spans over a period of 15 weeks of class work and one week of internal examinations, such as internal tests, quizzes, and mid-term examination.

Mathematics II
BIT152SH

Year: I **Semester: II**

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

Course Objective: The main objective of this course is to enable students to apply mathematical tools such as advanced calculus, functions of a complex variables and series in information technology.

Course Contents:

Unit 1: Multiple Integrals **(6 hrs)**

Definition and Evaluation of Double Integrals; Area by Double integration; Introduction to triple integrals & some simple applications; Change of variables.

Unit 2: Differential Equations of the first order **(8 Hrs)**

Variable separable; Exact Differential equations; Homogeneous equations; Linear Differential Equation; Simultaneous differential equations; Equations of higher degree Some applications.

Unit 3: Linear Differential Equations **(7 Hrs)**

Homogeneous equations of second order; Methods of determining particular integrals and application; Vibrations of a particle (SHM).

Unit 4: Fourier Series and Integrals **(10 Hrs)**

Definitions and derivations; Odd and Even functions; Half range series; Change of scale; The Fourier Integral and Fourier Transforms.

Unit 5: Functions of a Complex Variable **(8 Hrs)**

Basic definitions; Functions of a complex variable; Limits, continuity & differentiation; Cauchy Riemann Equations; Analytic Functions; Harmonic Functions; Complex exponential, trigonometric and hyperbolic function.

Unit 6: Complex Series, Residues and poles **(6 Hrs)**

Taylor's Theorem; Laurent's Series; Zeros, Singularities and poles; Residues.

References:

1. Engineering Mathematics Vol II.:--□ S.S. Sastry, Prentice Hall of India.
2. Fraleigh, J.B. Calculus with Analytic Geometry, Addison Wesley pub. Co. Inc (1980)
3. Bajpai, A.C., Calus, I.M and fairley, J.A., Mathematics for Engineering & Scientists, Vol I, John wiley & sons (1973)
4. Goldstain, I.J. Lay, D.C. and schinder, D.I. Calculus and its Applications, Prentice Hall Inc (91977)
5. Spiegel, M.R. Theory and problems of advanced calculus, Scham publishing co

6. Srivastava, R.S.L. Engineering Mathematics, Vol II, Tata, McGraw hill publishing co, (1980)
7. Potter & Goldberg, Mathematical Methods, Prentice Hall of India.

Digital Logic
BIT 152CO

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 main objective of this course is to familiarize students with the concepts of design and analysis of digital systems and introduce the principles of digital computer organization and design.

Course contents

Unit 1: Number Systems **(5 Hrs)**

Introduction, Comparison between analog and digital system, Number system and conversion (Binary, Octal, and Hexadecimal), signed and unsigned numbers, fraction conversion, Binary Arithmetic, Representation of Binary coded decimal, gray code, alphanumeric code and error detection and correction codes

Unit 2: Boolean Algebra and Logic Gates **(6 Hrs)**

Introduction to Boolean algebra; Basic theory and properties of Boolean algebra; Boolean functions; Logic gates and operations.

Unit 3: Simplification of Boolean Functions **(6 Hrs)**

K-Map; Two and three variable maps; Product of sums, sum of products; Simplification of NAND and NOR implementation.

Unit 4: Combinational Logic **(16 Hrs)**

Design procedure of Adders and Subtractors; Code conversion, Analysis procedure; Multilevel NAND gates; Multilevel NOR gates; Binary parallel adder; Decimal adder; Magnitude comparator; Decoders; Multiplexers; Read only memory Programmable logic array (PLA).

Unit 5: Sequential Logic **(6 Hrs)**

Difference between sequential and combinational circuit; Introduction and Design procedure of RS, JK, T, D and master-slave flip flops; Design with state equation and state reduction table.

Unit 6: Registers and Counters **(6 Hrs)**

Introduction; Left and right shift register; Serial in serial out, Serial in parallel out, Parallel in serial out, Parallel in parallel out; Asynchronous and Synchronous counter; Asynchronous up and down counter; Decade counter, Ring counter; Application of counter.

Laboratory:

1. Familiarization with logic gates
2. De Morgan's law
3. Multiplexer and de-multiplexer
4. Encoder and decoder

5. Half adder and half subtractor
6. Full adder and full subtractor
7. RS, JK, T,D and master slave flip flops
8. Shift registers, Sequential logic
9. Ripple counters and synchronous counters
10. Simulation using suitable software

References:

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

Discrete Structure
BIT153HS

Year: I **Semester: II**

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

Course Objective: The main objective of this course is to provide the concept of computational mathematics.

Course contents:

Unit 1: Set Theory and Matrices **(3 Hrs)**

Overview of sets and sets operation; Sequence; Matrices; Mathematical structure.

Unit 2: Function and Counting **(7 Hrs)**

Functions; Function for computer science; Permutation; Combination; The Pigeonhole principle; Recurrence relation.

Unit 3: Logic **(6 Hrs)**

Proposition and logical operation; Conditional statement; Proof Techniques; Mathematical induction.

Unit 4: Relation and Digraphs **(8 Hrs)**

Products set and partitions; Relations digraphs; Paths and in-relation and digraphs; Properties of relations; Equivalent relation; Manipulation of relation; Transitive closure and Warshall's algorithms.

Unit 5: Graph and Tree **(8 Hrs)**

Graphs; Euler path and circuit; Hamiltonian path and circuit; Trees; Labeled tree; Binary search tree; Minimal spanning tree.

Unit 6: Order Relation and Structure **(6 Hrs)**

Partially ordered sets; External element of a Posets; Lattices; Finite Boolean algebra.

Unit 7: Automata, Language and Grammar **(7 Hrs)**

Introduction; Finite-state Automata; Strings; Languages; Regular expressions; Grammars.

References:

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

Object-Oriented Programming in C++
BIT154CO

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	20	60	-	100

Course Objective: The main objective of this course is to introduce students with the concepts of object oriented programming using C++.

Course contents:

Unit 1: Introduction to Object Oriented Programming **[2 Hrs]**

Procedural Programming Language vs OOPL, Characteristics of object-oriented languages, Applications of OOP.

Unit 2: C++ Programming Concept **[3 hrs]**

Introduction to programming in C++, Operators in C++, Type conversion: automatic conversion, Type casting, Arrays and Pointers in C++, New and Delete operators, "this" pointer, Manipulators, Constants, Enumeration.

Unit 3: Functions Used in C++ **[3 Hrs]**

Functions overloading, Default arguments, Inline functions

Unit 4: Classes and Objects **[7 Hrs]**

Introduction, Access specifier (public, private and protected), Defining member functions, Accessing class members, Nesting of Member Functions, Array of Objects; Static Data Member, Static Member Functions; Friend Functions, Friend Class; Passing Objects as Function Arguments, Returning Objects from Functions.

Unit 5: Constructor & Destructor **[3 Hrs]**

Types of constructor (Default constructor, Parameterized constructor, Copy constructor); Overloaded constructors, Destructor.

Unit 6: Operator Overloading **[6 Hrs]**

General rules and restrictions for overloading operator; Overloading Unary and Binary operators; Data conversion: Conversion from Basic to Class types, Conversion from Class to Basic Types, Conversion between Objects of different classes.

Unit 7: Inheritance **[6 Hrs]**

Introduction & benefits of inheritance, Types of Inheritance, Types/Modes of Derivation, Multipath Inheritance, Ambiguity in Multipath Inheritance, Virtual Base Class, Abstract Base Class; Contructors and Destructors in Inheritance

Unit 8: Virtual Functions and Polymorphism **[4 Hrs]**

Early vs Late Binding, Overriding, Virtual functions, Pure Virtual Functions

Unit 9: File Handling **[6 Hrs]**

Stream Based Input/Output, Hierarchy Stream Classes; Unformatted and Formatted I/O Operations; File Input Output; Opening and Closing file; Opening file using constructor; Opening file using open() function; Reading and Writing Data Files.

Unit 10: Templates and Namespaces **[3 Hrs]**

Function templates, Class templates, Standard Template Library, Namespaces.

Unit 11: Exception handling **[2 Hrs]**

Introduction to exceptions, Exception handling model: Try, Catch ,Throw.

Laboratory: There shall be lab classes covering above mentioned topics.

References:

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

Financial Management and Accounting
BIT155MS

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 main objective of this course is to familiarize students with the basic knowledge of financial management and accounting in information technology.

Course contents

Unit 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

Unit 2: Time Value of Money **[3 Hrs]**

Concept, present values and future values

Unit 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.

Unit 4: Working Capital **[5 Hrs]**

Concept of working capital, cash management (preparation of Cash Budget), receivables management inventory management, financing working capital.

Unit 5: Capital Structure **[4 Hrs]**

Meaning of capital structure, optimum capital structure, business and financial risks, determining; Optimum structure, factors affecting capital structure policies.

Unit 6: Dividends **[4 hrs]**

Meaning of 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.

Unit 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.

Unit 8: Accounting Process **[6 Hrs]**

Journalizing and subdivision of journal, ledger posting, cash book, preparation of trial balance.

Unit 9: Financial statement **[5 Hrs]**

Meaning types- income statement (Trading & P/L account), B/S, preparation of financial statements of sole trading concern & Partnership firm.

Unit 10: Financial Analysis **[4 Hrs]**

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

Unit 11: Cash Flow Statement – Direct Method **[3Hrs]**

Laboratory: Lab will be conducted to the accounting topics of the syllabus using accounting package (e.g. Tally, Facts). Students should prepare final accounts of any organization using any of those accounting package.

References:

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

Project-II
BIT 156CO

Year: I **Semester: II**

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

Course Objective: The main objective of this course is to enable students design and complete the software project by using Object Oriented Programming Language (C++ Programming).

Course Contents:
A Project group will be developing a software project by using object-oriented programming [BIT154CO]. Every students of the group should work at least for 45 lab hours under the supervision of the assigned supervisor. Students must develop the assigned software, submit written report, and give oral presentation.

General Procedure:
1. Topic Selection
2. Information Gathering
3. System Requirements and Specifications
4. Algorithms and Flowcharts
5. Coding
6. Implementation
7. Documentation

The project document shall include the following:
1. Technical description of the project
2. System aspect of the project
3. Project tasks and time-schedule
4. Project team members
5. Project supervisor
6. Implementation of the project

Project Evaluation Criteria for Internal assessment:
The marks allocated for the project should be evaluated based on the following criteria:
- Title identification and Proposal Writing— 10 Marks
- Mid-term Presentation — 20 Marks
- Pre-final Submission and final Presentation — 30 Marks

Project Evaluation Criteria for External assessment:
The marks allocated for the project should be evaluated based on the following criteria:
- Project Documentation— 20 Marks
- Final Presentation — 10 Marks
- VIVA - 10 Marks

Group Size: 2 to 3 students in one group.

Purbanchal University

BACHELOR OF INFORMATION TECHNOLOGY (BIT)

Year: II **Semester: I**

Course Code	Course Title	Credits	Lecture (Hrs.)	Tutorial (Hrs.)	Laboratory (Hrs.)	Total (Hrs.)
BIT201HS	Numerical Methods	3	3	1	2	6
BIT202CO	Microcontroller	3	3	1	2	6
BIT203CO	Data Structure and Algorithm	3	3	1	2	6
BIT204CO	Computer Network and Data Communication	3	3	1	2	6
BIT205CO	System Analysis and Design	3	3	1	-	4
BIT206CO	Project-III	2	-	-	3	3
	Total	17	15	5	11	31

BIT (II/I)

3rd Sem

Numerical Methods
BIT201HS

Year: II **Semester: II**

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

Course Objective:

The main objective of this course is to enable students to (a) solve nonlinear equations, (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 Secant method
2.5 Horner's rule

3. Interpolation **[10 Hrs]**

3.1 Introduction
3.2 Finite differences
- 3.2.1 Foreward 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 Lagrange interpolation
3.5 Method of Least Square methods (LSM)
- 3.5.1 LSM for linear equation ($y=a+bx$)
- 3.5.2 LSM for quadratic equation ($y=a+bx+cx^2$)
- 3.5.3 LSM for $y=ax^b$
- 3.5.4 LSM for $y=ae^{bx}$

4. System of Linear Equations **[11 Hrs]**

4.1 Contingency 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 1st and 2nd order differentiation
- 5.1.1 Forward formula

5.1.2 Backward 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

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 2nd order and 4th order methods
6.4 Boundary value problem (Finite Difference method)

Laboratories: There shall be following lab exercises using any high-level Programming language.

1. Bisection method
2. Newton-Raphson method
3. Secant method
4. Horner's rule
5. Langrange interpolation
6. Newton interpolation
7. Least Square method for linear equations
8. Gauss Elimination method
9. Gauss Seidel iteration method
10. Integration (Trapezoidal rule, Simpson's 1/3 rule and 3/8 rule)
11. Euler's method
12. Rungekutta 4th order methods

Reference Books:

1. S. S. Sastry, "Introductory Methods of Numerical Analysis", PHI
2. S. Yakowitz & F. Szidarovszky, "An Introduction to Numerical Computations"
3. Dr. V. N. Vedamurthy, Dr. N. Ch. S. N. Iyengar, "Numerical Methods"
4. S. S. Sastry, "Engineering Mathematics Volume-II", PHI
5. E. Balagurusamy, "Numerical Methods"
6. B.S. Grewal, "Numerical Method "

Microcontroller

BIT202CO

Year: IISemester:I

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 theoretical and practical knowledge of microcontroller. It focuses on designing, implementing and managing the issues based on 8051.

Course Contents:

Unit1: Introduction to Microcontroller **(10 Hrs)**

Microcontroller basic concept, Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization, External Memory (ROM & RAM) interfacing.

Unit 2:Instruction Set **(8 Hrs)**

Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions, Simple Assembly language program examples (without loops) to use these instructions

Unit 3: Stack, I/O Port Interfacing and Programming **(7 Hrs)**

Stack and Subroutine instructions, Assembly language program examples on subroutine and involving loops, Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status

Unit 4: Timers and Serial Port **(10 Hrs)**

Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode- 2 on a port pin. Serial Communication- Basics of Serial Data Communication, RS- 232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.

Unit 5: Interrupts and Interfacing Applications **(10 Hrs)**

Interrupts, Assembly language programming to generate an external interrupt using a switch, 8051 C programming to generate a square waveform on a port pin using a Timer interrupt,

Interfacing 8051 to ADC-0804, DAC, LCD and Stepper motor and their 8051 Assembly language interfacing programming.

Laboratory Works:

The practical work consists of all features of Microcontroller

Reference Books:

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.

2. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

3. "The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.

4. "Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.

Data Structure and Algorithm
BIT203CO

Year: IISemester:I

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

CourseObjective:

The main objective of this course is to provide fundamental knowledge of data structure, various algorithms used and their implementations.

Course Contents:

1. **Introduction** **[2 Hrs]**
   - 1.1 Introduction to Data and Data Types
   - 1.2 Data Structure (DS),Abstract Data Type (ADT) and Applications
   - 1.3 Abstract Data Typevs.Data Structure

2. **Algorithm Efficiency andComplexity** **[2Hrs]**
   - 2.1 Time and SpaceAnalysis
   - 2.2 Asymptotic Notations: big O, sigma, theta,omega

3. **Stack** **[5Hrs]**
   - 3.1 Definition and Examples of Stack
   - 3.2 Stack as an Abstract Data Type
   - 3.3 Array Representation/ Implementation of Stack
   - 3.4 Primitive Stack Operations and Algorithm Efficiency
   - 3.5 Stack Overflow and Stack Underflow Conditions
   - 3.6 Application of Stack: Prefix, Infix and PostfixExpression:
     - 3.6.1 Definition.
     - 3.6.2 Evaluation of Infix, Prefix andPostfixExpression using Stack.
     - 3.6.3 Converting an Expression from Infix to Postfix and Vice-Versa.

4. Queue **[4 Hrs]**

4.1 Definition and Examples of Queue

4.2 Queue as an Abstract Data Type

4.3 Array Representation/ Implementation of Queue

4.4 Primitive Queue Operations and Algorithm Efficiency

4.5 Queue Overflow and Stack Underflow Conditions

4.6 Linear andCircularQueue

4.7 Priority Queue

5. List andLinkedList **[6Hrs]**

5.1 Introduction to List as an Abstract Data Type

5.2 Primary List Operations

5.3 Static and Dynamic List Structure

5.4 Linked List as anAbstract Data Type

5.5 Types of Linked List

5.5.1 Linear linked List – Singly and DoublyLinear Linked Lists

5.5.2 Circular linked list – Singly and Doubly Circular Linked Lists

5.6 Advantages of Doubly Linked over Singly Linked List

5.7 Basic Linked List operations: Insertion/Deletion of a Node as: Front Node, Last Node, Before a Given Node, & After a GivenNode.

5.8 Dummy Node

5.9 Linked List implementation of Stack and Queue

6. Recursion **[3Hrs]**

6.1 Principle of Recursion

6.2 Recursion Vs.Iteration with Advantages andDisadvantages

6.3 Applications of Recursion: Fibonacci Sequence, TOH andMultiplication of Natural Numbers; with Algorithm Efficiency

7. Trees **[6 Hrs]**

7.1 Concepts andDefinitions of Tree

7.2 Properties of Tree

7.3 Binary Tree: Definition,Applications, Representation using Linked List

7.4 Binary Search Tree (BST)

7.5 Insertion, Deletion in Binary Search Tree

7.6 Binary Tree Traversals – Pre-order, In-order and Post-order Traversal.

7.7 Height, Depth and Level of a Tree

7.8 AVLTree and Balancing Algorithm

7.9 HuffmanAlgorithm

8. Sorting **[6Hrs]**

8.1 Definition and types of Sorting: Internal and External sort

8.2 Sorting Algorithms: Insertion Sort,Selection sort, Bubble sort

8.3 Sorting using Divide & Conquer: Quick Sort,Merge Sort

8.4 Radix Sort, Shell sort

8.5 HeapSort as a Priority Queue

8.6 Efficiency ofSorting Algorithms

9. Searchingandhashing **[4Hrs]**

9.1 Definition, Concept and Essentials of Searching,Keys

9.2 Types of Searching:Sequential Search, Binary Search, Binary Search Tree

9.3 General SearchTree

9.4 Hashing

9.4.1 Hash Functions and HashTable

9.4.2 Collision Resolutiontechnique

9.5 Efficiency of different SearchingMethods

10. Graphs **[7 hrs]**

10.1 Definition and Representation ofGraphs

10.2 Application ofGraphs

10.3 Graphs as anAbstract Data Type

10.4 Adjacency Matrix Representation, Transitive Closure

10.5 Warshall'sAlgorithm

10.6 Types ofGraphs

10.7 Graph Traversal:Depth First Search (DFS), Breadth First Search(BFS)

10.8 Spanning Tree and SpanningForest

10.9 Minimum Spanning Tree &Greedy Approach: Kruskal'sAlgorithm, Prim's Algorithm, Round Robin Algorithm

10.10 Finding Shortest Path: Dijkstra'sAlgorithm

Laboratory Works:

There shall be following Lab Exercises:

- Implementation ofStack
- Implementation of Linear and CircularQueues
- Solution of TOH and FibonacciSequence
- Implementation of Linked List: Singly and Doubly Linear & Circular LinkedList
- Implementation of Tree: Binary TreeTraversals
- Implementation of trees: AVL Trees
- Implementation of MergeSort
- Implementation ofHeap
- Implementation of Search: Sequential, Binary
- Implementation ofHashing
- Implementation of Graph: GraphTraversals

Reference books

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

Computer Network and Data Communication

BIT204CO

Year: II **Semester:I**

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 provides students with the fundamental concepts of data communications and networking and their practical applications.

Course Contents:

1. **Introduction to Networkingand Data Communication** **[3 Hrs]**
   - 1.1 Introduction&Need of DataCommunication
   - 1.2 Data & Signal, Properties of a Signal, Analog & Digital Signal
   - 1.3 Introduction of Computer Network, Need and Advantages of Networking
   - 1.4 Types of Network- LAN, PAN, MAN & WAN
   - 1.5 Types of Network Model - Client/Server & Peer to Peer
   - 1.6 Network Topology - Bus, Ring, Star, Mesh, Hybrid

2. **Layered Network Architecture** **[4 Hrs]**
   - 2.1 Introduction to Layered Approach
   - 2.2 Benefits of Layered Model
   - 2.3 OSI Reference Model
   - 2.4 TCP/IP Model
   - 2.5 Network Protocol and TCP/IP Protocol Suite

3. **Data Transmission Fundamentals& The Physical Layer** **[6 Hrs]**

3.1 Signals for Conveying Information

3.2 Analog & Digital Transmission

3.3 Types of Transmission Medium: Guided & Unguided

3.4 Bandwidth, Channel Capacity, Latency, Throughput, Transmission Impairments

3.5 Transmission Modes: Simplex, Half-Duplex and Full-Duplex

3.6 Circuit Switching, Packet Switching

3.7 Serial Data Transmission: Synchronous and Asynchronous Transmission

3.8 Multiplexing and Demultiplexing: FDM, WDM, TDM

3.9 Introduction to Data Encoding and Modulation

3.10 Analog Modulation: Amplitude, Frequency and Phase Modulation

3.11 Digital Modulation: ASK, PSK, FSK

4. **Data Link Control** **[6 Hrs]**

4.1 Introduction, Functions of Data Link Layer

4.2 Flow Control: Introduction, Benefits

4.3 Flow Control Protocols: Stop-and-Wait, Sliding Window, Piggybacking

4.4 Error Detection and Correction: Parity Bit, Checksum, CRC, Forward and Backward Error Correction, Hamming Code

4.5 Medium Access Sub-layer, MAC Address

4.6 Framing, HDLC, PPP

4.7 Channel Allocation and Multiple Access Protocols

4.8 Collision Domain, Broadcast Domain

4.9 Networks: FDDI, ALOHA, VLAN, IEEE 802.3 Ethernet, IEEE 802.4 Token Bus, IEEE 802.5 Token Ring, IEEE 802.11 Wireless LAN

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

5.1 Addressing in Data Communication & Computer Network

5.2 Logical Addressingwith IP (IPv4), Classful Addressing

5.3 Network Connecting Devices: Hub, Switch (Layer-2 & Layer-3), Bridge, Router, Gateway

5.4 Subnetting

5.5 Routing: Adaptive and Non-adaptive Routing, Routing Table

5.6 Routing Protocols: RIP, OSPF, BGP, Unicast and Multicast Routing

5.7 Routing Algorithms: Shortest Path Routing, Distance Vector Routing, Link-State Routing

5.8 Protocols operating at Network Layer: ARP, RARP, ICMP

5.9 IPv6: Advantages, Packet Formats, Dual Stack, Tunneling

6. Transport Layer **[5 Hrs]**

6.1 Functions of Transport Later

6.2 Connection Management: TCP, UDP

6.3 Port Addressing: Ports and Sockets

6.4 Connection Establishment and Release

6.5 Flow Control, Buffering

6.6 Congestion Control: Token Bucket, Leaky Bucket

6.7 IP Remapping: NAT

7. Application Layer **[5 Hrs]**

7.1 Using & Accessing Network: DNS, DHCP, HTTP, HTTPS

7.2 Email: SMTP, IMAP, POP3

7.3 File Transfer: FTP, FTPS, SFTP

7.4 Network Management& Traffic Analyzer: SNMP, Packet Tracer, Wireshark

7.5 Proxy, Reverse Proxy, Webmail

8. Network Security **[6 Hrs]**

8.1 Information Security Basics: The CIA Model

8.2 Security Threats

8.3 Principles of Cryptography, Symmetric & Asymmetric Key Encryption

8.4 AES, RSA Security

8.5 Email/Message Integrity: Digital Signature, PGP

8.6 Secure Transport Connection: SSL, TLS

8.7 Firewall, VPN, Packet Filtering

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.

- Installation of network interface card and various network devices like hub, switch,router
- Cabling: construction of straight-through and cross-overcable
- Installation and configuration of server and workstation inwindows/Linux
- Setup client/Server and peer-to-peer networking and verifyit
- Workgroup networking, domainnetworking
- Familiarization with basic network commands: observing IP address and MAC address, setting IP address and default gateway inPC
- File sharing and printer sharing
- Firewallconfiguration
- Configure HTTP, FTP, DHCP, Telnet server and verifyit
- Configuration of DNS and e-mailserver
- Basic network commands and network management andtroubleshooting
- Static routing and dynamic routing (RIP andOSPF)
- Implement the data link layer farming methods such as character, character

stuffing and bit stuffing

- Implementation ofCRC
- Design of local area network(LAN)
- Case study; An existing network system of yourcollege

Reference Books:

1. *"Data & Computer Communications"*, 7/e, William Stallings, Pearson Education
2. *"Computer Networks"*, 4/e, A. S. Tanenbaum, Pearson Education / PHI
3. *"Data Communications and Networking"*, 5/e, Behrouz A. Forouzen, McGraw-Hills
4. *"Data Communications, Computer Networks & Open Systems"*, 4/e, Fred Halsall, Pearson Education
5. *"An Introduction to Computer Networking"*, Kenneth C. Mansfield, Jr. & James L. Antonakos, PHI
6. *"The Essential Guide to Telecommunications"*, 3/e, Annabel Z. Dodd, Pearson Education
7. *"Computer Networks & Internet"*, 2/e , D. E. Comer, Pearson Education

System Analysis & Design

BIT205CO

Year: II **Semester: I**

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 systems analysts or of users assuming an active role in building systems that satisfy their organization's information needs. The course also provides a solid foundation of systems.

Course Contents:

1. **Overview of Systems 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 analysis and design tools

2. **Process and Conceptual Modeling** **(6 Hrs)**
   - 2.1. Introduction to Data Flow Diagram (DFD)
   - 2.2. Concepts used in drawing 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/Benefit Analysis (Payback method, NPV method)

5. Systems Design (8 Hrs)

5.1. Introduction to systems design

5.2. The process and stages of systems 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. Introduction to Normalization

5.7. 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. System testing

7. Object-Oriented Analysis and Design (8 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:

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

Project-III

BIT 206CO

Year: II Semester: I

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 microcontroller based project.

Course Contents:

A Project group will be developing a microcontroller (BIT202CO)based system. Every students of the group should work at least for 45 lab hours under the supervision of the assigned supervisor. Students must develop the assigned software, submit written report, and give oral presentation.

Project Evaluation Criteria for Internal assessment:

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

- Title identification and Proposal Writing— 10 Marks
- Mid-term Presentation — 20 Marks
- Pre-final Submission and final Presentation — 30 Marks

Group Size: **2 to 3** student in a group

Purbanchal University

BACHELOR OF INFORMATION TECHNOLOGY (BIT)

Year:II **Semester:II**

Course Code	Course Title	Credits	Lecture (Hrs.)	Tutorial (Hrs.)	Laboratory (Hrs.)	Total (Hrs.)
BIT251HS	Probability and Statistics	3	3	1		4
BIT252CO	Computer Organization and Architecture	3	3	1		4
BIT253CO	Operating System	3	3	1	2	6
BIT254CO	Database Management System	3	3	1	2	6
BIT255CO	Programming in JAVA	3	3	1	2	6
BIT256CO	Project-IV	2	-	-	3	3
	Total	17	15	5	7	29

Probability and Statistics

BIT251H

Year II **Semester:** II

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.

Course Contents:

1. **Nature and scope of statistics** **[2Hrs]**
   - 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** **[2Hrs]**
   - 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** **[2Hrs]**
   - 3.1 Classification procedure: qualitative and quantitative classification
   - 3.2 Tabulation of data

4. **Diagrammatic and graphic presentation of data** **[3Hrs]**
   - 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** **[5Hrs]**
11.1 Introduction
11.2 Correlation analysis
11.3 Various methods of calculating correlation coefficient
11.4 Regression analysis

Laboratory Works:

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

References Books:

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

Computer Organization and Architecture

BIT251CO

Year: II **Semester:II**

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

2. **Computer organization and design** **[6Hrs]**
   - 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** **[4Hrs]**
   - 3.1 Microprogrammed control (control memory, address sequencing)
   - 3.2 Hardwired control

4. **Central processing unit** **[6Hrs]**
   - 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** **[6Hrs]**
   - 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:

1. M. Morris Mano, “Computer System Architecture”.
2. William Stalling, “Computer Organization & Architecture”.
3. M. Morris Mano, “Digital Logic & Computer Design”.
4. David A. Paterson & John L. Hennessy, “Computer Organization & Design”.
5. Vicent P. Heuring & Harry F. Jordan, “Computer Systems Design & Architecture”.
6. Andrew S. Tanenbaum, “Structured Computer Organization”.
7. John P. Hayes, “Computer Architecture & Organization”.

Operating System
BIT253CO

Year: II **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: Objectives of this course are to provide fundamental concepts of operating systems, operating system design, and understanding of implementation of system utilities for inter-process communication in a multiprocessor environment.

Course Contents:

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

2. Processes and Threads **[9 Hrs]**
- a. Introduction
- b. Process model, process states, process control block
- c. Introduction to threads, kernel and user implementation of threads
- d. Inter- process communication (Multiprogrammning, parallel processing, critical sections, race condition, mutual exclusion with busy waiting, semaphores, monitors)
- e. Preemptive scheduling vs non-preemptive scheduling
- f. Process scheduling (FCFS, SJF, RR, Priority, Real-time scheduling)

3. Memory Management **[8 Hrs]**
- a. Memory management without swapping
- b. Swapping
- c. Virtual memory
- d. Paging, Page replacement algorithms (FIFO, Optimal, LRU, LFU, NRU, Random, Clock, Second-chance)
- e. Predicting page faults
- f. Segmentation with paging

4. File Systems **[6 Hrs]**
- a. Files
- b. Directories
- c. File system implementation
- d. Protection mechanism and operating system securities

5. Input/Output **[7 Hrs]**
- a. Principles of input output hardware
- b. Principles of input output software
- c. Disks and disk scheduling algorithms (FSFS, SSTF, LOOK, SCAN, C-SCAN, C-LOOK)
- d. Clocks
- e. Terminals

6. Deadlocks **[7 Hrs]**
- a. Introduction
- b. Conditions of deadlock
- c. Resources and deadlock modeling using resources
- d. Deadlock detection and recovery
- e. Deadlock avoidance & prevention
- f. Banker's Algorithm (Single and multiple resources)

7. Real Time System **[2 Hrs]**
- a. Introduction
- b. Types of RTS (Soft real time, hard real time, firm real time)

8. Distributed System **[3 Hrs]**

a. Introduction and characteristics
b. Processes and processors in distributes system

9. Case Study

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

Laboratory Works: There shall be following 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
6. IPC (Inter Process communication)
7. Shell programming

Reference Books:

1. Andrew S. Tanenbaum, "Modern Operating System", PHI
2. Silberscatz and Galvin, “Operating System Concepts", Addison Wesley
3. Andrew S. Tanenbaum, "Operating System, Design & Implementation", PHI

Database Management System
BIT254CO

Year: II **Semester: II**

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

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Course Objective: The main objective of the course is to provide fundamental concepts, theories and practices in design and implementation of database systems.

Course Contents:

1. Introduction **[4 Hrs]**

Definition of database, DBMS, RDBMS, ORDBMS, Definition of database system, Types and Characteristics of database, Advantages and disadvantages of using DBMS

2. Database Systems Concepts and Architecture **[8 Hrs]**

Data models, Schemas and instances, DBMS architecture and data independence, Database language and interfaces, Degree of relationship, Cardinality, Data dictionary, E-R model, Strong and weak entity types, Attributes, Types of keys, Relationship types, E-R diagram

3. Relational Model **[4 Hrs]**

Introduction to relational databases, Relational algebra, Modification of database

4. SQL **[7 Hrs]**

Introduction, DDL, DML, Null values, String operations, Aggregate function, Joined relation, Views, Set operations, Triggers, SQL Queries, Nested Queries, Introduction to PL/SQL (Procedure, Function, Package)

5. Integrity Constraints **[2 Hrs]**

Entity constraints, Domain constraints, Referential integrity

6. Normalization **[6 Hrs]**

Pitfalls of relational model, Introduction to functional dependencies, Details of 1NF, 2NF and 3NF, Introduction to BCNF, 4NF and 5NF

7. Database Security **[4 Hrs]**

Different levels of database security, Access control, Authentication, Authorization, Non-repudiation, Encryption and decryption.

8. Transaction and Query Processing **[7 Hrs]**

Introduction to transaction, State, ACID properties, Introduction to concurrency control (Lock, Timestamp, Validation, Serializability, and Conflict serializability) Introduction to query processing, Steps used in query processing. – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Introduction to Crash recovery, the Write-Ahead Log Protocol.

9. Backup and Recovery **[3 Hrs]**

Failure of database system, Backup devices, Backup of database and database system, Techniques used in recovery of database system

Laboratory Works:

Laboratory works include the following exercises.

Use of CREATE, ALTER, RENAME and DROP statement in the database tables.
Use of INSERT INTO, DELETE and UPDATE statement in database tables.
Use of simple select statement.
Use of nesting of queries.
Use of aggregate functions.
Use of queries to create joins and views.

Consider the following schema for Order Database:
SALESMAN (*Salesman_id, Name, City, Commission*)
CUSTOMER (*Customer_id, Cust_Name, City, Grade, Salesman_id*)
ORDERS (*Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id*)

Write SQL queries to
1. Count the customers with grades above Amritsar's average.
2. Find the name and numbers of all salesmen who had more than one customer.
3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

Consider the following schema for Order Database:
SALESMAN (*Salesman_id, Name, City, Commission*)
CUSTOMER (*Customer_id, Cust_Name, City, Grade, Salesman_id*)
ORDERS (*Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id*)

Write SQL queries to
1. Count the customers with grades above Amritsar's average.
2. Find the name and numbers of all salesmen who had more than one customer.
3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

Reference Books:

1. "Database System Concept", Silberschatz et. al., McGraw Hill, 3rd Edition
2. "An Introduction to Database System", C. J. Date, Addison Wesley
3. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B. Navathe

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Programming in JAVA
BIT255CO

Year: II **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

Objective:

The main objective of this course is to make students understand fundamentals of object-oriented programming in Java using Java SDK environment so that they can write programs in JAVA to solve problems.

1. Introduction to Java **[12 Hours]**

1.1 Overview of Object-oriented Programming in Java
1.2 JVM, Java environment, Java tools
1.3 Features of Java
1.4 Control Statements
1.5 Looping
1.6 Array
1.7 String and StringBuffer
1.8 Vector
1.9 Class and Objects
1.10 Inheritance
1.11 Polymorphism
1.12 Working with Collections
1.13 Interface and Packages
1.14 Exception Handling [try, catch, throw, user defined exception]
1.15 Multi-threaded Programming [life cycle, thread creation, thread synchronization]

2. Applet Programming **[2 hours]**

2.1 Introduction to Applet
2.2 Standard Applet Methods
2.3 Putting an Applet on a Web Page
2.4 Passing parameter to Applets

2.5 Comparison between Applet and Application

3. GUI Programming **[7 hours]**

3.1 AWT Vs. Swing
3.2 Using Swing Components
3.3 Using Automic Components [JLabel, JButton etc]
3.4 Using JFrame, JPanal, JTree and JTable
3.5 Event handling[Mouse driven, Keyboard driven and other]

4. Java IO **[5 hours]**

4.1 Working with Input/output APIs
4.2 Working with scanner class
4.3 Working with Files
4.4 Working with Object Serialization

5. JDBC **[4 hours]**

5.1 JDBC Basic
5.2 Different Types of Drivers
5.3 Setting up a database
5.4 Setting up a Connection
5.5 Retrieving Values from Result Sets
5.6 Deleting/Updating tables
5.7 Working with Statement and PreparedStatement

6. Socket Programming **[6 hours]**

6.1 Overview of Socket Programming
6.2 Introduction of APIs related to Socket Programming
6.3 Server Side Programming [TCP and UDP]
6.4 Client Side Programming [TCP and UDP]
6.5 A Sample Program

7. Distributed Application **[5 hours]**

7.1 Introduction to Distributed Objects
7.2 Overview of RMI
7.3 Rmi Architecture
7.4 Creating Distributed Application using RMI

8. Overview of Servlet and JSP **[4 Hours]**

8.1 Introduction to Servlet and JSP and its Architecture

8.2 Configuring Apache Tomcat to host Servlet/JSP files

8.3 Sample program of Servlet and JSP.

Laboratory Works:

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

Reference Books:

1. Cay S. Horstman, "Core Java Volume I & II", PHI
2. Bruce Eckel, "Thinking in Java", PHI
3. Herbert Schildt, "Java: The Complete Reference", McGraw Hill
4. Java 2.0 by "Ivan Bayross"
5. Programming with java by: "E. BALAGURUSAMY" latest edition.

Computer Project-IV

BIT256CO

Year: II **Semester: II**

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 application software using JAVA programming language.

Course Contents:

Each group of students (up to 3) will be assigned a project work.Students must develop the assigned software, submit written report, and give oral presentation.

Project Evaluation Criteria for Internal assessment:

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

- Title identification and Proposal Writing— 10 Marks
- Mid-term Presentation — 20 Marks
- Pre-final Submission and final Presentation — 30 Marks

5th Semester - BIT

Year: III **Semester: I**

Course Code	Course Title	Credits	Lecture (Hrs)	Tutorial (Hrs)	Laboratory (Hrs)	Total (Hrs)
BIT301HS	Research Methodology	3	3	1		4
BIT302CO	Computer Graphics	3	3	1	2	6
BIT303CO	Cryptography and Network Security	3	3	1	2	6
BIT304CO	WebTechnology	3	3	1	2	6
BIT305CO	Internet of Things	3	3	1	2	6
BIT306CO	Project-V	2	-	-	3	3
	Total	17	15	5	7	31

Research Methodology
BIT301HS

Year III Semester II (first)

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

Course objectives:

This course will help you accomplish the following things:

- ability for individual research work on the field of information and communication technologies,
- ability to research, select and organize information, as well as synthesize solution and anticipate their consequences,
- mastering of research methods, procedures and processes, development of critical and self-critical assessment,
- ability to use knowledge in practice

Course Contents: **[8Hrs]**

Unit 1: Introduction to Research -

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.

[8 Hrs]

Unit 2: Research Design –

Concept of Research Design, Elements of Research Design, Types of Research Design: Historical, Descriptive, Developmental, Case Study, Co-relational, Causal- Comparative and Action Research Design.

[8 Hrs]

Unit 3: Sampling Process and Data Collection -

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.

Unit 4: Testing of Statistical Hypothesis – **[11 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.

Unit 5: Writing the Research Report **[10 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:

1.Kerlinger, Fred N, **Foundations of Behavioral Research**

Computer Graphics
BIT352CO

Year III Semester: I

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

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

Course Contents:

Unit 1: Introduction [2 Hrs]

1.1 History of computer graphics
1.2 Application of computer graphics

Unit 2: Graphics Hardware [5Hrs]

2.1 Keyboard, mouse (mechanical&optical), lightpen, touch screen, table tinput 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

Unit 3: Two dimensional algorithms [8Hrs]

3.1 Direct and incremental line drawing algorithms
3.2 Bresenham's line drawing algorithms for positive and negative slopes (DDAalgorithm)
3.3 Mid-poin tcircle drawing and mid-point ellipse-drawing algorithms

Unit 4: Two-dimensional transformations [10Hrs]

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-Sutherl and line-clipping algorithm,The Sutherland-Hodgman polygon clipping algorithm

Unit 5: Three-dimensional graphics **[12Hrs]**

5.1Projection (parallel and perspective)

5.2 3D transformations

5.2.1Translation, scaling, reflection

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

5.2.3 Windows to view point transformation

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

5.4 Introduction to non-planarsurfaces(Bezier,Splines)

Unit 6: Light, color and shading **[5Hrs]**

6.1 Introduction

6.2 Need for shading in engineering data visualization

6.3 Algorithms to stimulate ambient, diffuse and specularreflections

6.4 Constants, gouraud and phong-shading models

Unit 7: Graphical languages **[2Hrs]**

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

7.2 Discussion of available languages and file formats (graphicalfileformat)

Unit 8: Introduction to animation **[1Hr]**

8.1 Introduction to open GL

8.2 Application & today' strends

Laboratory work:

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-view port transformation
7. Implementation ofl ine-clipping process

Reference Books:

1. D.Harn&M.P.Baker,"ComputerGraphics",PHIEdition
2. T. I. James, D. Foley, A. Van Dam, S. K. Feiner& J. F. Hughes, "Computer Graphics, Principles and Practice", PHI Edition

Cryptography and Network Security
BIT303CO

YearIII **Semester:I**

TeachingScheduleHours/Week			ExaminationScheme				
Theory	Tutorial	Practical	InternalAssessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Course Objective:
To provide a practical survey of the principles and practice of network security.

Course Contents:

Unit 1:Introduction **[3 Hrs]**
What is network Security and its working? Types of Network Security, Differences among Network security, Cyber security and Information Security

Unit 2: Basics of Computer Network **[5 Hrs]**
Network Devices (Hub, Repeater, Bridge, Switch, Router, Gateways and Brouter), Network Terminology:IP Address (Internet Protocol address),MAC Address (Media Access Control address),Port,Socket,DNS Server, ARP,RARP, Layers of OSI and TCP/IP model.

Unit 3: IP Security **[3 Hrs]**
Uses of IP Security, Components of IP Security, Working of IP Security,IPSec Architecture, Difference between IPSec and SSL

Unit 4:Transport-Level Security **[7 Hrs]**
Benefits of TLS, Working of TLS, Secure Electronic Transaction (SET) Protocol Difference between Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Socket Layer (SSL).

Unit 5:Intrusion Detection &Prevention System (IDS/IPS) **[6 Hrs]**
Classification of Intrusion Detection System, Detection Method of IDS, Classification of Intrusion Prevention System (IPS), Detection Method of Intrusion Prevention System (IPS), Comparison of IPS with IDS, Approaches to Intrusion Detection and Prevention.

Unit 6: Wireless Network Security **[7 Hrs]**
6.1 IEEE 802.11 Wireless LAN Overview
6.2 IEEE 802.11i Wireless LAN Security
6.3 Wireless Application Protocol Overview

6.4 Wireless Transport Layer Security
6.5WAP End-to-End Security

Unit 7:Information Security **[4 Hrs]**

Approaches to Information Security Implementation, Objectives of IT, Need of Information Security, Threats to Information Security, Active and Passive attacks in Information Security, Difference between Active Attack and Passive Attack

Unit 8: Cryptography **[10 Hrs]**

Elementary Cryptography: Substitution Ciphers, Transpositions, Playfair Cipher with Examples, Hill Cipher, Vigenère Cipher, The Data Encryption Standard, RSA Algorithm, Uses of Encryption.

Laboratory Work:

There shall be lab classes covering important features of the course.

Reference Books:

1. Cryptography and Network Security: Principles and Practice, 5/William Stallings, ISBN-10: 0136097049, Prentice Hall, India Limited

Web Technology
BIT304CO

Year: III Semester: I

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

Course Objective:

After finishing this subject, students will be able to develop web pages using HTML, JavaScript, XML and advanced concepts of web applications and server-side programming.

Course Contents:

1. Introduction to Web Technology [4 Hrs]

1.1 Web Basics: Web Browsers, Web Servers, Tier Technology and its types, Static and Dynamic Web Page. Client side and Server side Scripting.
1.2 Web Protocols: details of 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 & HTML5 [8Hrs]

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
2.15

3. Page Designing with CSS [8Hrs]

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,Colors 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)
- 3.2.5

4. Client-side Scripting [6Hrs]

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 Expressions
- 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

5 XML, AJAX, and Web Services [5 Hrs]

2.1 Introduction to XML

2.2 XML validation with DTD & schema

2.3 XSL and XSLT

2.4 XML processing with PHP

2.5 Asynchronous JavaScript and XML (AJAX)

2.6 Web service

6. Server Side Programming with PHP [5 Hrs]

3.1 Introduction to server-side programming

3.2 PHP Basics, Object oriented Concept

3.3 Embedding PHP scripts

3.4 Basic syntax (Variables, operators, expressions, constants)

3.5 Control structures

3.6 PHP functions

3.7 Recursion
3.8 String manipulation
3.9 Using regular expression
3.10Exceptional handling with PHP

7. Database Connectivity in PHP [6 Hrs]

5.1 Introduction to SQL
5.2 Basic SQL commands (CRUD)
5.3 HTML forms and Methods
5.4 Database connectivity
5.5 MySQL functions
5.6 Executing DDL and DML queries using PHP
5.7 Login and authentication
5.8 Session and Cookies

8. Responsive Websites and Advanced Server-side Issues [3 Hrs]

7.1 Responsive website strategies and design
7.2 Smart device functionality
7.3 Testing and debugging
7.4 Overview to advanced server-side issues
7.5 MVC Frameworks (Code-Igniter)

Laboratory Work:

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

Reference Books:

1. "Open Sources: Voices from the Open Source Revolution", Chris DiBona, Sam Ockman, Mark Stone
2. "Perspectives on Free & Open Source Software", Joseph Feller, Brian Fitzgerald, Scott A. Hissam& Karim R. Lakhani, MIT Press
3. "Open Sources: Voices from the Open Source Revolution", Chris DiBona, Sam Ockman, O'Rielly Media
4. "Murach's HTML5 & CSS3", Zak Ruvalcaba& Anne Boehm
5. "JavaScript: The Definitive Guide", 6th Edition, David Flanagan, O'Reilly Media
6. "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, & Web Graphics", Jennifer Niederst Robbins, O'Rielly
7. "HTML5 Programming with JavaScript", John Paul Mueller, Wiley
8. "HTML5 & CSS3 for the Real World", Estelle Weyl, Louis Lazaris, Alexis Goldstein Sitepoint
9. David Hunter, "*Beginning XML*", Wrox Publication
10. Robin Nixon. "*Learning PHP, MySQL, & JavaScript*", O'Reilly Media
11. RasmusLerdorf, Kevin Tatroe, & Peter MacIntyre, "*Programming PHP*", O'Reilly Media
12. Deitel, Deitel, Goldberg, "*Internet & World Wide Web How to Program*", Pears Education
13. Paul S. Wang, "*Dynamic Web Programming & HTML 5*", Chapman & Hall/CRC

Internet of Things
BIT305CO

Year: III **Semester: I**

TeachingScheduleHours/Week			ExaminationScheme				
Theory	Tutorial	Practical	InternalAssessment		Final		Total
			Theory	Practical	Theory	Practical	
3	1	2	20	50	80	-	150

Course Objectives:

The objectives of this course are to provide theoretical as well as practical knowledge of fundamentals of Internet of Things to make students capable of designing, implementing and managing the issues of IoT in their personal as well professional life.

Course Contents:

Unit 1: Introduction to IoT **[6 Hrs]**

- Introduction to Internet of Things
- History of IoT
- IoT Architecture
- IoT Frameworks
- Benefits of IOT
- Applications of IOT

Unit 2: FundamentalIoTMechanisms and Key Technologies **[8 Hrs]**

- Identification of IoT Objects and Services,
- Structural Aspects of the IoT,
- Environment Characteristics,
- Traffic Characteristics,
- Scalability,
- Interoperability,
- Security and Privacy,
- Open Architecture,
- Key IoT Technologies,
- Device Intelligence,
- Communication Capabilities,
- Mobility Support,

- Security model for IoT.

Unit 6:Real World Application and Case Studies [10 Hrs]

- Real world design constraints and challenges
- Applications and Asset management,
- Industrial automation
- Smart Metering Advanced Metering Infrastructure
- Smart grid
- e-Health Body Area Networks
- Commercial building automation
- Smart cities - participatory sensing
- Data Analytics for IoT
- Software & Management Tools for IoT
- Cloud Storage Models & Communication
- APIs
- Cloud for IoT
- Amazon Web Services for IoT

Practical Works

The practical work consists of all features of IoT .

Reference Books:

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2. ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011. 3.
4. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
5. Jan Ho" ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
6. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012
7. HakimaChaouchi, " The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Willy Publications
8. Daniel Kellmereit, Daniel Obodovski, "The Silent Intelligence: The Internet of Things",. Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978- 0989973700. 4. Fang Zhaho, Leonidas Guibas, "Wireless Sensor Network: An information processing approach", Elsevier, ISBN: 978-81-8147-642-5.

- Device Power,
- Sensor Technology,
- RFID Technology,
- Satellite Technology

Unit 3: IoT Protocols **[6 Hrs]**

- Protocol Standardization for IoT
- Efforts
- M2M and WSN Protocols
- SCADA and RFID Protocols
- Unified Data Standards – Protocols
- IEEE 802.15.4
- BACNet Protocol
- Modbus
- Zigbee Architecture
- Network layer
- 6LowPAN
- CoAP
- Security

Unit 4: IoTwithRasberry PI **[9 Hrs]**

- Building IOT with RASPERRY PI
- IoT Systems
- Logical Design using Python
- IoT Physical Devices & Endpoints
- IoT Device
- Building blocks
- Raspberry Pi -Board
- Linux on Raspberry Pi
- Raspberry Pi Interfaces
- Programming Raspberry Pi with Python

Unit 5: Internet of Things, Privacy, SecurityandGovernance **[6 Hrs]**

- Vulnerabilities of IoT
- Security requirements
- Threat analysis
- Use cases and misuse cases
- IoT security tomography and layered attacker model
- Identity establishment
- Access control
- Message integrity
- Non-repudiation and availability

Project-V
BIT306CO

Year: III Semester: I

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 (upto 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 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

BIT

Sixth

Semester

Purbanchal University

Bachelor of Information Technology (BIT)

Year: III **Semester: II**

Course Code	Course Title	Credit Hour	Lecture (Hrs.)	Tutorial (Hrs.)	Laboratory (Hrs.)	Total (Hrs.)
BIT351CO	Artificial Intelligence	3	3	1	2	6
BIT352CO	Management Information System	3	3	1		4
BIT353CO	Data warehousing and Data Mining	3	3	1	2	6
BIT354CO	Simulation and Modeling	3	3	1	2	6
BIT355CO	Software Engineering	3	3	1		4
BIT356CO	Project-VI	2	-	-	3	3
	Total	17	15	5	9	29

Note: Each semester of BIT program spans over a period of 15 weeks of class work and one week of internal examinations, such as internal tests, quizzes and mid-term examination.

Artificial Intelligence
BIT351CO

Year III **Semester: II**

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

Course Objectives:

- To provide basic knowledge of Artificial Intelligence
- To proved the knowledge of Machine Learning, Natural Language, Expert Systems and Neural Network
- To develop entrepreneurship skills and leadership in practical fields

Course Contents:

Unit 1: Introduction **[2 Hrs]**

1.1 Definitions
1.2 Goals of AI
1.3 Challenges of AI
1.4 AI approaches
1.5 AI techniques
1.6 Applications of AI

Unit2 2: Agents **[5 Hrs]**

2.1 Introduction to agents
2.2 Agent's performance
2.3 Example of Agents
2.4 Rationality and omniscience
2.5 Types of agent environment
2.6 Agent architecture

2.7 PEAS (vaccum cleaner agent, human agent, robotic agent, taxi driving agent, 8-queen problem etc)

2.8 Types of agent (simple reflex, goal based, model based, utility agent, learning agent)

Unit 3: Problem solving using searching **[8 Hrs]**

3.1 Uninformed Search

- 3.1.1 Problem solving agents
- 3.1.2 Problem types
- 3.1.3 Problem formulation
- 3.1.4 Example problems
- 3.1.5 Basic search algorithms (BFS, DFS, Depth limited search, uniform cost search, iterative deepening, bidirectional search)
- 3.1.6 Comparative study of all uninformed search strategies (completeness, optimality, time complexity and space complexity)

3.2 Informed Search

- 3.2.1 Best first (greedy) search
- 3.2.2 A* Search
- 3.2.3 Heuristic function
- 3.2.4 Hill Climbing and problems
- 3.2.5 Comparative Study of each type of searching
- 3.2.6 Simulated annealing
- 3.2.7 Genetic Algorithm

Unit 4: Adversial Search and Constraint satisfaction problem **[5 Hrs]**

4.1 Games

4.2 Perfect games

4.3 Game tree and formal definition

4.4 Min Max problem

4.5 Alpha beta pruning algorithm

4.6 CSP Problem and examples

4.7 Crypto arithmetic problems and solutions

Unit 5: Knowledge Representations **[8 Hrs]**

5.1 Knowledge and its types

5.2 Logic

5.3 Semantic Nets

5.4 Propositional logic vs FOPL

5.5 Resolution in FOPL

5.6 Frames

Unit 6: Learning System **[4 Hrs]**

6.1 Rote learning
6.2 Learning from example: inductive learning methods
6.3 Decision trees
6.4 Explanation based learning
6.5 Reinforcement learning

Unit 7: Reasoning **[4 Hrs]**

7.1 Monotonic Reasoning
7.2 Statistical Reasoning (Bayesian Network)
7.3 Uncertainty in reasoning
7.4 Case based reasoning

Unit 8: Expert System **[4 Hrs]**

8.1 Human Expert vs expert system
8.2 Expert System Structure
8.3 Expert system example
8.4 Characteristics of expert system
8.5 Knowledge acquisition
8.6 Knowledge base
8.7 Inference engine
8.8 Forward chaining and backward chaining
8.9 Design of expert system

Unit 9: Artificial Neural Networks **[3 hrs]**

9.1 Research history
9.2 Model of artificial neuron
9.3 Neural networks architectures
9.4 Learning methods in neural networks
9.5 Perceptron Network, Multi-layered feed forward network, Hopfield networks
9.6 Application of neural networks

Unit 10: Natural language processing **[2 Hrs]**

10.1 Introduction
10.2 Components of natural language processing
10.3 Natural language understanding
10.4 Natural language generation
10.5Steps in Natural language processing.

Laboratory work:

There shall be following labs using prolog or LISP

- solving family relation problem
- GCD
- Tower of Hanoi
- Using prolog or LISP to understand (variable, rules, input output, arithematic operations, recursion)
  Students must do case study on expert system or natural language processing.

Reference Books:

1. E. Rich & K. Knight, "*Artificial Intelligence*", McGraw-Hill, 1991
2. Haykin "Neural Networks: *A Comprehensive Fundamentals*", Macmillan, 1994
3. E. Turban, "*Decision Support and Expert Systems*" , Macmillan, 1993
4. R. Shingal, "*Formal Concepts in Artificial Intelligence*" , Chapman & Hall, 1992
5. G. Gazadar& C. Mellish, "*Natural Language Processing in Prolog: and introduction to computational linguistics*", Addison-Wesley, 1989
6. D. Crookes, "*Introduction to Programming in Prolog*", Prentice Hall, 1988.
7. P. H. Winston, "*Artificial Intelligence* ", Addison-Wesley, 1984
9. Hecht-Neilson "*Neurocomputing*", Addison-Wesley, 1990
10. G. F. Luger & W. A Stubblefield, "*Artificial Intelligence*" , Benjamin Cummings, 1993

Management Information System
BIT352CO

Year: III **Semester: II**

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

Course Objective:

The course aims at providing students with the knowledge of different types of Computer information systems and primarily focuses on how to use computer information systems and information technologies to revitalize business processes, improve managerial decision making, and help organizations gain a competitive edge in business.

Course Contents:

Unit 1: Information systems in Global business today **[6 Hrs]**

Definition of Information system, Definition of Management Information System, Role of Information systems in business today, Globalization Challenges and opportunities, Strategic business objectives of Information systems, Business perspective of information system.

Unit 2: Global E-Business and Collaboration **[6Hrs]**

Business processes and Information Systems, Types of Information Systems, Systems for linking the enterprise systems for collaboration and team work. The information systems function in business.

Unit 3: Information Systems Organization and Strategy **[6 Hrs]**

Organizations and Information systems, Impacts of information systems on organizations and business firms, Using information systems to achieve competitive advantage, Business value chain model.

Unit 4: Information Technology Infrastructure **[5 Hrs]**

IT infrastructure, Infrastructure components, Contemporary hardware platform trends, Contemporary software platform trends.

Unit 5: Foundation of Business Intelligence **[2 hrs]**
Using databases to improve business performance and decision making, Case study.

Unit 6: Decision Support system and Executive Information System **[4 hrs]**
Definition of Decision Support Systems, Components of DSS, Applications of DSS, Functions of DSS, Definition of EIS, Characteristics of EIS

Unit 7: Business Information Systems **[3 Hrs]**
Functional Information Systems, Marketing Information Systems, Manufacturing Information Systems, Finance and Accounting Information Systems, Quality information system.

Unit 8: Security of Information Systems **[2 Hrs]**
System vulnerability and abuse, Technologies and tools for protecting information resources.

Unit 9: Achieving Operational Excellence and customer intimacy **[4 Hrs]**
Enterprise Systems, Supply Chain Management Systems, Customer relationship management systems, Enterprise applications.

Unit 10: Strategic Information Systems **[2 Hrs]**
Definition of Strategic Information System, Strategic Information System Plan, Strategy for developing Strategic information system.

Unit 11. Case Studies related to Unit 3, Unit 5, Unit 9, and Unit 10. **[5Hrs]**

Reference Books:

1. Kenneth C. Loudon/ Jane P. Laudon,"Management Information Systems, Managing the Digital Firm", Twelfth Edition, Pearson.
2. Uma G. Gupta,"ManagementInformationn Systems, A Managerial Perspective", Tenth Edition, West Publishing Company.

Data Warehousing and Mining
BIT353CO

Year:IV **Semester:II**

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

Course Objectives:

This course aims at introducing advance 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.

Course Contents:

Unit 1 **[4 Hrs]**

Introduction to data mining: Motivation, importance, definition of data mining, kinds of data mining, kinds of patterns, data mining technologies, kinds of applications targeted, major issues in data mining; Introduction to Data warehousing: Importance, uses and applications

Unit 2 **[9 Hrs]**

Data Warehouse and OLAP Technology, Data Warehouse Architecture, Stepsfor the Design and Construction of Data Warehouses, A Three-Tier Data WarehouseArchitecture, OLAP, OLAP queries, metadata repository, Data Preprocessing – Data Integration and Transformation, Data Reduction, Data Mining Primitives: What Defines a Data Mining Task? Task-Relevant Data, The Kind of Knowledge to be Mined, KDD.

Unit 3 **[9 Hrs]**

Mining Association Rules in Large Databases, Association Rule Mining, Market Basket Analysis: Mining A Road Map, The Apriori Algorithm: Finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiently of Apriori, Mining Frequent Itemsets without Candidate Generation, Multilevel Association Rules,

Approaches to Mining Multilevel Association Rules Mining

[6 Hrs]

Unit 4

Multidimensional Association Rules for Relational Database and Data Warehouses, Multidimensional Association Rules, Mining Quantitative Association Rules, Mining Distance-Based Association Rules, From Association Mining to Correlation Analysis

[9 Hrs]

Unit 5

What is Classification? What Is Prediction? Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Bayes Theorem, Naïve Bayesian Classification, Classification by Backpropagation, A Multilayer Feed-Forward Neural Network, defining a Network Topology, Classification Based of Concepts from Association Rule Mining, Other Classification Methods, k-Nearest Neighbor Classifiers, Genetic Algorithms, Rough Set Approach, Fuzzy Set approaches.

[8Hrs]

Unit 6

What Is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Classical Partitioning Methods: k-Meansand k-Medoids, Partitioning Methods in Large Databases: From k-Medoids to CLARANS, Hierarchical Methods.

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:

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

Simulation and Modeling
BIT354CO

Year:IV **Semester:II**

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

Course Objectives:

The objectives of this course are to introduce students to simulation and Modeling techniques and to provide opportunities to develop basic simulation and modeling skills with respect to carrying out projects using any simulation method on the computer.

1. Concepts of Simulation **[6 Hrs]**

1.1. Introduction
1.2. The system
1.3. Continuous and discrete systems
1.4. System simulation
1.5. Real time simulation
1.6. When to use Simulation
1.7. Types of Simulation Models
1.8. Steps in simulation Study
1.9. Phases of a simulation study
1.10. Advantages of simulation
1.11. Limitations of the Simulation Technique
1.12. Areas of applications

2. Monte Carlo Method **[4 Hrs]**

2.1. Monte Carlo Method
2.2. Normally distributed random number
2.3. Monte Carlo Method V/S Stochastic Simulation

3. Simulation of Continuous Systems **[5 hours]**

3.1. **Manual Simulation**
3.2. A pure Pursuit Problem
3.3. Queuing system
3.4. Markov chains
3.5. Differential and partial differential equations

4. Random Numbers **[10 hours]**
4.1. Random Numbers
4.2. Random Number Tables
4.3. Pseudo Random Numbers
4.4. Generation of Random Numbers
4.5. Mid square Random Number generator
4.6. Qualities of an efficient Random Number Generator
4.7. Testing Numbers for Randomness
4.8. Uniformity Test
4.9. Chi-square test
4.10. Testing for auto correlation
4.11. Poker Test

5. Analysis of simulation output **[10 hours]**
5.1. Estimation methods
5.2. Simulation run statistics
5.3. Replication of runs
5.4. Elimination of internal bias

6. Simulation languages **[10 hours]**
6.1. Basic concept of Simulation tool
6.2. Discrete systems modeling and simulation
6.3. Continuous systems modeling and simulation
6.4. Structural, data and control statements, hybrid simulation
6.5. Feedback systems: typical applications

Laboratory works:

There shall be laboratory exercises using any simulation and modeling packages. At the end of this course studentsmust do a project on simulation.

References books:

1. G. Gorden, " System Simulation", Prentice Hall of India
2. M. Law and R.F. Perry, " Simulation : A problem-solving approach", Addison Wesley publishing company.
3. M. Law and W.D. Kelton, " Simulation Modeling and analysis", McGraw Hill, 1991.

Software Engineering
BIT355CO

Year III **Semester II**

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

Course Objectives:

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.

- Provide students a comprehensive introduction to software engineering.
- provide the students the kinds of activities that are necessary for developing a software system
- Study the important phases of software development

Course Contents:

Unit 1:Introduction to Software Engineering: **[4 Hrs]**

1.1 Definition of software engineering
1.2 The evolving role of software
1.3 Changing nature of software
1.4 Characteristics of software
1.5 A generic view of software engineering
1.6 Software engineering-layered technology

Unit 2:Process Models **[5 Hrs]**

2.1 The Waterfall model
2.2 Prototyping model
2.3 RAD model
2.4 Spiral model
2.5 Agile Software Model.

Unit 3: Software Project Management **[8 Hrs]**

3.1 Meaning of 4Ps in software project management
3.2 Activities of project planning
3.3 Projectestimation techniques
3.4 COCOMOmodel
3.5 Risk Management
3.6 ProjectScheduling
3.7 Staffing
3.8 Software Configuration Management (SCM)

Unit 4: Software Requirements and Specification **[7 Hrs]**

4.1 Functional and non-functional requirements, requirements engineering process (feasibility studies, requirements elicitation and analysis, requirements validation, requirements management)
4.2 Data Modeling and flow diagram
4.3 Software prototyping techniques
4.4 Requirement definition and specifications

Unit 5:Software Design **[7 Hrs]**

5.1 Introduction to software design
5.2 Characteristics of a good software design
5.3 Design principle
5.4 Design concepts
5.5 Design strategy
5.6 Design process and design quality
5.7 Software architecture and its types

Unit 6:Software Testing **[7 Hrs]**

6.1 Software testing process
6.2 Principal of testing
6.3 Test case design
6.4 Black-box testing (Boundary-value analysis, Equivalence class partitioning)
6.5 White-box testing (Statement coverage, Path coverage, Cyclomatic complexity)
6.6 Software verification and validation

Unit 7:Metrics for Process and Products **[4 Hrs]**

7.1 Software measurement
7.2 Metrics for software quality
7.3 Software quality assurance
7.4 Software reliability
7.5 The ISO 9000 quality standards

Unit 8: Software Engineering Trends and Technology **[3 Hrs]**

8.1 Agile development

8.2 Extreme programming
8.3 Cloud computing and grid computing
8.4 Enterprise mobility
8.5 Business intelligent and approaches
    8.5.1 ERP, Supply chain management, Service-oriented architecture and web services
    8.5.2 Enterprise portals and Content management
8.6 Introduction to OOSE

Case Study: Students are encouraged to perform the case study to implement concepts of above-mentioned topics.

Reference Books:

1. Sommerville, "*Software Engineering*", Pearson Education
2. RajibMalla, "*Fundamentals of Software Engineering*"
3. Pankaj Jalote, "*Software Engineering – A Precise Approach*"
4. Udit Agrawal, "*Software Engineering*
5. Roger S. Pressman, "*Software Engineering - A Practitioner's Approach*", 6th Ed., McGrawHill International Edition

Project-VI

BIT356CO

Year: III Semester: II

Teaching Schedule Hours/Week			Examination Scheme				
			Internal Assessment		Final		Total
Theory	Tutorial	Practical	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 will be assigned to every student. Every group of students (upto 3) will be assigned a project work related to either Artificial Intelligence or Data Mining. Students must develop the assigned application, 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

Year:IV **Semester:I**

CourseCode	CourseTitle	Credits	Lecture (Hrs.)	Tutorial (Hrs.)	Laboratory (Hrs.)	Total(Hrs.)
BIT401CO	NetworkProgramming	3	3	1	2	6
BIT402CO	DigitalGovernance	3	3	1		4
BIT4**	Specialization1	3				
BIT4**	Specialization2	3				
BIT403CO	Internship	3				
	Total	15				

Year:IV **Semester:II**

CourseCode	CourseDescripton	Credits	Lecture (Hrs.)	Tutorial (Hrs.)	Laboratory (Hrs.)	Total(Hrs.)
BIT451MS	PrinciplesofManagement andEntrepreneurship inIT	3	3	1		4
BIT452CO	DistributedandCloudComputing	3	3	1	2	6
BIT4**	Specialization-3	3				
BIT4**	Specialization-4	3				
BIT453CO	ApprenticeProject	3				6
	Total	15				

Registrar

****SpecializationArea:**

Specialization area courses have been designed in three major areas for in-depth knowledge in thearea. Students develop specialized expertise in their specialization area. Students are required totake four specialization courses, two courses each in seventh and eight semester, from a selectedareaofspecialization.Currently,threespecializationareas(IntelligentSystemsandBusinessAnalytics, E-Commerce and Web Application Development, and Climate Change Management)are offered tothestudents.

A.IntelligentSystemsandBusinessAnalytics

Year:IVandSemester:I(Specialization1andSpecialization2)

BIT421CO:MachineLearning
BIT422CO:BusinessIntelligenceandDataScienceBI
T423CO: Deep Learning

Year:IVandSemester:II(Specialization 3andSpecialization 4)

BIT471CO:Natural Language
ProcessingBIT472MS:SupplyChain
Analytics

B:DigitalCommerceandMobileapplication Development

Year:IVandSemester:I(Specialization1andSpecialization2)
BIT428CO: Digital Commerc
eBIT429CO:MultimediaandApplication

Year:IVandSemester:II(Specialization 3andSpecialization4)
BIT478CO:BigData
BIT479CO:MobileAppdevelopment

C:Climate ChangeManagement

Year:IVandSemester:I(Specialization1andSpecialization2)
BIT435CO: **GIS**
BIT436CO:RemoteSensing
BIT437CO:DataCenterandDisasterRecoveryCenter

Year :IV and Semester :II (Specialization 3 and Specialization 4)BIT485CO:IncidentResponseandManagementSystemBIT486CO:
ClimateChange Risk Management
BIT487CO:DisasterGovernance

Network Programming
BIT401CO

Year: IV **Semester:I**

TeachingScheduleHours/Week			ExaminationScheme				
Theory	Tutorial	Practical	InternalAssessment		Final		Total
3	1	2	Theory	Practical	Theory	Practical	150
			20	50	80	-	

Courseobjectives:

Attheendofthiscourse,studentswillbeabletodesignandimplementnetworkclientserverapplications.

Course Contents:

Unit 1: Introductiontonetworkprogramming [5 Hrs]Introductiontocomputernetwork:client/servermodel,ProtocolSuite(ISO/OSI,TCP/IP),UnixStandards(POSIX,OpenGroup,IETF),NetworkUtilities(telnet,route,ipconfig,ifconfig,ping,netstat,Andftp)Introductiontoprogramming:wrapperfunctions,headerfiles,librariesandportsnumbers,IP address.Iterativeserver,concurrentserver,networkedservers

Unit 2: Elementaryoperatingsystemcalls [6Hrs]

Systemcall,program,thread,process,Kernel,fork(),exec()anditsfamily,waitpid(),wait(),pipe(),Fifo(), signals(SIGCHLD,SIGINT,SIGIO).IPCNames,creatingandopeningIPCchannels,IPCnames,creatingandopeningIPC channels, IPCpermissions

Unit 3: TCP/UDPtransportlayerprotocols [4Hrs]

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

Unit 4: Elementarysocketcalls [5Hrs]

Socketaddressstructure:forIPV4,IPV6,UNIXdomainsocketandgenericsocketaddressstructure, value-result argument. Byte ordering and manipulating function:htonl(),htons(),ntohl(),ntohs(),inet_addr(),inet_aton(),inet_ntoa(),inet_pton()

Unit 5: ElementaryTCP-UDPsocket [6Hrs]

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

Unit 6: I/Omultiplexing [4Hrs]

Introduction,I/Omodels:blockingI/O,non-

blockingI/O,I/Omultiplexing,signaldrivenI/O(SIGIO)and asynchronous I/Omodel. Select(),poll(), shutdown()

Unit 7: Socketoptions [2Hrs]

Getsockopt()andsetsockopt()functions,IPV4,IPV6,TCPsocketoptions

Unit 8: Nameandaddressconversion [2Hrs]

Domainnamesystem,gethostbyname(),gethostbyaddr(),uname(),getservbyname()andgetservbyport(), gethostname()functions,sockettimeouts

Unit 9: Unixdomainprotocol [3Hrs]

Introduction,Unixdomainsocketaddressstructure,socketpairfunction,Unixdomainstreamclient-server,UNIXdomain datagramclient/server

Unit 10: Daemonprocesses,Inetdsuperservers [2 Hrs]

Introduction,Sysloged(syslogfunction),daemon_initfunction,inetddaemon

Unit 11: Broadcastandmulticast [3Hrs]

Introduction,Broadcastandmulticastaddresses,comparisonbetweenbroadcast,unicastandmulticastsocketoptions,Unicast versusBroadcast,multicasatversusbroadcastonLAN

Unit 12: IPlayersandrawsocket [3Hrs]

Introduction,rawsocketcreation,inputandoutput(pingexample)

Laboratory Work:

Thereshallbelabstrictlyusingc/c++/Java/Linux

- Linuxcommands
- IPC(Pipe(),Fifo(),MessageQueue)
- TCP,UDPandUnixDomainsocketclientserverprogram
- TCPechoserverandclientprogram
- Fork()Systemcall
- Wait()andwaitpid()systemcall
- Uname(),gethostbyaddr(),gethostbyname(),gethostname()systemcall
- Shellprogramming

ReferenceBooks:

- StevensW.R.,"*UnixNetworkProgramming*",Vol-1
- StevensW.R.,"*UnixNetworkProgramming*",Vol-II
- DoglousE.Comer,"*InternetworkingwithTCP/IP*",Vol-III

Digital Governance
BIT402CO

Year: IV **Semester:I**

TeachingScheduleHours/Week			ExaminationScheme				
Theory	Tutorial	Practical	InternalAssessment		Final		Total
			Theory	Practical	Theory	Practical	
3	1	-	20	-	80	-	100

Course Objectives:

This course provides the implementation and management of e-Government from the technicalities of data flows and process mapping to the policies of e-government and also provides the case studies of different countries. It also familiarizes students with the knowledge of Digital governance in relation to Digital Democracy, Citizen Relationship management and application of Artificial Intelligence.

Course Contents:

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

1.1. e-Government and e-Governance.

1.2. e-Government as information system.

1.3. Benefits of e-Government.

1.4. e-Government stages of development.

1.5. Online service delivery and electronic service delivery.

Unit 2: Public-Private Partnership for e-Government **[4Hrs]**

2.1. G2C Project

2.2. G2B Project

2.3. PPP Forms-JV Model, BOO Model, BOOT model, ASP model

2.4. Issues in PPP for e-Government

2.5. Citizen-centric approach to e-Government.

Unit 3: ICT Infrastructure for e-Government **[3 Hrs]**

3.1 Network infrastructure.

3.2 Computing Infrastructure.

3.3 Data centers

3.4 E-Government architecture.

3.5 Interoperability framework.

Unit 4: e-Government Readiness **[4Hrs]**

4.1 e-Readiness framework

4.2 Steps to e-Government readiness.

4.3 Issues in e-Government readiness.

Unit 5: Security for e-Government **[5Hrs]**

5.1 Challenges of e-government security.

5.2 An approach to security for e-Government.

5.3 Security management model.

5.4 e-Government security architecture.

5.5 Security standards.

Unit 6: Implementing e-Government **[5Hrs]**

6.1 e-Government system life cycle and project assessment

6.2 Analysis of current reality

6.3 Design of new e-Government system.

6.4 e-Government risk assessment and mitigation.

6.5 e-Government system construction.

6.6 Implementation and beyond

6.7 Developing e-Government hybrids.

Unit 7: From Representative to Digital Democracy **[3 Hrs}**

7.1 Using Internet to increase Political Participation

7.2 Online Participation and Political Organization

7.3 Elections

7.4 Protecting Democracy

Unit 8: Citizen–Centric Remote Online Digital Governance [3Hrs]

8.1 Citizen Relationship Management and Digital Governance

8.2 Responding to citizens online

8.3 From Electronic communication to Modernizing Government

Unit 9: Applying Artificial Intelligence to improve Performance and Results [4 Hrs]

9.1 Accessing the Impact of Artificial Intelligence on Performance

9.2 Artificial Intelligence, Bias, Facial, and Voice recognition

Unit 10: Case Studies and Applications of e-government system [10Hrs]

10.1 Nepal: Cyber Laws, ICT development project, Government Integrated Data Center (GIDC), e-Government master plan, Human resource management software.

10.2 India: Community information centers, e-Procurement in the government of Andhra Pradesh, e-Suvida.

10.3 Other Countries: E-Government development in South Korea, e-Government in China, e-Government in Brazil, Sri Lanka, Singapore, USA.

Reference Books:

1. Implementing & Managing e-Government, Richard Heeks
2. e-Governance: Concepts & Case Studies, C. S. R. Prabhu, Prentice Hall of India
3. e-Government, J. Satyanarayana, Prentice Hall of India
4. Digital Governance: Applying Advanced Technologies to Improve Public Services, Michael E. Milakovich, Routledge Taylor & Francis Group

Internship
BIT403CO

Year: IV **Semester: I**

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

Course Synopsis:

The students are required to complete a three credit 3 (45 hour) internship as a part of the course requirement. Business organization is a crucial requirement of the Internship course and this will have to be secured before getting started with the course. The work that the students perform during the Internship will have to be supervised by the faculty members The internship experience is expected to enable the students to assist in the resolution of complex problem associated with Database systems.
At the end of the Internship, the student(s) are required to write a report on their internship work. Such a report needs to be structured according to the prescribed format. The Report forms a major aspect of the evaluation of the Internship work.

Goal :

Main goal is to assist students in focusing their interests, thus aiding in their professional carrier. It gives students the opportunity to re-examine their career objectives and explore the variety of opportunities in the field of computer application.
Preparation Students, the advisors, and the organization, with which the student team is affiliated, will have to agree on a problem that needs to be addressed during the internship. An internship is designed by the advisor and the student according to mutual interests, needs and availability of related organization. To develop a rewarding program, at the beginning of the internship, the advisor and student are asked to establish an internship plan, in the form of written objectives and goals, and to develop a strategy for attaining those goals. The plan may include a schedule of activities that need to be carried out in order to reach a solution for the problem being addressed. The internship plan is not intended to be rigid. Advisor may be unable to assess certain responsibilities until the student demonstrates his or her ability. The plan should be flexible and subject to revision. The advisor and student should assess the student's progress throughout the term of the internship both to evaluate the student's performance, and to establish new directions as needed.

Role of the Advisor:

Advisors are expected to share their experience, insight, and enthusiasm with the student throughout the internship. They should continually monitor the progress of the student, assessing written and oral communications and guiding the development of the student's technical and managerial skills, effectiveness and presentation of self. Advisors are expected to submit a post-internship evaluation of the student's accomplishments and abilities and of the internship program in general.

Role of the Student:

In order for the internship to be a mutually beneficial experience, a student should begin with a definition of his/her objectives and specific interests for of 45 hour period to ensure that appropriate activities and projects are selected by the advisor and the student. The student will be responsible for the timely completion and professional quality of all activities and projects assigned. The student is expected to speak frequently with the advisor on his/her progress and interest in other projects, as well as to discuss observations and questions about meetings, projects and other activities with which he/she is involved. The student is required to submit to Advisor, within the first two weeks of the internship, a brief plan for the internship.

Internship Group Size and document preparation :

Each group must be of maximum 3 Students.
Each student should prepare Individual document on the basis of his/her part in the group project.
Supervisors must be assigned to each group.

Domain/Scope of Internship (Project Implementation /Research) :

-Bank
-Hospitals
-Software Companies
-NTC, Ncell and other Telecommunication Sectors
-Government Organizations (IT Related) etc

Report Format :

APA Format

Tentative Contents of Report:

- Abstract
- Introduction (organization +Work Done)
- Statement of the problem and Objective
- Literature Review and methodology (Optional)
- System Analysis
- System Design
- Implementation
- System Testing
- Limitation/future enhancement
- Conclusion
- References and Bibliography

Evaluation Criteria:

Proposal Defense : 10% weight {Evaluated by Supervisor and Mentor}
Mid-Term : 30% weight {Evaluated by Supervisor and Mentor}
End-Term : 60% weight.

Proposal Defense (At beginning of the internship):

- Topic Selection with Proposal (5 of total)
- Presentation (5% of total).

Mid-Term (After 2 month) :

- Program Design (10% of total)
- Demo Presentation (10% of total).
- Viva (10% of total)

End-Term (After Completion of internship and before final Exam) :

- Depth of work (15% of total)
- Report (25% of total)
- Viva (10% of total)
- Presentation (10% of total)

Note: External examiner assigned from Purbanchal University (Dean Office, Faculty of Science & Technology). Students will be present in final presentation along with External Examiner and Supervisors.

Machine Learning
BIT421CO

Year: IV **Semester: I**

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

Objective: The main objective of the course is to provide both theoretical concepts and practical knowledge of machine learning.

Contents:

Unit 1: Introduction to Machine Learning **[5 Hrs]**

Introduction, Components of Learning, Learning Models , Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, Designing a Learning System, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Frameworks for building Machine Learning System

Unit 2: Supervised Learning: **[12Hrs]**

Regression: Linear Regression, Non-Linear Regression, and Model Evaluation Method

Classification: Logistic Regression, Support Vector Machine, K-Nearest Neighbors Methods

Decision Tree Technique- Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning

Unit 3: Unsupervised Learning: **[4Hrs]**

Introduction to clustering, K-means clustering, K-mode clustering

Unit 4: Model Diagnosis and Tuning: **[7 Hrs]**

Bias and Variance, K-Fold Cross-Validation, Random Forests

Unit 5:Text mining: **[6 Hrs]**

Text mining process overview, Text assemble, Text Preprocessing, Text Assemble, Text Exploration,

Unit 6: Deep Learning **[11Hrs]**

Artificial Neural Network, Feed Forward Neural Network with backpropagation, Convolution Neural Network, Recurrent neural network

Laboratory Work:

Laboratory work consists of the following laboratory exercises using Python.

1. Introduction to Python, Python Libraries- Numpy, Pandas, Matplotlib, Scikit
2. Perform Data exploration and preprocessing in Python

3. Implement Linear regression
4. Implement logistic regression
5. Build models using Decision trees
6. Implement K-NN algorithm to classify a dataset
7. Implement a sklearn multilayer perceptron classifier
8. Using WEKA for classification, clustering and regression

Reference Books:

1. Tom M. Mitchell, Machine Learning**,** India Edition 2013, McGraw Hill Education
2. Mastering Machine Learning with Python in six steps. A practical Implementation Guide to Predictive Data Analytics Using Python. Authors: Swamynathan Manohar
3. Muller Andreas and Sarah Guidos, Introduction to Machine Learning with Python: A guide for data scientists,
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, 2nd edition, springer series instatistics.
5. EthemAlpaydın, Introduction to machine learning, second edition, MITpress.

Business Intelligence and Data Science
BIT422CO

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

Course Objective:

The main objective of this course is to provide to students foundation in Business Intelligence and Data Science techniques and their applications. The course will also provide skills in using specific software tools for developing BI applications.

Course Contents:

Unit 1: An Overview of Business intelligence, Analytics and Decision Support [6 Hrs]

Changing Business Environments and Computerized Decision Support; Framework for Business intelligence (BI); Intelligence Creation, Use, and BI Governance; Transaction Processing versus Analytic Processing; Successful BI Implementation; Analytics Overview

Unit 2: Data Ware Housing [6 Hrs]

Data Ware Housing(DW) Definitions and Concepts;DW Process Overview, Architectures; Data Integration, and the Extraction, Transformation and Load (ETL) Processes;DWDevelopment;DW Implementation Issues; Real Time DW; and DW Administration, Security Issues and Future Trends.

Unit 3: Business Reporting, Visual Analytics and Business Performance Management [6 Hrs]

Business Reporting Definitions and Concepts; Data and Information Visualization;Different Types of Charts and Graphs; Emergence of Data Visualization and Visual Analytics; Performance Dash Boards; Business Performance Management; Performance Measurement; Balanced Score Boards; and Six Sigma as a Performance Measurement System; Using Tableau and Power BI for data visualization

Unit 4: Data Mining [9 Hrs]

Data Mining (DM) Concepts and Applications; DM Processed Methods Software Tools; and DM Privacy Issues; Using WEKA tools for data mining

Unit 5: Text and Web Analytics: [6 Hrs]

Text Analytics (TA) and Text Mining (TM) Overview; Natural Language Processing; TM Applications' Process; Sentiment Analysis; Web Mining (WM) Overview; Search Engines; Web Usage Mining (Web Analytics); and Social Analytics

Unit 6: Big Data Analytics: **[5 Hrs]**

Definition of Big Data; Fundamentals of Big Data Analytics; Big Data Technologies; Data Scientist; Big Data and Warehousing; Big Data Vendors; Big Data and Stream Analytics; and Applications of Stream Analytics.

Unit 7: Business Analytics (BA) – Emerging trends and Future Impacts: **[7 Hrs]**

Location-Based Analytics for Organizations; Analytics Applications for Consumers; Recommendation Engines; Web 2.0 Revolution and Online Social Networking; Cloud Computing and BI; Impacts of Analytics in Organizations –An Overview; Issues of Legality, Privacy and Ethics; and an overview of Analytics Ecosystem

Reference Books:

1. Ramesh Sharda, DursunDelen, Efraim Turban, et al, "Business Intelligence: A Managerial Perspective on Analytics", 3rd Ed, Pearson India EducationInc, Indian Subcontinent Reprint 2018 (ISBN 978-93-528-6271-9)
2. Jiawei Han and Michelinekambe, Jian Pei, "Data Mining: Concepts and Techniques ", 3rded. The Morgan Kaufmann Publishers.
3. Michael Steinbach, Pang-Ning Tan, and Vipin Kumar, "Introduction To Data Mining", Pearson International Edition, 2006.
4. James Allen," Natural Language Understanding", 2nd Ed., The Benjamin/Cummings Publishing Company Inc.
5. Daniel Jurafsky, James. H. Martin, " Speech and Language Processing" , 2nd Edition, Pearson Education Inc.
6. Gabe Ignatow, Rada F. Mihalcea, "An Introduction to Text Mining: Research
7. Design, Data Collection, and Analysis",1st Edition,
8. ChengXiangZhai, Sean Massung, "Text Data Management and Analysis: A Practical Introduction to Information Retrieval and Text Mining"1st Edition, ACM Book Series.
9. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise
10. Integration with Tools, Techniques, NoSQL, and Graph", 1st Edition, The MorganKaufmann Publishers.

Deep Learning
BIT423CO

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

Course Objectives:

The objective of this course is to cover the fundamentals of neural networks as well as some advanced topics such as recurrent neural networks, long short term memory cells and convolutional neural networks. The course also requires students to implement, train and debug their own neural network to solve some real world problem.

Course Contents:

Unit 1: Basics of artificial neural networks (ANN) [4 Hrs]
Artificial neurons, Computational models of neurons, Structure of neural networks, Functional units of ANN for pattern recognition tasks

Unit 2:Feedforward neural networks [5 Hrs]
Pattern classification using perceprton, Multilayer feedforward neural networks (MLFFNNs), Backpropagation learning, Empirical risk minimization

Unit 3: Deep neural networks (DNNs) [8 Hrs]
Difficulty of training DNNs, Greedy layerwisetraining, Optimization for training DNNs, Newer optimization methods for neural networks (AdaGrad, RMSProp, Adam), Second order methods for training, Regularization methods (dropout, drop connect, batch normalization)

Unit 4:Convolution neural networks (CNNs) [8Hrs]
Introduction to CNNs – convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG, PlacesNet, Training a CNNs: weights initialization, batch normalization, hyperparameter optimization, Understanding and visualizing CNNs

Unit 5:Recurrent neural networks (RNNs) [7Hrs]
Sequence modeling using RNNs, Backpropagation through time, Long Short Term Memory (LSTM), Bidirectional LSTMs,Bidirectional RNNs, Gated RNN Architecture
5
Unit 6:Generative models [7Hrs]
Restrictive Boltzmann Machines (RBMs), Stacking RBMs,Belief nets, Learning sigmoid belief nets, Deep belief nets

Unit 7:Applications [6 Hrs]

Applications in vision, speech and natural language processing

Laboratory work:

There shall be following laboratory sessions.

1.Exercises on neural networks(NNs), solving a problem with NNs on tensorflow.
2. Exercises on CNNs, solving a problem with CNNs on tensorflow
3. Exercises on RNNs, solving a problem with RNNs on tensorflow

References Books:

1. Ian Goodfellow, YoshuaBengio and Aaron Courville, Deep learning, In preparation for MIT Press, Available online: http://www.deeplearningbook.org, 2016
2. S. Haykin, Neural Networks and Learning Machines , Prentice Hall of India, 2010
3. Satish Kumar, Neural Networks - A Class Room Approach, Second Edition, Tata McGraw-Hill, 2013
4. B. Yegnanarayana, Artificial Neural Networks, Prentice- Hall of India, 1999
5. C.M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006

Digital Commerce
BIT428CO

Year: IV **Semester:I**

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

Course Objectives:

The main objective of this course is to equip students with fundamental knowledge of electronic commerce, Mobile Commerce, Digital Marketing, web content management system, and uses of Artificial Intelligence required for analyzing and implementing Digital Commerce in a typical business set up.

Unit 1: E-Commerce [11Hrs]

Introduction, Advantages and Disadvantages, Benefits, Features, Business models of E-Commerce, Infrastructure Requirement for E-Commerce, Security for E-Commerce, Firewall, Cryptography, Digital Token based Payments

Unit 2: Electronic Retailing [2 Hrs]

Mercantile Models from the consumer's perspective, Distinctive phases of a consumer Mercantile Model, Prepurchase Preparation, Purchase consummation, Postpurchase Interaction

Unit 3: Introduction to Digital Commerce [3 Hrs]

Need of digital commerce, comparison between Digital Commerce and E-Commerce, Challenges of Digital Commerce, Key Digital Commerce Trends

Unit 4: Fundamentals of Mobile Commerce [8 Hrs]

Definition, Types of Mobile Commerce, Applications Comparison between M-Commerce and E-Commerce, Features of M-Commerce, Global System for Mobile Commerce(GSM), GPRS, 3G, 4G

Unit 5: Digital Marketing [8 Hrs]

Internet Marketing and Digital Marketing Mix, Introduction to Search Engine Advertising, Introduction to SEO, Display marketing, Introduction to Social Media (Facebook, Linkedin,Twitter, Youtube, Google, Instagram) Marketing

Unit 6: Web Content Management systems [7 Hrs]

Planning and Developing Dynamic Web Content Sites, Building and Administrating a Wordpress Blog Site, Building an Online Social Network Using SocialGo

Unit 7: Application of Artificial Intelligence **[6 Hrs]**
Chatbots, Personalization, Intelligent Image Search

Laboratory work:

There shall be 11 lab classes on developing a digital commerce site using Wordpress.

Reference Books:

1. Electronics Commerce –Technologies and Applications: Bhaskar Bharat, TMH
2. Frontiers of Electronic Commerce: Kalakota ,Whinston, Pearson Education
3. E-Commerce : Strategy Technologies and Applications: Whiteley, David, TMH
4. Digital Marketing: Seema Gupta, Mc_Graw Hill

Multimedia and Application

BIT429CO

Year: ISemester:I

Teaching Schedule Hours/Week			Examination Scheme				
Theory	**Tutorial**	**Practical**	**Internal**		**Final**		**Total**
			Theory	**Practical**	**Theory**	**Practical**	
3	**1**	**2**	**20**	**20**	**60**	**-**	**100**

Course Objectives:

The main objective is introduce the technologies, concept and techniques associated with the development of multimedia system.

Course Contents:

Unit 1: Multimedia System [3Hrs]

1.1. Introduction, aspect, element, and structure
1.2. Medium, properties and notation
1.3. Data stream characteristics for traditional, and continuous media

Unit 2: Sound and Audio [4 Hrs]

2.1 Basic sound concept, Computer representation and file formats
2.1. Basic music (MIDI) concepts, MIDI devices, messages, and software
2.2. Basic speech concept, generation, analysis (recognition and understanding), and Transmission

Unit 3: Image and Graphics [4 Hrs]

3.1 Basic concept: representation, image format, graphics format
3.2 Image processing fundamentals, Synthesis, analysis and Transmission

Unit 4: Video and Animation [4 Hrs]

4.1 Basic video concepts: signal representation, format, and transmission
4.2 Basic animation concept, languages, control and transmission

Unit 5: Data compression [6Hrs]

5.1 Basic concepts, Coding requirement
5.2 Categories (Source, Entropy, and Hybrid Coding)
5.3 Basic compression techniques (Run-Length coding, Hoffman coding, Predictioncoding, and Adaptive compression techniques)
5.4 Coding standard JPEG, H.261 (px64), MPEG and DVI

Unit 6: Optical Storage Media [4 Hrs]

6.1 Basic technology
6.2 Video disk fundamentals, Blue ray disk
6.3 CD audio, CD ROM and Extended Architecture
6.4 Principles of CD Write-Once and CD Magneto Optical.

Unit 7: Multimedia Operating System **[4 Hrs]**

7.1 Introduction, Real Time

7.2 Resource management: Requirement, Allocation scheme, Continuous media resource model.

7.3 Process management: Real-time processing requirement, Real-time scheduling, Earliest deadline first algorithm, Rate monotonic algorithm/

7.4 System Architecture.

Unit 8: Multimedia communication system **[4 Hrs]**

8.1 Introduction to Multimedia communication
8.2 Application subsystem
8.3 Transport subsystem
8.4 Quality of service and resource management

Unit 9: Documentation Hypertext and MHEG **[4 Hrs]**

9.1Documents: architecture and Manipulation of multimedia data
9.2Hypertext, hypermedia and multimedia
9.3Hypermedia Systems: Architecture, nodes and pointers
9.4Document Architecture: SGML, ODA and MHEG.

Unit 10: Synchronization **[4 Hrs]**

10.1Introduction
10.2Notion of synchronization
10.3Presentation requirements
10.4Reference model for multimedia synchronization
10.5Synchronization specification
10.6

Unit 11:Abstraction of programming **[2 Hrs]**

11.1 Introduction
11.2 Abstraction levels
11.3Libraries, system software, Toolkits Higher programming language, Object-oriented approaches

Unit 12: Multimedia Application **[2 Hrs]**

12.1Video-On demand
12.2Video Conferencing
12.3Educational Application, Industrial Application
12.4Information System, Multimedia archives & digital libraries, Media entertainment, Media editors, trends

Laboratory work:

1. Integration of multimedia (Audio, Speech, and Music Video, Static and, Movie, Animation Programming etc.)
2. Image Enhancement in Photoshop, flash.
3. 2D & 3D animation in OpenGL/Maya/Flash/C++
4. Image Compression Algorithm :JPEG
5. Real Time Scheduling Algorithm

Note: Lab on any two topics.

Reference Books:

1. Ralf Steinmet and Klara Nahrstedt, Multimedia Computing Communications and applications, Pearson Education asia 2001, ISBN 81-7808-319-1
2. Andleigh P. Thakrar, Multimedia System Design Prentice Hall, NJ 1996
3. Gibbs S.J. Tsichritzis, D.C. Multimedia Programming objects, Environment and frameworks Addsion-wesley-1995
4. 0Koegel-Buford J.F. Multimedia System Addsion-Wesley, 1994
5. J.Jeffcoate, Multimedia in Practise: Technology &Application, PHI

GIS
BIT435CO

Year: IV Semester:I

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

Course Objectives:

The main objective of this course is to familiarize students with the fundamentals knowhow of geographical information system and its applications.

Course Contents:

1. Basic Concepts: Definition and Components of GIS; Functionality of GIS; Areas of GIS application; Advantages and Limitations of GIS. **4Hrs**

2. GIS Data & Database: Spatial and Attribute Data; Spatial Data Handling; Data Representations - points, lines, polygon; Information Organization and Data Structures - Raster and Vector data structures, Tessellations; File organization and formats; Geo-database; GIS Softwares. **8Hrs**

3. GIS Data Input: Nature and Source of data; Method of spatial data capture - Primary and Secondary; Digitization and Scanning method, Techniques and procedure for digitizing, Errors of Digitization; Attribute data capture; GPS and Remote Sensing. **6Hrs**

4. GIS Mapping: Defining Map, Categories of Maps, Map Contents and Map Scales; Georeferencing; Projection Systems – Types and Aspects; UTM. **8Hrs**

5. Data Editing in GIS: Detecting and Correcting Errors; Re-projection, Transformation and Generalization, Edge matching and Rubber sheeting; Conversion from other Digital Sources. **4Hrs**

6. Spatial Analysis: Types of Spatial Analysis, Measurement in GIS, Query by Attributes, Spatial Queries, Attribute-based operation, Neighborhood Analysis, Connectivity Analysis, Overlay and Coverage Rebuilding. **7Hrs**

7. Data Sharing and Spatial Data Infrastructure: Concept of Geospatial Infrastructure; Components of SDI - Standards, Metadata, Data Sharing Clearinghouse; NSDI. **6Hrs**

8. GIS in Nepal: Present Situation; Major GIS activities; Prospects and Challenges of Implementation.**2 Hrs**

Laboratory Work:

There shall be lab exercises covering several topics of GIS.

Reference Books:

1. P. A. Burrough& R. A. McDonnell, "*Principles of Geographical Information Systems*", Oxford University Press.
2. J. Star & J. Estes, "*Geographic Information Systems: An Introduction*", Prentice Hall, Englewood Cliffs, N. J.
3. Kang-Tsung, "*An Introduction to Geographic Information Systems*", Tata Mc Graw Hill.
4. C.P. Lo & Albert K.W. Yeung, "*Concepts & Techniques of Geographic Information Systems*", PHI Pvt. Ltd., New Delhi.
5. Ian Heywood, Sarah Cornelius, Steve Carver &Srinivasa Raju, "*An Introduction to Geographic Information Systems*", Pearson Education.
6. Basudeb Bhatta, "*Remote Sensing and GIS*".
7. J. Lee, D.W.S. Wong, "*Statistical Analysis with ArcView GIS*", John Wiley and Sons, Inc., New York.

Remote Sensing
BIT436CO

Year: IV Semester: I

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

Course Objective:

The main objective of this course is to familiarize students with the fundamentals knowhow of remote sensing and its applications.

Course Contents:

1. Concept and Scope of Remote Sensing: Definitions, Process and Characteristics of Remote Sensing System; Types and Components of Remote Sensing; Advantages and Limitations. **8 Hrs**

2. Concept of Electromagnetic Radiation (EMR): Wavelength-frequency-energy relationship of EMR; EMR Spectrum and its properties; EMR wavelength regions and their applications; Atmospheric windows; Interactions of EMR with matter, Energy Interaction in the atmosphere,Energy Interactions with Earth Surface features; Spectral Signatures. **8Hrs**

3. Types and Characteristics of Sensor: Sensor materials; Sensor System - Framing and Scanning System (Whiskbroom scanner, Push-broom scanner, Side Looking scanner); Imaging and non-imaging sensors; Active and passive sensors; Resolution of Sensors - Spectral, Spatial, Radiometric and Temporal; Scale, Mapping unit, Multi-band concepts and False Color Composites. **10 Hrs**

4. Remote Sensor Platforms and Satellite Orbits: Ground, Airborne and Space-borne Platforms; Orbital Characteristics – Coverage, Passes, Pointing Accuracy; Geostationary, Sun synchronous, shuttle orbit, Semisynchronous orbit (Molniya orbit) and Quasi-zenith satellite orbit. **8 Hrs**

5. Space Imaging Satellites: Early history of space imaging; Multispectral and Hyperspectral sensors, Radar, Lidar; Specification of some popular satellites – IRS, LANDSAT and SPOT series; High resolution satellites – IKONOS, Cartosat, Quickbird, OrbView, WorldView; Other latest earth resource satellites. **7 Hrs**

6. Integration of GIS and Remote Sensing **2 Hrs**
7. Applications of Remote Sensing **2 Hrs**

Laboratory Work:

There shall be lab exercises covering several topics of Remote Sensing and its integration with GIS.

References Books:

1. George Joseph, "*Fundamentals of Remote Sensing*".
2. Ravi P. Gupta, "*Remote Sensing Geology*".
3. Basudeb Bhatta, "*Remote Sensing and GIS*".
4. Noam Levin, "*Fundamental of Remote Sensing*".
5. Floid F. Savins, "*Remote Sensing, Principal and Interpretation*".
6. J. Lee, D. W. S. Wong, "*Statistical Analysis with ArcView GIS*", John Wiley and Sons, Inc., New York.

Data Center and Disaster Recovery Centers

BIT437CO

Year:IV **Semester:I**

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

Course Objective:

The main objective of the course is to provide students with the concepts of Data Center and Disaster Recovery Centers so that they can demonstrate the ability, knowledge and skills to be competent managers in the field of rapidly changing disaster management environment and be able to apply these in practical contexts.

Course Contents:

Unit 1: Introduction to Data Centre **[5 Hrs]**

- Defining a data centre
- Identify the main data centre types
- Identify the business service options
- Emerging delivery and future demands

Unit 2: The Role and Objectives of a Data Centre **[7 Hrs]**

- Driving factors for a data centre
- Data centre standards
- Data centre availability models and considerations
- Location and building considerations
- Analyzing reliability in the data center
- Data Center efficiency
- Data Center system planning

Unit 3: Design Overview **[10 Hrs]**

- Criticality and availability considerations
- Fire Protection Methods in the Data Center
- Cabling Strategies for Data Centers
- Maintaining humidity, optimizing cooling layouts
- Physical Security
- Power Management: power Generators, Power redundancy, power distribution
- Physical Infrastructure: Infrastructure Management and Designs, rack fundamentals, choosing between room, rack and row based cooling for data centers
- The four key constraints (4C's) – Power, Cooling, IT Infrastructure and Space

Unit 4: Managing the Data Centre **[6Hrs]**

- Regulations, best practices and operational processes
- Move, adds and change processes
- Efficient energy management
- Decommissioning processes
- Logical, IT & physical security

Unit 5: The Data Centre Industry and Market **[5Hrs]**

- The size of the market
- Market drivers and trends
- Powering the internet
- Case Study
-

Unit 6: Cloud Data Center **[4 Hrs]**

Unit 7: Disaster Recovery Center **[8Hrs]**

- Disaster Recovery Plan
- Business continuity and Disaster Recovery
- Data Backup
- Cloud Disaster Recovery
- Disaster Recovery Site
-

Notes: Students need to formulate planning document of DR center to secure 20 marks in practical.

Reference Books:

1. Scott D. Lowe, James Green and David Davis, Building a Modern Data Center Principles and Strategies of Design, ActualTech Media, 2016, New York
2. Mauricio Arregoces and Maurizio Portolani, Data Center Fundamental, Cisco Press, 2004, USA
3. Samee Ullah Khan and Albert Y. Zomaya, Handbook on Data Centers, Springer, 2015
4. Philip Jan Rothstein, IT Disaster Recovery Planning For Dummies, Wiley Publishing Inc, 2007

Principles of Management and Entrepreneurship in IT
BIT 451MS

Year: IV Semester: II

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal		Final		Total
			Theory	Practical	Theory	Practical	
3	1	0	20		80	-	100

Course Objectives:

The primary objective of this course is to present and explore current trends and changes in the nature, process and practice of management and entrepreneurship and innovation in the development, implementation and application of information technology.
The secondary objectives ofThe IT Entrepreneurship track prepares students to identify, select, and launch new IT innovations, products, and services, for enterprises in global market in new and existing organizations.

Course Contents:

1. **Introduction to Management** **3Hrs**
   Concept and scope of management.levels, principles, functions, of management, roles and skills of managers, women in organizational hierarchy**.**

2. **Organization Design** **3Hrs**
   Concept, principles, and benefits of organizing, Approaches to organization, organization design, departmentation, formal and informal organization, authority and responsibility, decentralization of authority**.**

3. **The Foundation of Entrepreneurship** **5Hrs**
   The world of entrepreneur, what is entrepreneur, the benefits of entrepreneurship, the potential drawbacks of entrepreneurship, behind the boom: what's feeding the entrepreneurial fire? The cultural diversity of entrepreneurship, The ten deadly mistakes of entrepreneurship, and how to avoid the pitfalls.

4. **Conducting a Feasibility Analysisand Crafting Winning Business Plan 5Hrs**
   Conducting a feasibility analysis, why develop a business plan, the elements of business plan, making the business plan presentation, conclusion and business plan format.

5. **Forms of Business Ownership, Franchisingand the Entreprenuer** **4Hrs**
   The sole proprietorship, partnership and corporation.Other forms of ownership. Types of franchising, the benefits of buying a franchise, the drawbacks of buying franchise, the right way to buy a franchise

6. **Building a Powerful Marketing Plan** **4Hrs**

Building a guerrilla marketing plan, pinpointing the target market, determine customer needs and wants through market research, plotting a guerrilla marketing strategy, marketing on the WWW and the marketing mix.

7. **Choosing the right location and Layout** **4Hrs**
   A source of competitive advantage, location criteria and option for service business, the location decision for retail, manufactures and service business, layout: maximizing revenues, increasing efficiency and reducing costs.
8. **E-commerce and the Entrepreneur** **5Hrs**
   Benefits of selling on the web, factors to consider before launching into E-commerce, twelve Myths of E-commerce, strategies for E-commerce, designing a killer web site, tracking web results, and ensuring web privacy and security.

9. **Entrepreneur of IT** **8Hrs**
   Marketing information of Technology Products, technological lifecycle, classification of buyers in information technology market, technological SWOT, techno ready marketing, how and why customers adopt information technology, issues in technology management, mechanism and modes of technology transfer, information technology transfer to developing countries, information technology as the wealth of nation.

Note: Case study and Presentation on the basis of chapter 8, 9. **4Hrs**

References Books:

1. Essential of Management, Harold Koontz and Heinz Weihrich, Tata McGraw Hill Publishing Company Limited
2. Essential of entrepreneurship and Small Business Management, Thomas W. Zimmer and Norman M. Scarborough, PHI
3. Principles of Marketing, Philip Kotler and Gary Armstrong, Pearson Education Asia

Apprentice Project
BIT453CO

Year: IV **Semester: II**

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 2-tire or 3-tire or n-tire application using any RDBMS tool.

Course Contents:

A total of 45 lab hours covering all features Client side scripting; Server Side scripting (2-tire or 3-tire or n-tire application) using any RDBMS tool will be assigned to every student. Students must develop the assigned application software.

Project Evaluation Criteria for Internal assessment:

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

- Title identification and Proposal Writing— 10 Marks
- Mid-term Presentation — 20 Marks
- Pre-final Submission and final Presentation — 30 Marks

Project Evaluation Criteria for External assessment:

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

- Project Documentation— 20 Marks
- Final Presentation — 10 Marks
- VIVA--- 10 Marks

Note: Final Project Documentation should be in APA Format.

Natural Language Processing
BIT471CO

Year: IV **Semester: II**

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

Course Objective:
To understand the basics of speech and language processing, apply conventional techniques in NLP and to design a TTS and ASR system.

Contents:

Unit 1
Introduction to NLP: Definition, issues and strategies, application domain, tools for NLP, Linguistic organisation of NLP, NLP vs PLP, Word Classes review of Regular Expressions, CFG and different parsing techniques

Unit 2
Morphology: Inflectional, derivational, parsing and parsing with FST, Combinational Rules, Phonology: Speech sounds, phonetic transcription, phoneme and phonological rules, optimality theory, machine learning of phonological rules, phonological aspects of prosody and speech synthesis.

Unit 3
Pronunciation, Spelling and N-grams: Spelling errors, detection and elimination using probabilistic models, pronunciation variation (lexical, allophonic, dialect), decision tree model, counting words in Corpora, simple N-grams, smoothing (Add One, Written-Bell, Good-Turing), N-grams for spelling and pronunciation.

Unit 4
Syntax: POS Tagging: Tagsets, concept of HMM tagger, rule based and stochastic POST, algorithm for HMM tagging, transformation based tagging

Module 5
Sentence level construction & unification: Noun phrase, co-ordination, sub-categorization, concept of feature structure and unification Semantics, Representing Meaning: Unambiguous representation, canonical form, expressiveness, meaning structure of language, basics of FOPC, Semantic Analysis: Syntax driven, attachment & integration, robustness

Module 6
Lexical Semantics: Lexemes (homonymy, polysemy, synonymy, hyponymy), WordNet, internal structure of words, metaphor and metonymy and their computational approaches, Word Sense Disambiguation:

Selectional restriction based, machine learning based and dictionary based approaches.

Module 7

Pragmatics: Discourse: Reference resolution and phenomena, syntactic and semantic constraints on Co-reference, pronoun resolution algorithm, text coherence, discourse structure, Dialogues: Turns and utterances, grounding, dialogue acts and structures, Natural Language Generation: Introduction to language generation, architecture, dicourse planning (text schemata, rhetorical relations.

Reference Books:

1.D. Jurafsky& J. H. Martin – "Speech and Language Processing – An introduction to Language processing, Computational Linguistics, and Speech Recognition", Pearson Education

2. Allen, James – "Natural Language Understanding". Benjamin/Cummings, 2nd Edn.,1995
3. Bharathi, A., Vineet Chaitanya and Rajeev Sangal., Natural Language Processing- "A Pananian Perspective", Eastern Economy Edition, PHI, 1995
4. Eugene Cherniak: "Statistical Language Learning", MIT Press, 1993.
5. Manning, Christopher and Heinrich Schutze, "Foundations of Statistical Natural Language Processing". MIT Press, 1995

SupplyChain Analytics
BIT472MS

Year: IV **Semester: II**

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

Course Objective:

The main objective of course is to introduce how data analytics and machines learning can be applied in the supply chain management field to provide meaningful insights in decision making.

Course Contents:

Unit 1:Introduction **[5 Hrs]**

Definition of Supply chain, Need of Supply Chain, Structure of Supply Chain, Supply Chain Process, Supply Chain Flows, Supply Chain Management, Business Analytics, Supply Chain Analytics, SMART Goals of Supply Chain Analytics

Unit 2:Data driven Supply Chain **[6 Hrs]**

Data and its value in supply Chain Management, Data Source in supply chains, Big Data,Introduction to Python

Unit 3:Data Manupulation **[4 Hrs]**

Data loading and writing,Data Indexing and selection, data Merging and Combination, Data Cleaning and Preparation, Data Computation and aggregation

Unit 4:Data Visualization **[6 Hrs]**

Data Visualization in Python, Creating a figure in Python, Formatting a figure, Plotting simple charts, Plotting with Seaborn, Geographic mapping with Basemap, Visualizing wiStarbucks Location

Unit 5:Customer Management **[5 Hrs]**

Customers in Supply Chain, Benefits of Customer-Centric Supply Chain, Building Customer Centric Supply chain, Cohort Analysis, RFM Analysis, Clusturing Algorithms

Unit 6:Supply Management **[5 Hrs]**

Procurement in Supply Chains, Supplier Selection, Supplier Evaluation, Supplier Relationship Management, Supplier Risk Management, Supplier Selection Examples, Regression Algorithms

Unit 7: Warehouse and inventory Management **[5 Hrs]**

Warehouse Management, Inventory Management, Warehousing Optimization, Classification Algorithms

Unit 8: Demand Management **[5Hrs]**

Demand Management, Demand Forecasting, Time Series Forecasting, Machine learning Methods

Unit 9: Logistics Management **[5 Hrs]**

Definition of Logistics Management, Mode of Transports in Logistics, Logistics Service providers,Global Logistics Management, Logistics Network design, Route Optimization

Laboratory Work:

There shall be laboratory classes on data visualization as applied to supply chain analytics using Python.

Reference Books:

1. Kurt Y. Liu, "Supply Chain Analytics : Concepts, Techniques and Applications", Palgrave macmillan

2.Nicoleta Tipi," Supply Chain Analytics and Modelling Quantitative Tools and Applications", Kogan Page Ltd.

Big Data
BIT478CO

Year: IV **Semester: II**

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

Course Objectives:

The objective of this course is to familiarize the concept of big data in business intelligence and big data analytics and perform map-reduce analytics.

Course Contents:

Unit 1: Introduction **[5 Hrs]**

- Overview of Big Data
- Background of Data Analytics
- big data use in Distributed system
- development of big data,
- Current Trend in Big Data Analytics
- benefits of Big data, Applications of Big data

Unit 2: MapReduce Applications **[8 Hrs]**

- Map reduce fundamentals
- MapReduce workflows
- anatomy of Map Reduce job run,
- Fault tolerance
- Real world problems
- Scalability goal
- Optimization and data locality
- Parallel Efficiency of Map-Reduce

Unit 3: Data Management **[12 Hrs]**

Structured and Unstructured Data

- Taxonomy of NoSQL Implementation
- Schemaless databases

- Basic architecture of Hbase, Cassandra and MongoDb
- Partitioning and combining, composing map-reduce calculations

Unit 3: Fundamentals of HADOOP **[10 Hrs]**

- Analyzing data with Hadoop,
- Hadoop streaming,
- Hadoop pipes and design of Hadoop ,
- distributed file system (HDFS) ,
- HDFS concepts, Hadoop I/O,
- data integrity,
- compression,
- serialization,
- file-based data structures

Unit 5: HADOOP Tools

[10 Hrs]

- Data model and implementations
- Hbase examples
- Cassandra data model with examples
- Cassandra clients, pig data model
- developing and testing Pig Latin scripts
- Hive
- data types and file formats
- HiveQL data definition
- HiveQL data manipulation
- HiveQL queries.

Laboratory Works:

The practical work consists of all features of big data.

Reference Books:

1. Jeffrey Dean, Sanjay Ghemawat, Map reduce, "simplified data processing on large clusters
2. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
4. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
5 . Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

MobileAppdevelopment
BIT479CO

Year: IV **Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	Tutorial	Practical	Internal		Final		Total
			Theory	Practical	Theory	Practical	
3	1	2	20	50	80	-	100

Course Objective:

The main objective of this course is concerned with the development of applications on mobile and wireless computing platforms. Android will be used as a basis for teaching programming techniques and design patterns related to the development of standalone applications and mobile portals.

Course Contents:

Unit 1: Introduction **[5 Hrs]**

- History of mobile devices
- Modern mobile operating systems and their architecture
- Wireless communications standards
- Data transmission standards
- Software distributions systems for mobile devices
- Preparing programming tools for a mobile application developer

Unit2 2: Mobile Platforms **[5 Hrs]**

- Mobile programming languages
- Challenges with mobility and Wireless communication
- Location-aware applications
- Mobile platform constraints
- Emerging technologies

Unit 3: Introduction to Android: **[4 Hrs]**

- Introduction to Android platform:
    - virtual machine,
    - development tools,

    - Java packages,
    - emulators,
    - services
- Folder structure of an android project
- Anatomy of Android Application,
- Android Manifest File and its common settings

Unit 4: Android Application Design Essentials [8 Hrs]

- User Interface Screen elements,
- Designing User Interfaces with Layouts,
- Android View Hierarchy system
- Linear and Relative Layout elements and essential attributes
- Building responsive layout with constraint Layout
- Adding motion to layout using Motion Layout
- Creating List with Recycler View
- Styling layout elements with style assets
- Drawing and Working with Animation.

Unit 5: Writing basic application in Android [8 Hrs]

- Android Context & Application Context
- Hello world application in android
- Activities and Activity Life Cycle
- Event Handling
- Services & Intents - Receiving and Broadcasting Intents,
- Using Intent Filter,
- Providing necessary permissions to application from manifest and run time permissions

Unit 6: Data handling in android [5 Hrs]

- Using Android Data and Storage APIs
- Data management using SQLite
- Using Android preferences,
- Sharing Data Between Applications with content providers

Unit 7: Developing real time application [5 Hrs]

- Using common android APIs
- Android Telephony APIs
- Application security and permissions: security architecture, application signing, user identification, file access, declaration and verification of permissions
- In app messaging using broadcast
- Consuming RESTful APIs in android application

Unit 8: Debugging, Testing & Deployment [3 Hrs]

- Testing Android applications,
- Localization of applications, application signing, version management, licenses, preparing for distribution
- Publishing Android application,

Unit 9: Recent Concepts & Trends **[2 Hrs]**

- Application Monetization
- Introduction to Location Kit
- Introduction to ML Kit

Laboratory work:

Laboratory work consists of following laboratory exercises.

Exercise 1

- Preparing environment for android studio
- Hello World Application in android
- Deploying in simulator & real device

Exercise 2

- Creating Applications with Multiple Activities
- Message passing with Intents
- Setting Permissions in manifest as well as real time permission

Exercise 3

- Menu driven applications and Parsing XML Files
- Using Recycler View for list of items

Exercise 4

- Graphics Support in Android
- Drawables& Assets
- Playing with animations in Android

Exercise 5

- Using SQLITE in Android
- State management using StoredPreferences

Exercise 6

- Content Providers
- Media Store

Exercise 7

- Location Services and Google Maps in Android
- Obtaining User Location
- Creating Status Bar Notifications

Exercise 8

- Distributing APK manually
- Distributing via Google Play Store
- Concept of App Monetization

Reference Books:

1. Mobile Computing: Technology, Applications, and Service Creation – Asoke K. Talukder, Roopa R. Yavagal - McGraw-Hill Communications Engineering 2007
2. Android Programming: The Big Nerd Ranch Guide (Big Nerd Ranch Guides) 4th Edition
3. Android in Practice - Charlie Collins, MichaleGalpin, Matthias Kaeppler –Manning publications 2012

Incident Response and Management System
BIT485CO

Year: IV **Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
Theory	**Tutorial**	**Practical**	**Internal Assessment**		**Final**		**Total**
			Theory	**Practical**	**Theory**	**Practical**	
3	**1**	**1**	**20**	**20**	**60**	**-**	**100**

Course Objective:

To provide the concepts of Incident Response and Management and can demonstrate and implement the ability, knowledge and skills to be competent managers in the rapidly changing incident management platform and be able to apply these in practical contexts.

Course Contents:

Unit 1: Introduction to Incident Response System [5 Hrs]

- Introduction to Incident Response System
- Incident Command Systems
  - National Emergency Operation Center
  - Regional Emergency Operation Center/Provincial Emergency Operation Center
  - District Emergency Operation Center
  - Crisis Management Centers etc.
- Crisis Management Now and then (Case Studies)

Unit 2: Functioning of IRS [5 Hrs]

- Primary management functions
- Management by Objectives
- Unity and Chain of Command
- Organizational flexibility
- Unified Command
- Span of control

Unit 3: Resources and Infrastructure Management [6 Hrs]

- Common terminology
- Personnel accountability
- Integrated communications
- Resources management
- Establishment and transfer of command
- The Incident Action Plan

Unit 4: Incident Decision System and Reporting [8 Hrs]

- Early Warning Systems or Pre-Alert Systems
  - Epidemic and Pandemic Alert System
  - Hydrological and meteorological stations
  - Flood forecasting
  - Road Condition Alert/Information System
  - Glacial Lake Outburst Flood (GLOF) warning systems
  - Lightning Warning Systems, forest fire alert systems etcs)
- Utilizing Mass Media platform
  - Push message/notifications,
  - Paper Media,
  - Radio
  - Television
  - Social Media Platform
  - Other new-media and online mediums
  - Community Chaining etc.
- Role of Nepal Police, Armed Police Force and Nepal Army, Nepal Scout, RedCross and other line agencies into incident response
-

Unit 5: Disaster Recovery Portals [8 Hrs]

- DRR Portal Fundamentals
- Verifying datas for Real Time Information Platforms
- Developing DRR Portals
- Food Stock, SAR Materials and Medical Stock Record Management
- Integrating Alert/Warning Systems, various National Database into NEOC or DRR Portals
- Case Studies and DRR Experience of Nepal

Unit 6: Phases of Disaster Management [7 Hrs]

- Four Phases of DM (Mitigation, Preparedness, Response, and Recovery),
- Five Phases of DM (Prevention, mitigation, preparedness, response and recovery).
- Components of DM (Hazard Assessment Mapping, Vulnerability Mapping, Demographic Distribution, Infrastructure Lifelines and critical Facilities, logistics and transportation routes, human and material response resources, communication facilities etc.)

Unit 7: Cyber threats and Disaster Management [6 Hrs]

- Recovery of Data from DR Site
- Managing Scams and Spams, Fake News and Hoax
- Securing and utilizing DR sites
- Connecting the risks: critical infrastructure, cyber security and cascading effects
- Cyber security and the Sendai framework for disaster risk reduction
- Holistic risk assessments – interconnected and interdependent
- Risk-informed strategies and sustainable investments
- Adapting risk management capacity to a changing risk dynamic

Notes: Students need to perform Software Requirement Specification and develop prototype of Incidence Response System to secure 20 marks in practical.

Reference Books:

1. Jamie Watters, Disaster Recovery, Crisis Response, and Business Continuity: A Management Desk Reference, APress, 2014
2. Gerard Blokdijk, Disaster Recovery 100 Success Secrets: IT Business Continuity, Disaster Recovery Planning and Services, Emereo Publishing, 2008
3. Michael Wallace, Lawrence Webber, The Disaster Recovery Handbook, Amacom, New York, 2018
4. Vincent Faggiano, John McNall and Thomas T. Gillespie, Critical Incident Management: A Complete Response Guide, Second Edition, CRC Press, New York, 2012
5. Louis N. Molino & Sr., Emergency Incident Management Systems: Fundamentals and Applications, John Wiley & Sons, Inc., New Jersey, 2006
6. Rob Schnepp, Ron Vidal, and Chris Hawley, Incident Management for Operations, O'Reilly Media, Inc., 2017

Climate Change Risk Management
BIT486CO

Year: IV **Semester: II**

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

Course Objective:

To provide the concepts of World Climate Change issues and risk management due to climate change in various areas. After completion of the course students can demonstrate and implement the ability, knowledge and skills to be competent managers in the rapidly changing Climate Change issues through Green Computing environments.

Course Contents:

Unit 1: Overview of Climate Change Science [4 Hrs]

- Overview
- Earth's climate is changing
- The extent of future climate change
- Climate change impacts on health, environment, and economy

Unit 2: Causes of Climate Change [4 Hrs]

- Earth's temperature: Green House Effect, Sun's Energy, Reflectivity affect
- Mountain Resources, Snow Packs, Water resources, Coastal zones, Agriculture, Rangelands and livestock, Human health, Energy, Forests, Biodiversity, Fisheries etc.

Unit 3: Future of Climate Change [5 Hrs]

- Increasing greenhouse gas (GHG) concentrations will have many effects
- Future temperature changes
- Future ice, snowpack, and permafrost
- Future sea level change
- Future precipitation and storm events
- Future ocean acidification

Unit 4: Climate Change Impacts **[5 Hrs]**

- Climate change impacts in Nepal
- Extreme Heat
- Climate change impacts on Human Health
- Climate impacts on Ecosystems
- Impacts by Sector: Energy, Agriculture, coasts, forests, Society, transportation, water resources, mountain resources, tourism etc.
-

Unit 5: Climate Change Indicators **[5 Hrs]**

- Greenhouse Gasses
- Weather and climate
- Precipitation (Heavy Precipitation, river flooding, drought)
- High and low temperature
- Snow level and depths, snowfalls, snow covers, glaciers, lake ice, snow packs etc.
- Sea Level, sea surface temperature, ocean acidity, coastal flooding
- Health and Society, heat related illness and deaths, Lyme diseases, length of growing season, ragweed pollen season
- Ecosystem, wildfires, streamflows, lake water levels and temperatures, birds wintering/migration ranges, species distributions, leaf and bloom dates

Unit 6: Climate Change and Extreme Weather **[4 Hrs]**

- Changes in Extreme Weather and Climate Events
- Trends in Specific Extreme Weather Events
- Adaptation: Reducing the Threat of Climate Change and Preparing for Impacts

Unit 7:ICT for Climate Change **[10 Hrs]**

- An Introduction to Climate Change and Green Growth
- World of Tomorrow: Computer Simulation Models
- ICT Trends and their Implications for Tackling Climate Change
- ICT Applications for Adapting to Climate Change
- ICT Applications for Mitigating Climate Change
- ICT for Green Growth and Sustainable Development

Unit 8: Climate Change Impacts and Risk Analysis (CIRA) **[8 Hrs]**

- CIRA Framework
- Temperature Projections
- Precipitation Projections
- Sea Level Rise Projections
- Other forecasting and projections

Notes: Students need to perform hazard/vulnerability area mapping using GIS application to secure Practical 20 Marks in practicals.

Recommended Readings

1. Sue Roaf, David Crichton and Fergus Nicol, Adapting Buildings and Cities for Climate Change, Architectural Press, 2009
2. Robert M. May, The Britannica Guide to Climate Change: An Unbiased Guide to the key issue of our age, Encyclopedia Britannica Inc, 2008
3. Leslie Lipper, Nancy McCarthy, David Zilberman and Solomon Asfaw, Giacomo BrancaClimate Smart Agriculture: Building Resilience to Climate Change, Springer, 2018

4. Jan F. Feenstra, Ian Burton, Joel B. Smith and Richard S.J. Tol, Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies, UNEP, 1998
5. O'Neill, M. , Green IT for Sustainable Business Practice. British Computer Society, 2010
6. Kuehr, R. and Williams, E. (eds)., Computers and the Environment: Understanding and Managing Their Impacts. Kluwer Academic Publishers, 2009

Disaster Governance
BIT487CO

Year: IV **Semester: I**

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

Course Objective:

The main objective of this course is to provide students with the concepts of Electronic and Digital Governance model to address Disaster/Incident Response and Management so that they can demonstrate and implement the knowledge and skills in practical context and can become competent policy makers regarding disaster risk reduction and incident management.

Course Contents:

Unit 1: Overview of Digital Governance [[6 Hrs]

- Introduction to Digital Governance
- Types of Interaction in Digital Governance
- Digital Governance Infrastructure
- E-Readiness of Government Services
- Government Data Center and Government Cloud
- ICT and Government Application

Unit 2: Knowledge Management in Digital Governance [4 Hrs]

- Introduction
- Types of Knowledge
- Disaster Knowledge Repository

Unit 3: Overview of Disaster [5 Hrs]

- Introduction
- The Environment and Disaster Risk
- Natural and Non-natural Disasters
- Disaster and Digital Divide
- Addressing Vulnerabilities
- Health Aspects
- Sendai Framework

Unit 4: Disaster Governance [5 Hrs]

- Introduction
- Measures of Effectiveness of Disaster Governance
- Disaster Management now and then
- Coping Climate Change Practices
- Determinants of Good Disaster Governance
- Urban Disaster Governance
- Sustainable Development Goals and Disaster

Unit 5: Governance in Disaster Mitigation [7 Hrs]

- Critical Infrastructure Planning
- Preparing Social Security Database
- Disaster Management Consortium and Expert Rosters
- Search and Rescue (SAR) Planning
- Policy Development for Disaster Risk Reduction

Unit 6: Governance in Disaster Preparedness [7 Hrs]

- Geo-Projections of Disaster
- Preparing Evacuation Plan
- Simulating Search and Rescue operation
- Public Awareness
- National Strategy for Disaster Risk Management in Nepal (NSDRM)
- Developing focal points, national and local platforms for Disaster Risk Reduction.

Unit 7: Governance in Disaster Response [7 Hrs]

- Activating Disaster Response team
- Relief Distribution
- Safe Evacuation of affected peoples
- Managing and Transforming Infrastructure and Resources
- Transforming of funds for Disaster, Early Distribution of Disaster Relief Fund
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Unit 8: Governance in Disaster Recovery [4 Hrs]

- Post-Disaster Recovery Planning
- Restoration of Critical Infrastructure
- Developing Knowledge Repository from Disaster
- Updating Mitigation Plan referring recent disaster learning

Notes: Students need to formulate Planning Documents based on any phases of Disaster Management to secure 20 marks in practical.

Reference Books:

1. Melanie Gall, Susan L Cutter and KhaiHoan Nguyen, Governance in Disaster Risk Management, Technical Report, ResearchGate.net, 2014
2. Indrajit Pal and Rajib Shaw, Disaster Risk Governance in India and Cross Cutting Issues, Springer 2017
3. R. Subramanian, Disaster Management, Vikas Publishing House, India, 2018
4. Jeffrey B. Bumgarner, Emergency Management: A Reference Handbook, ABC-Clio., 2008
5. Kevin M. Cahill, More with Less: Disasters in an Era of Diminishing Resources, Fordham University Press, 2012
6. Thomas A. Birkland, Lessons of Disaster: Policy Change after Catastrophic Events, Georgetown University Press, 2006