

SHSB1102	GENERAL ENGLISH – I	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide opportunities for students to read and respond to representations of current issues
- To prepare the students to effectively communicate by applying reflective thinking practices
- To provide an opportunity to the students to improve their vocabulary
- To create and apply lateral and critical thinking
- To learn academic writing strategies

UNIT 1**9 Hrs.**

Listening to identify vocabularies- Self Introduction - Developing dialogue between characters -Talking about neighbours, family members, likes and dislikes, Reading Comprehension strategies- Parts of Speech- Kinds of Sentences Connectives and Discourse markers - Rearranging the Jumbled sentences, E-Mail Writing.

UNIT 2**9 Hrs.**

Listening for Inference- Just a Minute speech- Types of words- Compound words, abbreviations and acronyms, Word Association- Tenses and its Types- Voice- Impersonal Passive- Rules of Passive voice formation - Transcoding - Encoding and Decoding- Bar chart, Pie Chart.

UNIT 3**9 Hrs.**

Listening to telephonic talk to fill blanks- Giving information- travel, hotel booking, making enquiries about availability of seats for admission, asking about courses - Question Tags - Open ended and Close ended questions, Concord, Single - Line Definition - Note Making - Preparing checklists.

UNIT 4**9 Hrs.**

Listening to summarise the information- Reading and identifying the topic sentence, - Editing - Punctuation- Error Corrections, 'If 'Conditionals, Idioms & Phrases, Instructions & Recommendations - Drafting a brochure/Advertisement.

UNIT 5**9 Hrs.**

Listening to Movie reviews and book reviews, Listening and summarizing- Giving impromptu talks - Reading and Summarizing -Types of words- Homonyms, Homophones, eponyms, acronyms- Writing a Paragraph, Descriptive Essay, Dialogue Writing.

Max. 45 Hrs.**COURSE OUTCOMES**

On the completion of the course, student will be able to

- CO1** - Remember knowledge of linking words related to both spoken and written discourse
- CO2** - Understand collocations, words to express one's point of view in both writing and speaking
- CO3** - Apply the rules for writing compare and contrast paragraphs by using cohesive devices based on prompts given
- CO4** - Analyse critical thinking skills by framing questions related to elements of reasoning
- CO5** - Evaluate written pieces to self-correct in the topic areas of verbs, reported speech, and punctuation
- CO6** - Equip the students with the required Professional Skills

TEXT / REFERENCE BOOKS

1. Sen S, Mahendra et al. (2015) Communication and Language Skills. Foundation books. Chennai
2. Strunk, William Jr., and E.B. White. The Elements of Style. Allyn and Bacon, 2000.
3. Murphy, Raymond. English Grammar in Use. Cambridge University Press, 2012.
4. Thomson, A.J., and A.V. Martinet. A Practical English Grammar. Oxford University Press, 1986.
5. Straus, Jane. The Blue Book of Grammar and Punctuation. John Wiley & Sons, 2014.
6. O'Conner, Patricia T. Woe is I: The Grammarphobe's Guide to Better English in Plain English. Riverhead Books, 2019

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 marks each uniformly distributed - No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 marks****80 Marks**

SMTB1111	ANCILLARY MATHEMATICS I FOR COMPUTER SCIENCE (for B.Sc CS, CS with AI, DS, IT and BCA)	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- The ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

UNIT 1 MATRICES**9 Hrs.**

Characteristic Equation of a square matrix - Eigen values, Eigen vectors of a real matrix, Properties of Eigen values and Eigen vectors. Cayley Hamilton Theorem (without proof) Verification - Finding inverse and power of a matrix.

UNIT 2 DIFFERENTIAL CALCULUS**9 Hrs.**

Differentiation of all standard functions (without proof): Product rule, quotient rule, function of a function rule, logarithmic differentiation, differentiation of implicit function, Successive differentiation, Partial derivatives (simple problems only).

UNIT 3 INTEGRAL CALCULUS**9 Hrs.**

Methods of Integration - Integration by parts-Bernoulli's formula- Definite Integrals - Properties of Definite Integrals-Simple problems.

UNIT 4 CORRELATION AND REGRESSION**9 Hrs.**

Karl Pearson's Correlation Coefficient, Spearman's Rank Correlation Coefficient, Tied Ranks - Linear Regression Analysis - Fitting of Straight line and Parabola by the method of Least Squares.

UNIT 5 PROBABILITY CONCEPTS**9 Hrs.**

Definitions, Sample Space, Events, Addition Law of Probability - Conditional Probability - Multiplication law of Probability-Bayes's theorem (without proof)-problems

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Manipulate power, inverse, Eigen values and Eigenvectors of a matrix.
- CO2** - Describe ordinary and partial derivatives of standard functions by various methods
- CO3** - Evaluate the integrals of standard functions by various methods.
- CO4** - Evaluate correlation, regression and generate straight line and parabola.
- CO5** - Apply the concept of probability to solve the problems.
- CO6** - Evaluate conditional probability using Bayes theorem.

TEXT / REFERENCE BOOKS

1. T.K.Manickavachagam Pillai, Matrices, S.Viswanathan Printers & Publishers, 2012.
2. Dipak Chatterjee, Integral Calculus and Differential equations, TATA McGrawS Hill Publishing Company Ltd., 2000.
3. Narayanan, T.K. Manichavasagam Pillai, Calculus, Vol. I, S. Viswanathan Printers Pvt. Limited, 2007.
4. P. R. Vittal, Mathematical Statistics, Margham Publications, Chennai, 2002.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB1101	PROBLEM SOLVING TECHNIQUES WITH C	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the fundamental of PST and methodologies which are essential to building good C program.
- To demonstrate a thorough understanding of modular programming by designing programs which require the use of programmer - defined functions.
- To demonstrate Structures, pointers and file processing in C

UNIT 1 INTRODUCTION TO COMPUTER PROBLEM SOLVING**9 Hrs.**

Algorithms - Building blocks of algorithms (statements, control flow, functions) -Notation (pseudo code, flow chart) - Algorithmic problem solving for socio economic conditions in global perspectives - Simple strategies for developing algorithms (iteration, recursion) - Efficiency of algorithms.

UNIT 2 BASICS OF C PROGRAMMING**9 Hrs.**

Introduction to C: Features of C - Structure of C Program-Data Types- 'C' Tokens-Input/output statements-Control Statement, Functions: - Types of Functions -Recursion. Algorithms: Reversing the digits of a number - Generation of Fibonacci sequence- Factorial Computation.

UNIT 3 ARRAYS AND STRINGS**9 Hrs.**

Arrays: Single and Multidimensional Arrays-- Array as Function Arguments, Strings: Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, String-handling Functions, Example Programs (with and without using built-in string functions).

UNIT 4 STRUCTURES**9 Hrs.**

Structure: Nested Structures - Array of Structures - Structure as Function Argument-Function that Returns Structure, Union. Algorithms: Sum of array elements- Removal of duplicates from an array- Finding the Kth smallest element.

UNIT 5 POINTERS AND FILE PROCESSING**9 Hrs.**

Pointers: Introduction, Arrays Using Pointers - Structures Using Pointers - Functions Using Pointer, Dynamic Memory Allocation, Storage Classes, File Handling in 'C'. Algorithms: Swap elements using Call by Reference - Sorting Arrays using pointers- Finding sum of array elements using Dynamic Memory Allocation.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Develop solutions for the given problem.
- CO2** - Understand and design solutions for a problem
- CO3** - Able to understand variables, tokens and keywords in C
- CO4** - Design and Implement applications using memory allocation, arrays and string
- CO5** - Understand and design programs using structures and unions
- CO6** - Demonstrate file processing functions in C

TEXT / REFERENCE BOOKS

1. Dromey.R.G, "How to Solve it by Computer", Prentice-Hall of India, 8th Indian Reprint, 2008.
2. Aho.A.V., Hopcroft.J.E and Ullman.J.D, "The Design and Analysis of Computer Algorithms", Pearson education, 2004.Deitel and Deitel, C how to Program, 7th Eition, Pearson Education, 2013.
3. Brian W.Kernighan and Dennis M.Ritchie, The C Programming Language, Pearson Education, 2015.
4. Yashavant Kanetkar, Understanding Pointers in C, 4th Revised & Updated Edition, Bbp Publications, 2008.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 marks each uniformly distributed - No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 marks****80 Marks**

SBSB1102	FUNDAMENTALS OF COMPUTER TECHNOLOGY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basic of computer and working with OS.
- To learn about internet, its types and its applications.
- To understand basics of communication and networks.

UNIT 1 INTRODUCTION TO COMPUTERS**9 Hrs.**

Definition-Characteristics of a computer - Classification of Computers - Basic Anatomy of the Computer- Applications/ Uses of Computers in different fields.

UNIT 2 INPUT AND OUTPUT DEVICES**9 Hrs.**

Input devices- Output devices- Data Representation - Programming Languages/ Computer Languages – Software: System software - Application software.

UNIT 3 DATA COMMUNICATION AND COMPUTER NETWORKS**9 Hrs.**

Data Communication- Computer Network- The Uses of a Network- Types of Networks- Network Topologies- Transmission Media: Guided Transmission Media - Wireless Transmission.

UNIT 4 INTERNET AND ITS APPLICATIONS**9 Hrs.**

History of Internet- Uses of Internet- Advantages of Internet - ISP - Internet Services - IP Address - Web Browser - URL - DNS - Internet Explorer - Types of Internet Connections - E-mail - Search Engine.

UNIT 5 OPERATING SYSTEM**9 Hrs.**

Evolution of Operating Systems- Function of Operating System - Classification of Operating system - Example of Operating System - DOS- Windows - UNIX- Linux.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Converse in basic computer terminology
- CO2** - Apply algorithmic reasoning to a variety of computational problems
- CO3** - Solve basic computational problems
- CO4** - Formulate opinions about the impact of computers in society
- CO5** - Posses the knowledge of basic hardware peripherals
- CO6** - Describe the use of internet and its applications

TEXT / REFERENCE BOOKS

- Alexis Leon and Methews Leon “Fundamentals of information Technology” Vikas Publishing House Pvt. Ltd.
- Introduction to Information Technology, P.Rizwan Ahmed, Second Edition, Margham Publications, 2016.
- Introduction to Information Technology, Pelin Aksoy, Leura DeNardis, Cengage Learning India Pvt.Ltd.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB2101	PROBLEM SOLVING TECHNIQUES LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Program to find GCD.
2. Program to find the max and min from the three numbers.
3. Program to find Exponentiation.
4. Program to find sum of an array of numbers.
5. Program to implement Sine function computation.
6. Program to Generate the Fibonacci sequence.
7. Program to find the roots of a Quadratic equation.
8. Program for reversing the digits of an integer.
9. Program to find the smallest divisor of an integer.
10. Program to Generate Prime Numbers.
11. Program for Removal of Duplicates.
12. Program to find the kth smallest Element.
13. Program for finding the factorial using recursive and non-recursive functions

SHSB1201	GENERAL ENGLISH- II	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide opportunities for students to read and respond to representations of current issues through texts that present themes and topics that are familiar, insightful and informative.
- To provide an opportunity to the students to improve their vocabulary
- To develop skills relating to creative writing.
- To provide an opportunity to the students to improve their Spoken Language.
- To comprehend the overall idea of a written and oral context.

UNIT 1**9 Hrs.**

Listening for details, Speaking - making a presentation, reading for details and Global Comprehension Vocabulary Binomials, Types of Words- Synonyms, Antonyms that describe people, things and their actions - Paired Expressions -Letter Writing - Informal Letters- Letter to a Friend / Family Members - Creating blogs to post written materials.

UNIT 2**9 Hrs.**

Listening for details - Speaking: Giving Interview, Public Speech based on specific topics given. Reading for Comprehension and for overall idea - Vocabulary: phrases - Sentence Pattern - Contextual guessing of words- Singular, Plural- Letter writing- Formal letters- Inviting dignitary for a function, Application for job with resume.

UNIT 3**9 Hrs.**

Listening for details - Telephonic conversation - Speaking: Narrating a Story - Vocabulary: positive and negative connotations - Language Focus: Adjective- Degrees of Comparison, Direct and Indirect Speech - Types of Sentences (simple, compound, complex) - Collocations -Letter to the Editor (Social Issues) - Hints Development.

UNIT 4**9 Hrs.**

Listening for Overall information - Making requests and suggestions - Speaking: Group Discussion - Vocabulary: Homonyms and Homophones - Language Focus: Transitive and Intransitive verbs - Writing: Precis writing, Story Writing - Process description (Flow chart).

UNIT 5**9 Hrs.**

Listening for specific details - Speaking using imagination. Reading to identify facts - Language focus: Modal Auxiliary Verbs Writing: Imaginative writing by predicting, Argumentative Essay, Writing a Book or Film review. Vocabulary: Countable and Uncountable Nouns, foreign nouns and framing of plurals.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Remember knowledge of linking words related to both spoken and written discourse
- CO2** - Understand collocations, words to express one's point of view in both writing and speaking
- CO3** - Apply the rules for writing compare and contrast paragraphs by using cohesive devices based on prompts given
- CO4** - Analyse critical thinking skills by framing questions related to elements of reasoning
- CO5** - Evaluate written pieces to self-correct in the topic areas of verbs, reported speech, and punctuation
- CO6** - Equip the students with the required Professional Skills

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1. Sen S, Mahendra et al. (2015) *Communication and Language Skills*. Foundation books. Chennai
2. Strunk Jr., William, and E.B. White. *The Elements of Style*. Allyn and Bacon, 2000.
3. Murphy, Raymond. *English Grammar in Use*. Cambridge University Press, 2019.
4. Thomson, A.J., and A.V. Martinet. *A Practical English Grammar*. Oxford University Press, 2013.
5. Straus, Jane. *The Blue Book of Grammar and Punctuation*. John Wiley & Sons, 2014.
6. Swan, Michael. *Practical English Usage*. Oxford University Press, 2016

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B :** 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SMTB1209	ANCILLARY MATHEMATICS IIFOR COMPUTER SCIENCE (for B.Sc CS, CS with AI, DS, IT and BCA)	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- The ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

UNIT 1 LOGIC**9 Hrs.**

Propositional calculus - propositions, logical operators, truth tables, disjunction and conjunction, tautologies and contradiction, laws of equivalence, Tautological Implications, Principal normal forms (only by truth tables).

UNIT 2 SET THEORY AND FUNCTIONS**9 Hrs.**

Basic concepts of Set theory - Laws of Set theory - Partition of set, Relations -Types of Relations: Equivalence relation, Partial ordering relation - Graphs of relation - Hasse diagram, Functions: Injective, Surjective, Bijective functions, Compositions of functions, Identity and Inverse functions.

UNIT 3 NUMERICAL METHODS FOR SOLVING EQUATIONS**9 Hrs.**

Numerical Solution of algebraic and transcendental equations: Regula Falsi method, Newton Raphson method - Numerical Solution of simultaneous linear algebraic equations: Gauss Jordan method, Gauss Jacobi method, Gauss Seidel method.

UNIT 4 NUMERICAL INTERPOLATION**9 Hrs.**

Interpolation: Newton's forward and backward difference interpolation formula (equal interval) - Lagrange's interpolation formula (unequal interval).

UNIT 5 NUMERICAL DIFFERENTIATION AND INTEGRATION**9 Hrs.**

Numerical Differentiation - Newton's forward and backward difference interpolation formula (equal interval). Numerical Integration: Trapezoidal rule, Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Apply logic and truth tables to solve problems on propositional calculus.
CO2 - Explain the concept of set theory and relations.
CO3 - Apply the concept of the numerical solutions to algebraic and transcendental equations.
CO4 - Categorize and implement the various numerical methods for Interpolation.
CO5 - Evaluate the solution of differentiation using numerical methods.
CO6 - Appraise the solution of integration using numerical methods.

TEXT / REFERENCE BOOKS

1. Tremblay S Manohar. Discrete Mathematics Structure with Application to Computer Science, McGraw – Hill, 1975.
2. Venkatraman M K, Discrete Structures, National Publishing Company, Madras, 1992.
3. Kandasamy P, Thilagavathy. K and G. Gunawathy, Numerical Methods, S.Chand & Sons, 3rd Revised Edition, 2013.
4. Balagurusamy. E, Numerical Methods, Tata McGraw Hill Publishing Company, 3rd Edition, 2000.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB1201	DATABASE MANAGEMENT SYSTEM	L	T	P	EL	C	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain knowledge in fundamentals of data models using ER diagram.
- To make a study of SQL and relational database design.
- To understand about Query processing, optimization, and Concurrency control technique

UNIT 1**9 Hrs.**

Basic Concepts: Database and Database users - Database system concepts and architecture - Data modeling using Entity Relationship model - Enhanced entity relationship and object modeling - Record storage and file organizations - Index Structures for files

UNIT 2**9 Hrs.**

Relational Model, Languages and Systems: The Relational Data Model, Relational Constraints, and the relational Algebra - SQL - The Relational Database Standard - ER and EER to Relational Mapping and Other Relational Languages - Examples of Relational Database Management Systems: Oracle and Microsoft Access.

UNIT 3**9 Hrs.**

Database Design, Theory and Methodology: Functional dependencies and normalization for relational database - Relational database design algorithms and further dependencies - Practical database design and tuning.

UNIT 4**9 Hrs.**

System Implementation Techniques: Database system architectures and the system catalog - Query processing and optimization.

UNIT 5**9 Hrs.**

Transaction processing concepts - Concurrency control techniques - Database recovery techniques - Database security and Authorization. Introduction to Emerging Database Technologies and Application

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Design ER-models to represent simple database application scenarios
- CO2** - Ability to understand and design data modelling using Entity-Relationship model
- CO3** - Implement SQL to a broad range of query and data update problems
- CO4** - Articulate socio-economic applications of distributed databases and use database recovery mechanisms
- CO5** - Familiarize with data warehousing and data mining applications
- CO6** - Apply Normalization techniques to normalize and improve the database design

TEXT / REFERENCE BOOKS

1. Elmasri & Navathe, Fundamentals of Database Systems, 6th Edition, Addison Wesley, 2010
2. Korth, Silberschatz & Sudarshan, Database System Concepts, 5th Edition, Tata McGraw Hill, 2010.
3. Raghu Ramakrishnan & Johannesgerhrke, Data Base Management Systems, 3rd Edition, Tata Mc Graw Hill, 2002.
4. Abraham Silberschatz, Henry.F.Korth and S.Sudharshan, "Database System Concepts", 4th Edition, 2002.
5. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 3rd Edition, Elsevier, 2012
6. Jan L. Harrington, "Object oriented database design", Harcourt India private limited 2000.
7. http://nptel.iitm.ac.in/courses/IIT-MADRAS/Intro_to_Database_Systems_Design/index.php

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 marks each uniformly distributed - No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 marks****80 Marks**

SBSB1202	DIGITAL COMPUTER FUNDAMENTALS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To Understand the concept of digital systems
- To operate on various number systems and Simplify Boolean functions.
- To Design counters and understand the working of arithmetic logic and control unit

UNIT 1**9 Hrs.**

Number systems - Conversion from one number system to another - compliments - Binary codes - Binary logic - Logic gates - Truth tables.

UNIT 2**9 Hrs.**

Boolean Algebra - Axioms - Truth table simplification of Boolean function - Canonical and Standard forms: Sum of product, Product of Sum, Minterm-Canonical Sum of product Expression: Maxterm - Canonical Sum of product Expression: -Map method (up to 4 Variables).

UNIT 3**9 Hrs.**

Combinational logic -. Adders - Subtractors - Decoders - Encoders - Multiplexer - Demultiplexer -- Memory Unit ROM and RAM: SRAM and DRAM.

UNIT 4**9 Hrs.**

Sequential Logic - RS, JK, D and T Flip flops - Registers -Shift Registers - Counters - Ripple Counters - Synchronous Counter - Design of Counters.

UNIT 5**9 Hrs.**

Application of Digital Circuit: Mobile phones, Calculator, Digital Computer, Smart Card, Radio and Sensors- Digital Design of ALU -. Design of Status Register - Design of accumulator

Max. 45 Hrs.**COURSE OUTCOMES**

- CO1** - To Understand the concept of digital systems
CO2 - To operate on various number systems and Simplify Boolean functions.
CO3 - To Distinguish logical and combinational circuits
CO4 - To Design counters and understand the working of counters
CO5 - To Design arithmetic logic and control unit
CO6 - To evaluate the combinational circuits

TEXT / REFERENCE BOOKS

1. M. Morris Mano, "Computer System Architecture", Pearson Education, 2008.
2. Carter Nicholas, "Computer Architecture", Schaun outline Seives , Tata McGraw-Hill, 2008.
3. J.P. Hayes, "Computer Architecture & Organization", Tata McGraw Hill
4. Leach.D.P & Malvino.A.P, (2002), "Digital Principles and Applications", FifthEdition, TMH.(UNIT I,II,III)
5. Moris Mano.M,(2001),"Digital Logic and Computer Design", Fourth Edition,
6. Ananthi Shashasaayee, Sheshasaayee.J.G,(2003), "Digital Logic Fundamentals", First Edition, Margham Publications

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB2201	RDBMS LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

LIST OF EXPERIMENTS

Creation of a Database and performing the operations given below using a Menu Driven Program. a) Insertion B) Deletion c) Modification d) Generating a Simple report for the following:

1. Payroll
2. Mark sheet Processing
3. Saving Bank account for banking
4. Inventory System
5. Invoice system
6. Library information system
7. Student information system
8. Income tax processing system
9. Electricity bill preparation system
10. Telephone directory maintenance

SBSB1301	ADVANCED JAVA PROGRAMMING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Develop server side programs in the form of servlets and JSP
- To know about Enterprise architecture models
- To introduce the basics of session tracking

UNIT 1**9 Hrs.**

Introduction-Procedure vs. object-oriented programming-Concepts: Classes and Objects-Operator & Function Overloading-Inheritance- Polymorphism and Virtual Functions- Class Fundamentals - Declaring Objects - Methods - Constructors - Garbage Collection. Inheritance - Basics - Using Super – Method Overriding - Abstract Classes - Using final with inheritance. String Handling - String class - String buffer class.

UNIT 2**9 Hrs.**

Introduction to Packages - User Defined Packages - Importing packages - Access protection - Interfaces - Exception Handling - Exception Types - Using try, catch, throw, throws and finally - Multithreading - Java Thread Model - Main thread - Creating multiple thread - Thread priorities - Synchronization.

UNIT 3**9 Hrs.**

IO Package - Introduction - Input Stream and Output Stream classes - Data Output Stream and Data Input Stream classes -File Input Stream - File Output Stream. - Reader and Writer Classes - File Reader and File WriterJ2EEPlatform- - RMI Architecture- Overview of JNDI Java Database Connectivity -Introduction - Driver Types- Establishing a connection - Creating and Executing SQL Statement - Prepared Statement -The Result Set Object.

UNIT 4**9 Hrs.**

Servlets: Servlets- Background- Life Cycle of a Servlet- HTTP protocol-Generic and Http Servlet- Handling HTTP Requests and Responses- Handling form data with get and post request.- App-Demonstrating Session-cookies- A simple Shopping cart using Sessions-Servlet Context Interface-ServletContextLifecycle-EventHandling-ServletCollaboration-ServletChaining-RequestDispatching.

UNIT 5**9 Hrs.**

Java Server Pages - JSP Technologies - Difference between Servlets and JSP- JSP Directives - Scripting elements - Standard Actions - Implicit Objects -Simple Application - Introduction to Enterprise Java Beans -Session Beans-Entity Beans-Message Driven Beans.

Max. 45 Hrs.**COURSEOUTCOMES**

On completion of the course, student will be able to

CO1 - Implement Java programs with its functions and methods

CO2 - Implement and develop J2EE Platform and packages

CO3 - Outline the concept of Servlets and its lifecycle

CO4 - Extend the Servlets Collaboration and cookies

CO5 - Make use of JSP Technologies

CO6 - To develop enterprise java applications there by meeting the Industrial requirements

TEXT / REFERENCEBOOKS

1. Subrahmanyam Allama raju, Cedric Buest, John Davies, Tyler Jewell, Rod Johnson, Andy Long shaw, Ramesh Nagappan, P.G. Sarang, Alex Toussaint, Sameer Tyagi, Gary Watson,
2. Marc Wilcox, Alan Williamson, Professional Java Server Programming J2EE", 1.3 Edition, Wrox Publications.
3. Patrick Naughton, HerbertSchildt, "TheCompleteReferenceJava2", ThirdEdition, TataMcGrawhill
4. Thomas A.Powell, FritzSchneider, "JavaScript: The Complete Reference", Third Edition, McGraw Hill / Osborne.
5. Jayson Falkner, Kevin Jones, "Servlets and Java Server Pages,The J2EE Technology Web Tier", Pearson Education
6. James Holmes-Structs, "The complete Reference", 2nd Edition, Tata McGraw Hill, 2007.
7. Subrahmanyam Allamaraju and Cedric Buest, "Professional Java Server Programming", A press, J2EE 1.3, 2007.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B :** 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB1302	COMPUTER ARCHITECTURE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To impart knowledge on various types of Registers and Microinstructions.
- To discuss about the Data path design and Processor design in detail.
- To understand the types of memory organizations.

UNIT 1**9 Hrs.**

Number systems - Conversion from one number system to another - Compliments - Binary codes - Binary logic - Binary Arithmetic - Logic gates - Truth tables. Boolean Algebra - Axioms - Truth table simplification of Boolean function - Map method - Mc-Clausky tabulation method.

UNIT 2**9 Hrs.**

Combinational Logic: Adders-Half Adders-Full Adders - Subtractors-Half Subtractor-Full Subtractor - Decoders - Encoders - Multiplexer - Demultiplexer Sequential logic: RS, JK, D and T Flip flops - Registers -Shift Registers Counters - Design of Counters.

UNIT 3**9 Hrs.**

Associative Memory - Cache Memory - Virtual Memory - Auxiliary Memory Management Hardware. Peripheral Devices - Input-Output Interface - Asynchronous Data Transfer: Handshaking - Serial Transfer - Communication Interface - Modes of Transfer - Priority Interrupt - DMA -Serial Communication- Devices - Input-Output Interface - Asynchronous Data Transfer: Handshaking - Serial Transfer - Communication Interface - Modes of Transfer - Priority Interrupt - DMA -Serial Communication.

UNIT 4**9 Hrs.**

Introduction to microcomputers, Microprocessors and Assembly languages - Microprocessor architecture and its operations - 8085 MPU - 8085 instruction set and Classifications.

UNIT 5**9 Hrs.**

Central Processing unit: General register and stack organizations, instruction formats - Addressing modes, Data transfer and manipulation - program control, RISC - Pipelining - Arithmetic and instruction, RISC pipeline - vector processing and array processors.

Max. 45 Hrs.**COURSE OUTCOMES**

- CO1** - Classify the various types of registers, microinstructions and addressing modes.
CO2 - Design the data path for processor
CO3 - Demonstrate the usage of Memory Organization.
CO4 - Describe about the I/O devices.
CO5 - Explain the characteristics, structure, communication, and synchronization of multiprocessor.
CO6 - State the inter processor communication and synchronization.

TEXT / REFERENCE BOOKS

1. M.Moris Mano, Computer system Architecture. PHI (Third edition, 1993)
2. M.M. Mano, Digital Logic and Computer Design, Prentice Hall of India, 1994.
3. Carl Hamacher, uonko G.Vranesic, Safwat G.Zaky - Computer Organisation, McGraw hill ISE 1987.
4. John, P.Hayes., Computer System architecture, McGraw Hill, ISE,1988.
5. Hwang.K.Briggs .F.A -Computer Architecture and parallel Processing, McGraw Hill ISE, 1988.
6. T.C.Bartee, Computer Architecture and logical Design, McGraw Hill, 1991

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB1303	OPERATING SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn how computers work and to learn about system design (performance vs. simplicity, HW vs. SW, etc.)
- To have an overview of different types of operating systems.
- To learn and implement the concept of process management.

UNIT 1 INTRODUCTION TO OPERATING SYSTEM**9 Hrs.**

Introduction: Basic of Operating system -Views and Goals - Types of System- OS Structure - Components - Services - System Structure - Layered Approach - Process Management Introduction to Process - Process State- PCB- Process Scheduling - Cooperating Process - Thread- Inter process Communication.

UNIT 2 OS SCHEDULING**9 Hrs.**

CPU Scheduling: Introduction types of CPU Schedulers - Scheduling Criteria - Scheduling Algorithms- FCFS Scheduling- SJF Scheduling- Priority Scheduling- Round Robin Scheduling- Multilevel Queue Scheduling- Data Dead lock- Basic concept of dead lock prevention - Deadlock Avoidance- Dead lock Detection and Memory.

UNIT 3 MEMORY MANAGEMENT**9 Hrs.**

Basic Concept of Memory Address -Binding logical - Physical Address Space - Memory Allocation- Production Fragmentation and Compaction.

UNIT 4 SWAPPING**9 Hrs.**

Using bits maps- using linked list Paging- Mapping of pages to frames- Hierarchical page tables- Segmentation Virtual Memory demand paging- Transaction look a side Buffer (TLB) - Inventor page table- Page replacement algorithms.

UNIT 5 FILE MANAGEMENT**9 Hrs.**

File System: Basic Concepts of Files - Access Methods - Directory Structures - Protection Consistency Semantics - File System Structures - Allocation Methods - Various Disk Scheduling Algorithm. Free Space Management.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Understand the fundamental components of a computer operating system and how computing resources are managed by the operating system.
- CO2** - Apply the concepts of CPU scheduling, synchronization, and deadlocks in real computing problems.
- CO3** - Demonstrate the different memory and I/O management techniques used in Operating Systems.
- CO4** - Have practical exposure to the concepts of semaphores and monitors for process synchronization.
- CO5** - Create design and construct the following OS components: Schedulers, Memory management systems in the modern operating system.
- CO6** - Understand file system structure and implement a file system such as FAT.

TEXT / REFERENCE BOOK

1. Silberschatz P.B.Galvin, Gange., Operating System Concepts, 6th Edition., Addison-Wesley Publishing Co., 2002.
2. William Stallings, Operating Systems, Fourth Edition, PHI.
3. Andrew S Tanenbaum, Operating Systems: Design and Implementation, Third Edition,

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB1304	DATA MINING AND DATAWAREHOUSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the overall architecture of a data warehouse and techniques and methods for data gathering and data pre-processing
- Identify the scope and necessity of Data Mining & Warehousing for the society.
- Describe various Data Models and Design Methodologies of Data Warehousing destined to solve the root problems.

UNIT 1**9 Hrs.**

Introduction To Data Warehouse- A Multidimensional Data Model - Data Warehouse architecture - Efficient Methods for Data Cube Computation - Further Development of Data Cube and OLAP Technology - Attribute-Oriented Induction. Introduction to Data Mining - Data Mining Functionalities - Classification of Data Mining systems, Major issues in Data mining - Data preprocessing- Data cleaning – Data integration and Transformation.

UNIT 2**9 Hrs.**

Data mining primitives: Task - relevant data - kind of knowledge to be mined - Background knowledge – interestingness measures- presentation.

UNIT 3**9 Hrs.**

Visualization of discovered pattern - Data Mining Query language - Designing Graphical User interfaces based on DMQL - Architecture of Data mining. Basic concepts - market basket analysis - Mining single dimensional Boolean association rules from transactional databases. Classification & prediction: What's classification - issues regarding classification and prediction - Bayesian classification – prediction: linear - non linear.

UNIT 4**9 Hrs.**

Types of Data in cluster analysis - Major clustering methods. Data mining applications - Clustering High Dimensional Data, Outlier Analysis. Mining Streams, Time-Series, And Sequence Data Mining Data Streams, Mining Time-Series Data, and Mining Sequence Patterns in Transactional Databases and Biological Data.

UNIT 5**9 Hrs.**

Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Assess Raw Input Data and process it to provide suitable input for a range of data mining algorithm.
- CO2** - Design and Modelling of Data Warehouse.
- CO3** - Discover interesting pattern from large amount of data
- CO4** - Design and Deploy appropriate Classification Techniques
- CO5** - Able to cluster high dimensional Data
- CO6** - Apply suitable data mining techniques for various real time applications

TEXT / REFERENCE BOOKS

1. Jiawei Han & Micheline Kamber, Data Mining - Concepts and Techniques -2nd Edition - Morgan Kaufmann Publishers, 2006.
2. Immon.W.H., Building the Data Warehouse, Wiley Dream Tech, 3rd Edition, 2003.
3. Anahory S., Murray, D, Data Warehousing in the Real World, 1st Edition, Addison Wesley, 1997.
4. Arun K Pujari , Data Mining Techniques, 2nd edition, Universities Press.
5. Sam Aanhory & Dennis Murray , Data Warehousing in the Real World -Pearson Edn Asia. K.P.Soman,S.Diwakar,V.Ajay, Insight into Data Mining, PHI,2008.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 marks each uniformly distributed - No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 marks****80 Marks**

SBSB2301	ADVANCED JAVA PROGRAMMING LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

LIST OF SUGGESTED EXPERIMENTS

1. Write a Java program using Classes and Objects.
2. Write a java Program using various types of Constructors.
3. Implement the concept of Inheritance
4. Write a Java Program to access various members of super class using Super Keyword
5. Write a java program that illustrates the example for abstract class.
6. Write an Application for Student Information System using JDBC and AWT
7. Client validation using JavaScript
8. Write a program to demonstrate event handling in JavaScript.
9. Web Application using servlet to demonstrate the Http Handling (GetRequest& PostRequest)
10. Write a servlet program to demonstrate the cookie.
11. Write a servlet program to demonstrate the URL Rewriting.
12. Banking Application using JSP Use Bean Methods.

SBSB1401	PYTHON PROGRAMMING	L	T	P	EL	Credits	Total Marks
		2	0	0	3	3	100

COURSE OBJECTIVES

- To provide Basic knowledge of Python
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs

UNIT 1**9 Hrs.**

Overview of Programming: Structure of a Python Program, Elements of Python.

UNIT 2**9 Hrs.**

Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).

UNIT 3**9 Hrs.**

Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, exit function, Difference between break, continue and pass.), Defining Functions, default arguments, Errors and Exceptions.

UNIT 4**9 Hrs.**

Iteration and Recursion: Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, The while statement, Tables, Two-dimensional tables.

UNIT 5**9 Hrs.**

Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - To provide Basic knowledge of Python
- CO2** - To learn how to design and program Python applications.
- CO3** - To learn how to use lists, tuples, and dictionaries in Python programs
- CO4** - To learn syntax of Python language
- CO5** - To create dynamic applications in Python
- CO6** - To implement object-oriented concepts using Python

TEXT / REFERENCE BOOKS

1. Allen Downey, Jeffrey Elkner, Chris Meyers. How to think like a computer scientist learning with Python / 1st Edition, 2012
2. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 9781111822705

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB1402	FOG AND CLOUD COMPUTING	L	T	P	EL	C	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basic concepts of cloud computing and cloud enables.
- To understand cloud services and multi-tenancy computing.
- To study about various models of cloud environments and virtualization.

UNIT 1 INTRODUCTION OF CLOUD COMPUTING**9 Hrs.**

Basic Concepts and Cloud Computing -Cloud Computing Architectural Framework - Types of Clouds - pros and cons of cloud computing - Cloud Characteristics - difference between web 2.0 and cloud - key challenges in cloud computing - Major Cloud players - Virtualization in Cloud Computing- Parallelization in Cloud Computing

UNIT 2 CLOUD SERVICE MODELS**9 Hrs.**

Service Models -Software as a Service (SaaS) - Infrastructure as a Service (IaaS)- Platform as a Service (PaaS)- pros and cons of Cloud Service Models Web services - Service Oriented Architecture (SoA) - Elastic Computing - On Demand Computing- Service Management in Cloud Computing - Characteristics of Cloud Service Management -Multitenancy computing, architecture- Benefit and Drawbacks of Multitenancy- Multitenant Cloud architecture.

UNIT 3 CLOUD DEPLOYMENT MODELS AND VIRTUALIZATION**9 Hrs.**

Deployment models: Public cloud - Private Cloud - Hybrid cloud - Community cloud - Cloud Deployment of application on the cloud- Need for virtualization - Types of Virtualizations - Pros and cons of Virtualization- VMware - Process VM - Virtual Machine Monitor - Properties - Hypervisor -Xen Hypervisor, Hyper V- Virtual Box, Eucalyptus.

UNIT 4 UNDERSTANDING FOG COMPUTING**9 Hrs.**

Fog Computing: The Next Evolution of Cloud Computing - Cloud computing vs Fog Computing -Goal Of Fog Computing - Pros and Cons of Fog computing - Fog computing vs. edge computing - Fog computing and the Internet of Things -, Connecting IoT to cloud, Cloud Storage for IoT- Data management and analysis in Fog Computing.

UNIT 5 FOG COMPUTING ARCHITECTURE & APPLICATIONS**9 Hrs.**

From Cloud to Fog - Fog Computing architecture - fog networks Fog Computing in the IoT Environment: Principles, Features, and Models - Role of Cloud Computing in IoT- Applications of fog computing - Security and privacy in Fog.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures.
- CO2** - Implement and install the cloud tools to make enable the cloud computing infrastructures.
- CO3** - Apply and design suitable Virtualization concept, and Cloud deployment Model.
- CO4** - Construct combinatorial auctions for cloud resources and services as commercial.
- CO5** - Assess cloud, Fog Network and cloud to Fog with IoT.
- CO6** - Ability to, understand fog computing architecture, Security, and privacy

TEXT / REFERENCE BOOKS

1. Cloud computing concepts, technology and Architecture - Thomas Erl, Zaigham Mahmood, Ricardo Puttini , Pearson , 2017.
2. Instant Guide to Cloud Computing, Anand Nayar(Ed), Ashokkumar, sudeep Tanwar, BPB, 2019.
3. Cloud computing a practical approach - Anthony T.Velte, Toby J. Velte Robert Elsenpeter TATA McGraw - Hill, New Delhi – 2010.
4. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.
5. Fog Computing Concepts, Frameworks and Technologies, Mahmood, Zaigham (Ed.), Springer, 2018.
6. <https://internetofthingsagenda.techtarget.com/definition/fog-computing-fogging>

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 marks each uniformly distributed - No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 marks****80 Marks**

SBSB1403	DATA STRUCTURES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- It focuses on how to organize data for more efficient problem-solving using data structures methods and techniques.
- To impart the basic concepts of data structures and algorithms
- To be familiar with writing recursive methods.

UNIT 1**9 Hrs.**

Arrays- Linked List - Single Linked List - Insertion and Deletion - Doubly Linked List. -Circular Linked List - Stack- Queues- Array implementation of a Stack and queue - Linked List implementation of a Stack and Queue- Priority Queues.

UNIT 2**9 Hrs.**

Evaluation of arithmetic expression using stack- Prefix -Infix-Postfix-notations, Converting infix expressions to postfix- Evaluation of postfix expression, -Towers of Hanoi problem.

UNIT 3**9 Hrs.**

Tree Structures: Binary Trees- Implementation of Binary Trees- Linear Representation of Binary Tree Linked representation of a Binary Tree. Binary Tree Traversal: Pre order - In order - Post order.

UNIT 4**9 Hrs.**

Sorting Techniques: Bubble Sort- Merge Sort - Shell Sort- Insertion Sort- Selection Sort-Quick Sort-Heap Sort, Searching Techniques: Sequential Search- Binary Search-Hashing- Indexing.

UNIT 5**9 Hrs.**

Graphs and Networks: Implementation of Graphs - Adjacency Matrix- Depth First Search-Breath First Search. Networks: Minimum Spanning Tree - The Shortest path Algorithm.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Understand the concept of recursive algorithms.
- CO2** - Demonstrate the different types of data structures.
- CO3** - Able to understand the operations on linear data structures.
- CO4** - Summarize searching and sorting techniques.
- CO5** - Choose appropriate data structure as applied to specified problem definition.
- CO6** - Understand and implement the applications of linear data structures.

TEXT / REFERENCE BOOKS

1. E. Horowitz, S. Sahni, Fundamentals of Data Structures.
2. Bhagat Singh and Thomas L, Introduction to Data Structures, Naps, TMH.
3. Helieman, Data Structures, Algorithms and Object-Oriented Programming.
4. Thomas H Coreman, Charles E Leiseron, Ronald L Rivest, Introduction to Algorithms, PHI 2002.
5. Jean-Paul Tremblay, Paul G. Sorenson, 'An Introduction to Data Structures with Application', TMH, 2017.
7. Richard F, Gilberg, Forouzan, "Data Structures", Cengage, 2004, 2nd Edition.
8. Larry R. Nyhoff, ADTs, Data Structures, and Problem Solving with C++, Prentice Hall Editin, 2004.
9. Thomas H. Cormen, Charles E. Leiserson, "Introduction to Algorithms", 3rd Edition, 2010.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB1404	CYBER SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce the basic concepts of cyber security
- To acquire knowledge on cyber threats and attacks
- To become aware of significant security technologies and tools

UNIT 1 INTRODUCTION TO CYBER SECURITY**9 Hrs.**

Introduction - Need for Security - Security Approaches - Principles of Security - Components - Balancing Security & Access - Software Development Life Cycle - Security Systems Development Life Cycle - Security Professionals and the organization.

UNIT 2 CYBERSECURITY – THREATS & ATTACKS**9 Hrs.**

Threats: Intellectual Property - Software Attacks - Deviations in QoS - Espionage - Forces of Nature - Human Error - Information Extortion - Missing, inadequate or incomplete organization policy and Controls- sabotage - Theft - Hardware Failures - Software Failures Attacks: Malicious Code - Hoaxes - Back Doors - Password Crack - Brute Force - DoS and DDoS - Spoofing - Man-in-the-Middle - Spam - Email Bombing - Sniffer- Timing Attack.

UNIT 3 SECURITY TOOLS & TECHNOLOGIES**9 Hrs.**

Firewall and VPNs - Intrusion Detection and Prevention Systems - Other Security Tools - Access Control - Firewalls - Protecting Remote Connections - Intrusion Detection and Prevention Systems - Honeypots, Honeynets and Padded Cell Systems.

UNIT 4 CRYPTOGRAPHY**9 Hrs.**

Cryptology Terminology - Cipher methods - Cryptographic Algorithms - Cryptographic tools - Attacks on cryptosystems - Physical Security.

UNIT 5 PROTOCOLS FOR SECURE COMMUNICATION**9 Hrs.**

Basic Concepts - SHTTP, SSL & SET - S/MIME, PEM & PGP - WEP, WPA & WPA2 - IPSEC & PGP.

Max. 45 Hrs.**COURSE OUTCOME**

On the completion of the course, the students will be able to

CO1 - Understand the basic concepts, need, approaches, principles and components of security.

CO2 - Explain the various cyber threats and attacks.

CO3 - Describe the various Security Technologies and Tools

CO4 - Explain the basic principles of cryptography and algorithms.

CO5 - Examine the various protocols for secure communication.

CO6 - Explore the significant aspects of cyber security.

TEXT / REFERENCE BOOKS

1. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security", CENGAGE Learning, 4th Edition.
2. William Stallings, "Cryptography and Network Security - Principles and Practice", Pearson Education, 7th Edition.
3. Atul Kahate, "Cryptography and Network Security", Mc Graw Hill, 4th Edition.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each uniformly distributed - No choice

20 Marks

PART B : 2 Questions from each unit of internal choice, each carrying 16 marks

80 Marks

SBSB2401	PYTHON PROGRAMMING LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

LIST OF EXPERIMENTS

1. Data Types in Python
2. Python Operators
3. Electricity Bill
4. Roots of Quadratic Equation
5. Biggest of Three Numbers
6. Perfect Number Checking
7. Area of Shapes
8. Prime Numbers From 1 To N
9. String Operations
10. Dictionary Operations
11. a) Single Inheritance
b) Multilevel Inheritance
12. Scipy Library

SBSBLH51	FULL STACK WEB DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		2	0	4	0	4	100

COURSE OBJECTIVES

- To provide knowledge of languages, frameworks, and tools to create interactive and engaging websites
- To provide basic design principles to present ideas, information, products, and services on websites
- To induce basic programming principles to the construction of websites

UNIT 1**9 Hrs.**

Introduction to Dynamic Web Content-Three-tier architecture-architecture for client-server applications- Introduction to HTML5-Elements, Tags and Attributes- Formatting Tags - Styles - List, Table, Phrase- Embedding Audio and Video - Block elements and Layouts- Forms -The HTML5 Canvas.

Practice:

1. Write an HTML document with an example of Ordered List and Unordered List.
2. Write an HTML document with an example of Table format to print your Bio-Data.

UNIT 2**9 Hrs.**

Introductions to CSS-Box Model and Text properties- Font and Display Properties- Float and Overflow- Link - List - Table- Forms- Web Layout- Accessing CSS from JavaScript- Expressions and Control Flow in JavaScript-JavaScript Functions, Objects, and Arrays- Event and Event Listeners - Closure- Classes – Fetch API.

Practice:

1. Create a login form with verification and validations
2. Create a simple webpage with website visitor counter

UNIT 3**9 Hrs.**

Introduction to PHP. -Expressions and Control Flow in PHP. -PHP Functions and Objects-PHP Arrays- GET, POST variables- Embedding PHP- PHP and MySQL

Practice:

1. Write a PHP script to : -
2. a) transform a string all uppercase letters
b) transform a string all lowercase letters.
3. Write a PHP script to remove comma(s) from the following numeric string
4. Write a PHP script to remove part of a string

UNIT 4**9 Hrs.**

Introduction to AngularJS, -AngularJS - Overview- Environment Setup- MVC Architecture- Directives- Expressions- Controllers - Filters - Tables- Animations

Practice:

1. Create a weather Application
2. Create a soundnote application

UNIT 5**9 Hrs.**

HTML DOM - Modules - Forms - Includes - AJAX - Views - Scopes - Services -Dependency Injection - Custom Directives - Fetching Data from a PHP Server Running MySQL

1. Create a program using PHP and MySQL
 - a. Student Information System
 - b. Payroll System
 - c. Inventory Management System

COURSE OUTCOME

On the completion of the course, students will be able to

- CO1** - Understand and develop HTML applications
- CO2** - Design and style webpage using CSS
- CO3** - Design web page to perform form validation using client-side scripting language
- CO4** - Implement new technologies such as Angular JS
- CO5** - Develop web applications using server-side scripting language..
- CO6** - Understand the differences between usability and user experience.

SBSB1501	MOBILE APPLICATION DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To develop applications for current and emerging mobile computing devices, performing tasks at all stages of the software development life-cycle.
- To learn how to utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
- To understand the programming languages and platform for developing mobile applications.

UNIT 1 INTRODUCTION TO ANDROID**9 Hrs.**

Introduction to mobile technologies, mobile operation systems, Mobile devices - pros and cons, Introduction to Android, Versions, Features, Architecture, UI Widgets and Events handling, Layouts, required tools - Eclipse, ADT, AVD, Application structure, Android Manifest file, Creating Android applications.

UNIT 2 BUILDING BLOCKS AND DATABASES**9 Hrs.**

Introduction to Activities and Intents - Understanding Activity life cycle, Linking Activities, Passing Data, Toast, Displaying a Dialog Window and Notifications. Content Provider, Services, Broadcast receivers, accessing databases, Location and sensors, Multimedia audio, video and camera, Deploying and publishing application.

UNIT 3 OBJECTIVE C PROGRAMMING**9 Hrs.**

Objective C - Objects and Classes, Property, Messaging, Categories and Extensions, Fast Enumeration - NSArray, NSDictionary, Methods and Selectors, Static & Dynamic objects, Exception handling, Memory management, Swift language essentials: Arrays, Dictionaries, functions.

UNIT 4 INTRODUCTION TO iOS**9 Hrs.**

Introduction to iPhone, MVC Architecture, View Controller - Building the UI and Event handling, Application life cycle, Tab Bars, Story Boards and Navigation Controllers, Table View, Push Notification, Database handling, Introduction to iCloud, Webkit framework in iOS8, Deploying and publishing application.

UNIT 5 WINDOWS MOBILE APP DEVELOPMENT**9 Hrs.**

Introduction to Windows Phone 8, Application Life cycle, UI Designing and events, Building, Files and Storage, Network Communication, Push Notification, Background Agents, Maps and Locations, Data Access and storage, Introduction to Silverlight and XAML, Data Binding, Deploying and Publishing.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - Learn and understand the technology and business trends impacting mobile applications.

CO2 - Understand and remember the components of android, iOS and Windows mobile applications.

CO3 - Learn the programming languages and techniques for developing mobile applications.

CO4 - Design the mobile application by using Eclipse with ADT / Android Studio, Objective-C and Swift.

CO5 - Develop mobile application with compelling user interface and database connectivity for real time applications.

CO6 - Deploy mobile applications using an appropriate software development and finally, upload the developed App it into the web.

TEXT / REFERENCE BOOKS

1. Reto Meier, "Professional Android Application Development", Wrox, 4th Edition, 2018.
2. <http://www.tutorialspoint.com/android/index.htm>
3. <http://developer.android.com/training/index.html>
4. Stephen G. Kochan, "Programming in Objective C", Addison Wesley, 4th Edition, 2012.
5. David Mark, Jack Nutting and Jeff LaMarche, "Beginning iOS 5 Development", Apress Edition, 2012.
6. Baijian Yang, Pei Zheng, Lionel M. Ni, "Professional Microsoft Smartphone Programming", Wrox Edition, 2011.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B :** 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB1502	FUNDAMENTALS OF MICROPROCESSOR	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- The prime objective of this course is to introduce to the students the fundamentals of Microprocessor Microcontroller and Arduino.
- The students will be equipped with the basic knowledge of microprocessor, microcontroller, and Arduino
- The students will have the knowledge of interfacing microprocessor, microcontroller, Arduino and their applications.

UNIT 1 INTRODUCTION TO INTEL 8085**9 Hrs.**

Evolution of Microprocessor-Architecture of 8085-Instructionformat-Addressingmodes-Basic timing diagram of opcode fetch, memory read, memory write I/O read and I/Owrite- Interruptsof8085-Software interrupts, Hardware interrupts, Priorities of interrupts 8085 based system design.

UNIT 2 INTEL 8085 INTERFACING**9 Hrs.**

Interfacing devices-8255 Programmable Peripherals Interface-Architecture & various modes of operation- 8251USART Architecture and programming features-8237, interfacing with ADC and DAC, LCD, keyboard Interface. Application: Stepper Motor Control, Temperature Control.

UNIT 3 INTRODUCTION TO 8051**9 Hrs.**

Introduction to 8-bit Microcontrollers - 8051/8051, Microcontroller Architecture - Internal RAM & Internal ROM, Instruction set, Addressing Modes, Simple programs.

UNIT 4 INTERNAL PERIPHERALS OF 8051**9 Hrs.**

Modes of Timer/Counter operation - Serial Port operation & Modes - Interrupt Structure of 8051 - Memory Interfacing with 8051 - I/O ports- Input and output devices interfacing with 8051.

UNIT 5 ARDUINO UNO**9 Hrs.**

Arduino - Architecture, Pin diagram, Programming Structure, Simple program to blink LED, Subroutine, 16x2 LED display, interfacing with Arduino: LCD, Temperature Sensor, Humidity Sensor and ultrasonic sensor.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - Understanding architectural principle of 8085 & 8051.

CO2 - Interpret the various peripherals devices with 8085 & 8051 microprocessor

CO3 - Design and implement programs on 8051 microprocessors.

CO4 - Examine various I/O devices with 8051 microcontrollers

CO5 - Apply Arduino code and how to Interface various sensors with the Arduino Board.

CO6 - Implement the interface circuit with various sensor and I/O devices with microprocessor and microcontroller and Arduino Board.

TEXT / REFERENCE BOOKS

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming, and application with 8085, 4th Edition, Penram International Publishing, New Delhi, 2000.
2. Kenneth J. Ayala, 8051 Microcontroller, Thomson, 2005.
3. Charles M. Gilmore, Microprocessor Principle and Application, McGraw Hill Publication, 1995.
4. Nagoor Kani A., Microprocessor & Microcontroller, Tata McGraw Hill, 3rd Edition, 2012.
5. Ram B., Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai Publications, 2001.
6. Michael Mc Roberts, beginning Arduino, 2nd Edition, 2013.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB2501	MICROPROCESSOR LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

LIST OF EXPERIMENTS

1. 8 BIT ADDITION
2. 8 BIT SUBTRACTION
3. BCD ADDITION
4. BCD SUBTRACTION
5. BCD MULTIPLICATION
6. ASCENDING ORDER SORTING
7. DESCENDING ORDER SORTING
8. LARGEST ELEMENT IN AN ARRAY
9. BLOCK MOVE
10. LINEAR SEARCH
11. REVERSING AN ARRAY
12. 8 BIT DIVISION

SBSB1601	ETHICAL HACKING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce the basic concepts of Ethical Hacking and Penetration Testing
- To acquire knowledge about gathering information about the victim
- To demonstrate Enumeration and Port Scanning

UNIT 1 INTRODUCTION TO ETHICAL HACKING**9 Hrs.**

Important Terminologies - Categories of Penetration Test - Writing Reports - Structure of PT report - Vulnerability Assessment Summary - Risk Assessment -Methodology - Detailed Findings - Reports

UNIT 2 INFORMATION GATHERING**9 Hrs.**

Active and Passive Information Gathering - Sources - Copying Website locally - yougetsignal.com - NeoTrace - Intercepting a Response - Acunetix Vulnerability Scanner - NetCraft - Google Hacking - Interacting with DNS Servers - DNS Cache Snooping.

UNIT 3 ENUMERATION AND PORT SCANNING**9 Hrs.**

Host Discovery - Scanning for Open Ports and Services - Types of Port Scanning - TCP Three-way handshake - TCP Flags - Port Status Types - TCP SYN Scan- TCP Connect Scan - NULL, FIN and XMAS SCAN - NULL Scan - FIN Scan - XMAS Scan - TCP ACK Scan - Responses - UDP Port Scan - Scanning a vulnerable host - Performing an IDLE scan with NMAP - Service Version Detection - OS Fingerprinting.

UNIT 4 VULNERABILITY SCANNING**9 Hrs.**

Working with Vulnerability Scanners - Nmap - Testing SCADA Environments - Nessus Vulnerability Scanner - Installing Nessus - Adding a user - Creating a new policy - Safe Checks - Silent Dependencies - Port Range - Preferences.

UNIT 5 NETWORK SNIFFING**9 Hrs.**

Introduction - Types of Sniffing - Hubs vs. Switches - Promiscuous Mode vs. Non-Promiscuous Mode - MITM Attacks - ARP Protocol Basics - How ARP works - ARP attacks - DoS Attacks - Sniffing with Wireshark - DNS Spoofing - DHCP Spoofing.

Max. 45 Hrs.**COURSE OUTCOMES**

On the completion of the course, students will be able to

- CO1** - Understand the basic concepts of Ethical Hacking and Penetration Testing and will be able to prepare penetration testing reports.
- CO2** - Demonstrate information gathering about the victim using various tools such as acunetix, net craft and Google hacking
- CO3** - Enumerate and perform different types of scanning and demonstrate nmap.
- CO4** - Explore the vulnerability scanners: nmap and Nessus.
- CO5** - Understand and demonstrate sniffing, MITM attacks, ARP attacks and DoS attacks.
- CO6** - Explore the crucial areas of Ethical Hacking and Penetration Testing with Case Studies.

TEXT / REFERENCE BOOKS

- Rafay Baloch, "Ethical Hacking and Penetration Testing Guide", CRC Press - Taylor & Francis Group, 2015.
- Jon Erickson, "Hacking - The Art of Exploitation", No Starch Press, San Francisco ,2nd Edition,2008.
- Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, Gray Hat Hacking: "The Ethical Hackers Handbook", TMH ,3rd Edition, 2011.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB1602	SOCIETY 5.0	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVE

- To understand the society 5.0, Cyberspace And Physical Space to solve
- To Provide knowledge and overview about Big data, IoT and Artificial Intelligence for Society 5.0.
- Discuss To understand Augmented Reality and Virtual Reality, Next Generation Sensors

UNIT 1 INTRODUCTION TO SOCIETY 5.0**9 Hrs.**

Introduction -Schema of society 5.0-Characteristics of Society 5.0. Introduction to communication technologies: Artificial Intelligence - robotics - 3D Printing. People: Centric Society -Knowledge Sharing- Physical space-Cyberspace - Humanity VS Society 5.0 -Elements of Society 5.0-Data Driven to Society- Modeling real world Issues.

UNIT 2 EMERGING TECHNOLOGIES WITH SOCIETY 5.0**9 Hrs.**

Introduction to Big Data - Issues and Challenges in the traditional systems -Intelligent Data Analysis - Big Data Storage Statistical Concepts: Sampling Distributions - Re-Sampling - Prediction Error - Random Sampling- Artificial Intelligence - Foundations of AI - Intelligent agent - Types of agents - Structure - Problem solving agents -Internet of Things- Introduction to IoT- Basic Architecture of an IoT, From M2M to IoT, M2M towards IoT-Robotics- Robotics system components - Robot classification Coordinate frames - degree of freedom - dynamic stabilization of robots.

UNIT 3 INTRODUCTION TO INDUSTRY 4.0**9 Hrs.**

Introduction-Globalization and Emerging Issues, LEAN Production Systems, Smart and Connected Business Perspective, Cyber Physical Systems and Next Generation Sensors, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis- An emerging industrial structure for IoT -Cyber security in Industry 4.0-Basics of Industrial IoT. Common Issues in Industry 4.0 and Society 5.0.

UNIT 4 CHALLENGES AND TECHNOLOGIES TOWARDS SOCIETY 5.0**9 Hrs.**

Overcome with Economic Development and Solution to Social Problems in Society 5.0- Security of Cyber Physical Systems -Embedded and CPS security - attacks and countermeasures, authentication, identification, confidentiality, data integrity, authorization, access control, malware attacks and countermeasures, security protocols- Social Issues in Society 5.0 - human-centered society (Society 5.0)- Sustainable Development Goals-Economic Advancement- Resolution to Social Problems..

UNIT 5 INNOVATION WITH FUTURE TRENDS WITH APPLICATIONS**9 Hrs.**

Mobility - Health Care -Agriculture- Food Products - Disaster Prevention.

Max. 45 Hrs.**COURSE OUTCOMES**

- CO1** - Able to understand the Social Problems by A System That Highly Integrates Cyberspace and Physical Space to solve
- CO2** - Ability to get skills For Economic Development and A Human-Cantered Society That Balances Economic Advancement
- CO3** - Achieve A High Degree of Convergence Between Cyberspace (Virtual Space) And Physical Space (Real Space)
- CO4** - Able to Use Of Emerging Technologies With Society 5.0 To Achieve The More Production / Avoid Loss Of Productions
- CO5** - Able Internet and IoT, Big data for production lines to be adaptive, intelligent, and flexible enough to meet the updated requests.
- CO6** - Design and apply in Health Care, Agriculture, Food Products, Disaster Prevention

TEXT/ REFERENCE BOOKS

1. Society 5.0 A People -Centric Super -Smart Society, Hitachi -Utokyo Laboratory, Springer,2020.
2. Society 5.0 Industry of the Future Technologies Methods and Tools By Bruno Salgues,Wiley, 2018
3. Stuart J.Russel, Peter Norvig, "Artificial Intelligence A Modern Approach ", 3rd Edition, Pearson Education, 2009.
4. The Internet of Things: Applications and Protocols, Wiley publications. Author(s): Oliver Hersent, David Boswarthick, Omar Elloumi.,2012.
5. McKerrow P.J. "Introduction to Robotics", Addison Wesley, USA, 1991.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 marks each uniformly distributed - No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 marks****80 Marks**

SBSB5101	ADVANCED DATASTRUCTURES AND ALGORITHMS	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To understand and analyze fundamental data structures, such as binary search trees, disjoint sets, and self-adjusting lists.
- Understand the implementation and complexity analysis of fundamental algorithms such as RSA, primarily testing, max flow, discrete Fourier transform.
- Will be exposed to algorithmic issues in a variety of areas, including linear programming and game-theory.

UNIT 1 INTRODUCTION TO ALGORITHMS**12 Hrs.**

Role of Algorithms in computing- Analyzing algorithm- Designing algorithm- Asymptotic Notations Summations -Formulas and properties- Recurrences. SORTING TECHNIQUES: Heap sort - Quick sort-Radix sort- Bucket sort- Analysis of sorting algorithms.

UNIT 2 TREE STRUCTURES**12 Hrs.**

Binary Search Trees- AVL Trees- Red-Black Trees- B-Trees-Splay Trees - HEAP STRUCTURES: Min/Max heaps- Leftist Heaps- Binomial Heaps- Fibonacci Heaps

UNIT 3 MULTIMEDIA STRUCTURES**12 Hrs.**

Segment Trees- k-d-Trees-Point Quad Trees-MX-Quad Trees-R-Trees-TV-Trees.

UNIT 4 PROBLEM SOLVING TECHNIQUES**12 Hrs.**

Branch and Bound-NP hard and NP complete problems-Huffman Coding-Activity Networks-Flow Shop Scheduling-Randomized Algorithms. ALGORITHMS: Greedy Algorithms-Backtracking-Dynamic programming- Divide and Conquer.

UNIT 5 GRAPH ALGORITHMS**12 Hrs.**

Graph Representation-BFS-DFS-Topological Sort-Connected Components Minimum Spanning trees- Kruskal's Algorithm - Prim's Algorithm - Dijkstra's Algorithm - Floyd's Algorithm - Bellman Ford Algorithm.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - Understand the concept of Analyzing and designing algorithms

CO2 - Demonstrate the different types of data structures.

CO3 - Able to understand multimedia structures

CO4 - Summarize searching and sorting techniques.

CO5 - Choose appropriate data structure as applied to specified problem definition.

CO6 - Understand and implement the various problem-solving techniques.

TEXT / REFERENCE BOOKS

1. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, "Introduction to Algorithms", PHI, 2002.
2. Sara Baase, Allen van Gelder, "Computer Algorithms and Introduction to Design and Analysis", Pearson, 2000.
3. Sahni, "Data Structures algorithm and application in C++", PHI, 2000.
4. Mark Allen Weiss, "Data Structures and Algorithms in C++", Addison Wesley, 3rd Edition.
5. Aho A.V., Hopcroft J.E. and Ullman J.D., "Design and analysis of Computer algorithms"

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each uniformly distributed - No choice

20 Marks

PART B : 2 Questions from each unit of internal choice, each carrying 16 marks

80 Marks

SBSB5102	DATABASE TECHNOLOGIES	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To give students in depth information about system implementation techniques, data storage, representing data elements, database system architecture.
- Demonstrate principles of design, development, and administration relevant to Oracle database technology.
- Formulate a working definition of database development and administration.

UNIT 1 INTRODUCTION**12 Hrs.**

Database system Architecture - Query Optimization Techniques - Transaction Management: Transaction Processing Concepts - Concurrency Control - Recovery Techniques -Database Security.

UNIT 2 PARALLEL DBMS**12 Hrs.**

Architecture-Query Evaluation-Query optimization-parallelizing Individual operations. Distributed DBMS: Architecture-storing data-Cataloguing-Query Processing-Transactions Concurrency and Recovery.

UNIT 3 MOBILE DATABASES**12 Hrs.**

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols.

UNIT 4 OBJECT AND MULTIMEDIA DATABASE SYSTEMS**12 Hrs.**

Object Databases-Advantages and disadvantages compared to Relational Databases- Abstract data types, Objects identity and reference types- Inheritance Database design for ORDBMS ODMG data model and ODL OQL.MULTIMEDIA DATABASES: Nature of Multimedia data and applications Data management issues- Components of Multimedia database management system.

UNIT 5 BIGDATA AND HADOOP**12 Hrs.**

Big Data-Introduction-Technologies-Reference Architecture- Hadoop- Introduction to Hadoop Distributed File System-Design of HDFS-HDFS Concepts-Interfaces for Hadoop File System-Map Reduce-weather Dataset-Analyzing the data with Hadoop- Anatomy of Map Reduce Job Run.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course the student will be able to -

- CO1** - Understand database system architecture.
- CO2** - Ability to understand and apply parallel DBMS.
- CO3** - Understand and Implement mobile databases and protocols
- CO4** - Describe relational databases and its components.
- CO5** - Familiar with big data and its applications
- CO6** - Use tools like Hadoop and map reduce for data analytics.

TEXT / REFERENCE BOOKS

1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3rd Edition McGraw Hill Publications.
2. Korth.H.F. and A.Silberschatz, "Data base system concepts", 3rd Edition, McGraw Hill Publications.
3. Ramez Elmasri and B.Navathe:"Fundamentals of Database Systems", 5th Ed., Addison Wesley, 2008.
4. Stenfno Ceri and Gieusppepelagatti, "Distributed database-principles and systems", 3rd Edition.
5. O'Reilly, "Hadoop-The Definitive Guide", O'Reilly Media.
6. <http://www.oracle.com/technetwork/topics/entarch/articles/info-mgmt-big-data-ref-arch-11202853.pdf>
7. <http://www.comptechdoc.org/independent/database/basicdb/dataobject.html>.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks**70 Marks**

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB5103	SOFTWARE QUALITY ASSURANCE AND TESTING	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To introduce the basics and necessity of software testing.
- To introduce various testing techniques along with software production.
- To introduce the concepts of Software quality and its assurance

UNIT 1 INTRODUCTION**12 Hrs.**

Software testing fundamentals-objectives-principles-Testability-Levels of testing-TMM- Characteristics of a tester-A testing group-Comparison of KPA in ISO, CMM and TMM-Software quality attributes.

UNIT 2 SOFTWARE TESTING METHODS AND STRATEGIES**12 Hrs.**

Test case design-White box testing- Basic path testing-Flow Graph Notation-Cyclomatic Complexity-Deriving Test Cases- Graphic Matrices-Control Structure Testing-Deriving Test Cases-Dataflow Testing-Loop Testing-Black box Testing-Graph Based Testing Methods-Equivalence partitioning-Boundary value analysis-Comparison testing. Strategic Approach to Software Testing- Verification and Validation-Strategic Issues-Unit testing-Consideration Procedures. Integration Testing-Regression Testing- Integration Test Documentation-Validation Testing-Configuration Review-Alpha and Beta Testing System Testing-Art of Debugging. Case studies: Writing test cases for white box and black box testing.

UNIT 3 OBJECT ORIENTED TESTING, METRICS AND MEASUREMENTS**12 Hrs.**

Testing OOD Models-OO Testing Strategies-Test Case Design for OO Software-Testing Methods applicable at the class level- Inter class test design-The intent of OO metrics-Distinguishing characteristics of OO metrics. Common software measurements: Code coverage-Cohesion-Comment density, Coupling-Function point analysis- Number of classes and interfaces-Number of lines of customer requirements-Robert Cecil Martin's software package metrics-Bugs per line of code-Source lines of code.

UNIT 4 QUALITY CONSIDERATIONS**12 Hrs.**

Planning for quality - Quality plan - Cost/benefit tradeoff - Feature/bug tradeoff - Modeling quality improvement-Notation of defects-Defects-Defect removal activities-Conditions for each activity-Defect removal goals-Quality improvement teams- quality recognition-Manage Priorities Effectively-Statistical Quality Assurance-Software Reliability.

UNIT 5 OVERVIEW OF STANDARDS**12 Hrs.**

Levels of standards-Quality assurance standards-Project management standards-Dependability standards-Product standards- Process standards-ISO12000-Reviews, Audits and Certification.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Learn software quality factors
- CO2** - Apply common software testing strategies
- CO3** - Demonstrate about the project process control and software Metrics
- CO4** - Implement all the common software testing strategies.
- CO5** - Understand the SQA standards and software process assessments
- CO6** - To deploy quality engineering models in projects

TEXT / REFERENCE BOOKS

1. Ilene Barnstein, "Practical Software Testing-A Process Oriented Approach", Springer International Edition.
2. Humphrey, W.S. (2002), "A Discipline for Software Engineering. Reading, MA", Addison-Wesley
3. Roger S. Pressman, "Software Engineering, A Practitioner's Approach", Tata McGraw Hill, 5th Edition
4. Marc Roper, "Software Testing", McGraw Hill Professional, 112124.
5. Ian Sommerville, "Software Engineering", Addison-Wesley, 5th Edition, 112126.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks
(Out of 100 marks, maximum of 10% problems may be asked)**70 Marks**

SBSB5104	INTRODUCTION TO MATLAB	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- Enable the students to learn many of MATLAB commands
- To study the fundamentals for image processing
- Use MATLAB and study image enhancement techniques and mathematical transforms.

UNIT 1 DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS**12 Hrs.**

Elements of Visual Perception - Image Sampling and Quantization- Basic Relationships between Pixels - Basic Geometric Transformations - Introduction to Fourier Transform and DFT - Properties of 2D Fourier Transform - FFT - Separable Image Transforms - Walsh - Hadamard - Discrete Cosine Transform.

UNIT 2 IMAGE ENHANCEMENT TECHNIQUES**12 Hrs.**

Spatial Domain Methods- Basic Grey level transformation- Histogram Equalization - Image Subtraction - Image Averaging - Spatial Filtering - Smoothing, Sharpening filters- Laplacian Filters- Frequency Domain Filters- Smoothing, Sharpening Filters- Homomorphic Filtering.

UNIT 3 IMAGE RESTORATION**12 Hrs.**

Model of Image Degradation/ Restoration Process - Noise Models - Blind Image restoration - Pseudo Inverse- Singular Value Decomposition.

UNIT 4 IMAGE COMPRESSION**12 Hrs.**

Lossless compression- Variable Length Coding - LZW coding - Bit Plane Coding - Predictive Coding - DPCM- Lossy Compression- Transform Coding - Wavelet Coding- Basics of Image Compression Standards: JPEG, MPEG.

UNIT 5 BOUNDARY REPRESENTATION**12 Hrs.**

Chain codes- Polygonal Approximation - Boundary Segments - Boundary Descriptors- Simple Descriptors - Fourier Descriptors - Regional Descriptors - Simple Descriptors- Textures.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Analyze general terminology of digital image processing in MATLAB
- CO2** - Examine various types of images, intensity transformations and spatial filtering.
- CO3** - Develop Fourier transform for image processing in frequency domain.
- CO4** - Evaluate the methodologies for image segmentation, restoration etc
- CO5** - Implement image process and analysis algorithms.
- CO6** - Apply image processing algorithms in practical applications.

TEXT / REFERENCE BOOKS

1. Rudra Pratap, "Getting Started with MATLAB 6.0", 1st Edition, Oxford University Press, 2004
2. Duane Hanselman, Bruce Littlefield, "Mastering MATLAB 7", Pearson Education Inc, 2005
3. William J. Palm, "Introduction to MATLAB 6.0 for Engineers", Mc Graw Hill & Co, 2001
4. M. Herniter, "Programming in MATLAB", Thomson Learning, 2001
5. K.K. Sharma, "MATLAB Demystified", K.K. Sharma, Matlab : Demystified Basic Concepts and Applications, Vikas Publishing House Pvt Ltd, 2010
6. Stephen J. Chapman, "MATLAB Programming for engineers", Thomson, 4th Edition, 2007

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks**70 Marks**

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB6101	ADVANCED DATA STRUCTURES AND ALGORITHMS LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Polynomial Differentiation.
2. Printing the node details level wise
3. Searching the given element from N*N matrix using Binary search.
4. Knapsack Problem using Greedy Method.
5. Traveling salesman Problem
6. Binary Tree Traversal.
7. Implementing RED BLACK Trees.
8. Minimum Spanning Tree using KRUSKAL'S Algorithm.
9. Minimum Spanning Tree using FLOYD - WARSHALL Algorithm
10. Implementing Splay trees.
11. Implementing quad trees.

SBSB6102	PROGRAMMING IN MATLAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Study of MATLAB
2. Digital Image Import, Export and Conversion, Image data import and export, Conversion of Image types and Classes
3. Digital Image Display and Exploration Interactive tools for Image display and exploration
4. Geometric Transformation Scale, Rotate, Padding and Shearing Transformations.
5. Spatial Referencing, Provide Spatial Information
6. Image Registration Align Images using Automatic or Control Point registration
7. Image Analysis, Region Analysis, Texture Analysis, Pixel and Image statistics
8. Measuring image Features, Identify the round objects and the regions
9. Working with Large Images Block Processing.

SBSB5201	NETWORK HACKING AND DIGITAL FORENSICS	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To develop ability to quantitatively assess and measure threats to information assets
- Evaluate where information networks are most vulnerable and perform penetration tests into secure networks for evaluation purposes
- Critique security plans designed at protecting data assets against attacks from the Internet and investigate and mitigate data risk

UNIT 1 ETHICAL HACKING**12 Hrs.**

Types of Data Stolen, Elements of Information Security, Authenticity and Non-Repudiation, Security Challenges, Effects of Hacking, Types of Hackers, Ethical Hacker, Hacktivism - Role of Security and Penetration Tester, Penetration Testing Methodology, Networking & Computer Attacks - Malicious Software (Malware), Protection Against Malware, Intruder Attacks on Networks and Computers, Addressing Physical Security - Key Loggers and Back Doors.

UNIT 2 FOOT PRINTING AND SOCIAL ENGINEERING**12 Hrs.**

Web Tools for Foot Printing, Conducting Competitive Intelligence, Google Hacking, Scanning, Enumeration, Trojans & Backdoors, Virus & Worms, Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering - shoulder surfing, Dumpster Diving, Piggybacking.

UNIT 3 DATA SECURITY & FIREWALLS**12 Hrs.**

Physical Security - Attacks and Protection, A study on various attacks - Input validation attacks - SQL injection attacks - Buffer overflow attacks - Privacy attacks, Attacks and Measures, Wireless Hacking, Windows Hacking, Linux Hacking.

UNIT 4 NETWORK PROTECTION SYSTEM & HACKING WEB SERVERS**12 Hrs.**

Routers, Firewall & Honeypots, IDS & IPS, Web Filtering, Vulnerability, Penetration Testing, Session Hijacking, Web Server, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobiles Phone Hacking.

UNIT 5 ETHICAL HACKING LAWS AND TESTS**12 Hrs.**

An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking, ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking - Social Engineering, Host Reconnaissance, Session Hijacking, Hacking - Web Server, Database, Password Cracking, Network and Wireless, Trojan, Backdoor, UNIX, LINUX, Microsoft, NOVEL Server, Buffer Overflow, Denial of Service Attack, Methodical Penetration Testing.

Max.60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - Understand the concepts of Cyber forensics

CO2 - Apply the Computer Forensics Technology.

CO3 - Know How to Investigate Computer Forensic

CO4 - Understand the importance of Business Computer Forensic Technology

CO5 - Analyse the Advanced Cyber Forensics - windows, memory, Virtual machine Forensics

CO6 - Understand hacking laws and tests.

TEXT / REFERENCE BOOKS

1. Michael T. Simpson, Kent Backman, James E. Corley, Hands On Ethical Hacking and Network Defense, Second Edition, CENGAGE Learning, 2010.
2. Kenneth C.Brancik, Insider Computer Fraud, Auerbach Publications Taylor & Francis, Group 2008.
3. Ankit Fadia, Ethical Hacking, Second Edition Macmillan India Ltd, 2006.
4. Steven DeFino, Barry Kaufman, Nick Valenteen, Official Certified Ethical Hacker Review Guide, CENGAGE Learning, 20012-11-01.
5. Patrick Engebretson, The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy, Syngress Basics Series -Elsevier, August 4, 2011
6. Whitaker & Newman, Penetration Testing and Network Defense, Cisco Press, Indianapolis, IN, 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks
(Out of 100 marks, maximum of 10% problems may be asked)**70 Marks**

SBSB5202	MOBILE COMPUTING	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- Understand the basic concepts of Wireless Communication and be familiar with the network protocol stack
- Learn the basics of mobile telecommunication system
- Be exposed to Mobile Ad-Hoc networks and gain knowledge about different mobile platforms and application development.

UNIT 1 WIRELESS COMMUNICATION FUNDAMENTALS**12 Hrs.**

Introduction - Wireless transmission - Frequencies for radio transmission - Signals - Antennas - Signal propagation - Multiplexing - Modulations - Spread spectrum - MAC - SDMA - FDMA - TDMA - CDMA - Cellular wireless networks.

UNIT 2 TELECOMMUNICATION NETWORKS**12 Hrs.**

Telecommunication systems - GSM - GPRS - DECT - UMTS - IMT-2000 - Satellite networks - Basics - Parameters and configurations.

UNIT 3 MOBILE NETWORK LAYER**12 Hrs.**

Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

UNIT 4 MOBILE AD HOC NETWORKS (MANETS)**12 Hrs.**

Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

UNIT 5 PROTOCOLS AND TOOLS**12 Hrs.**

Wireless Application Protocol - WAP.(Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - To understand concepts of Mobile Communication.

CO2 - To analyse next generation Mobile Communication System

CO3 - To understand network and transport layers of Mobile Communication.

CO4 - Analyze various protocols of all layers for mobile and ad hoc wireless communication networks

CO5 - To understand IP and TCP layers of Mobile Communication.

CO6 - Evaluate the effectiveness of different mobile computing frameworks.

TEXT / REFERENCE BOOKS

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2004.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 04714112028.
3. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML"
4. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 00714123712, McGraw-Hill Professional, 2005.
5. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, 2003.
6. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks**70 Marks**

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB5203	NATURAL LANGUAGE PROCESSING	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To understand the use of state automata for language processing.
- To provide the fundamentals of parsing.
- Learn parsing and grammars for natural language

UNIT 1 LINGUISTIC BACKGROUND**12 Hrs.**

An outline of English Syntax - Grammars and Parsing Features and Augmented Grammars.

UNIT 2 SYNTACTIC PROCESSING**12 Hrs.**

Grammars for Natural Language - Toward Efficient Parsing - Bottom-Up Parsing - Top-Down Parsing - Transition Network Grammars.

UNIT 3 FEATURES AND AUGMENTED GRAMMARS**12 Hrs.**

Feature Systems and Augmented Grammars - Some Basic Feature Systems for English - Morphological Analysis and the Lexicon - Grammar using Features - Parsing with Features - Augmented Transition Networks - Generalized Feature Systems and Unification grammars.

UNIT 4 GRAMMARS FOR NATURAL LANGUAGE**12 Hrs.**

Auxiliary Verbs and Verb Phrases - Movement Phenomena in Language - Handling questions in Context - Free Grammars- Relative Clauses - Hold Mechanism in ATN's.

UNIT 5 EFFICIENT PARSING**12 Hrs.**

Human Preferences - Parsing Semantic Interpretation - Semantics and Logical Form Word Senses and Ambiguity - The Basic Logical Form Language - Encoding Ambiguity - Verbs and States in Logical Form - Semantic Interpretation and Compositionality - A Simple Grammar and Lexicon with Semantic Interpretation Prepositional Phrases and Noun Phrases.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - Understand NLP problems and survey the literature about that problem

CO2 - Understand language modeling

CO3 - Describe automated natural language generation and machine translation

CO4 - Learn the natural language generation.

CO5 - Analyze the logic and semantics of world knowledge

CO6 - Analyze and compare the use of different statistical approaches for different types of NLP applications.

TEXT / REFERENCE BOOKS

1. James. Allan, "Natural Language understanding", Benjamin/Gumming Publishing Company Inc, 5th edition, 2015.
2. Richard M Reese, "Natural Language Processing with Java, O'Reilly Media, 2015

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.**

PART A: 6 Questions of 5 marks each - No choice

30 Marks

PART B: 2 Questions from each unit with internal choice, each carrying 14 marks

70 Marks

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB6201	NATURAL LANGUAGE PROCESSING LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Word Analysis
2. Word Generation
3. Text Classification
4. Semantic Analysis
5. Parts of Speech Tagging
6. Chunking

SBSB5301	CYBER PHYSICAL SYSTEM	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To introduce basics of cyber-physical system and Industrial revolution 4.0 concepts
- To develop an exposition of the challenges in implementing a cyber-physical system
- To analyze the functional behavior of CPS based on standard modeling formalisms.

UNIT 1 INTRODUCTION TO INDUSTRY 4.0 & CYBER PHYSICAL SYSTEM 12 Hrs.

Industry 4.0 - Globalization and Emerging Issues, The Fourth Revolution - Smart and Connected Business Perspective, Basics of Industrial IoT - Industrial Processes - Industrial Sensing & Actuation, Industrial Internet Systems - Basic principles of design and validation of CPS - Cyber-Physical Systems (CPS) in the real world- Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation.

UNIT 2 EMBEDDED SYSTEMS MODELING AND DESIGN AND CPS 12 Hrs.

Platform components - Embedded Systems definition, specification, and languages. Concepts, requirements, examples. Embedded system models at different abstraction levels. Test benches, design under test, Intellectual Property components. Discrete event simulation, semantics, algorithms. Design, analysis techniques for decentralized computer architectures, communication, and hardware-software systems. -Cyber Physical System Hardware Platform - Processors, Sensors, Actuators - Network - Wireless Hart, CAN, Automotive Ethernet - Software stack -Real-Time Operating system (RTOS) -Scheduling Real Time control tasks.

UNIT 3 SENSORS, ACTUATORS AND SENSOR NETWORKS 12 Hrs.

Sensors, Actuators and Sensor Networks & Real-Time and Distributed Systems - Fundamental principles and applications of sensors, actuators. Smart sensors and microsensor/microactuator array devices. Introduction to signal processing and sensor/actuator networks, deployment and architecture, wireless communication, multiple access control layer, data gathering, routing and querying, collaborating signal processing - Time dependent systems, clock synchronization, real-time communication protocols, specification of requirements, task scheduling. Validation of timelines, real-time configuration management. Middleware architecture for distributed real-time and secure services.

UNIT 4 SECURITY OF CYBER PHYSICAL SYSTEM 12 Hrs.

Security of Cyber Physical Systems -Embedded and CPS security - attacks and countermeasures, authentication, identification, confidentiality, data integrity, authorization, access control, malware attacks and counter-measures, security protocols. Privacy issues - vehicular devices and smart metering. Applications of public key and symmetric cryptography, - digital certificates, credentials. Security and vulnerability of cyber-physical infrastructure networks - Mobile and wireless network security, Robust wireless infrastructure - Cloud computing and data security, Event Awareness and System Monitoring for Cyber Physical Infrastructure.

UNIT 5 CYBER-PHYSICAL SYSTEMS CASE STUDIES AND PROJECTS 12 Hrs.

Cyber-Physical Systems Case Studies and Projects - Automotive: SW controllers for Antilock braking system, Adaptive Cruise Control, Lane Departure Warning, Suspension Control - Healthcare: Artificial Pancreas/Infusion Pump/Pacemaker - Green Buildings: automated lighting, AC control - power distribution grid - robotics - civil infrastructure - avionics - Transportation

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - An ability to expose the student to real world problems in CPS and Industrial revolution 4.0 best practices.
- CO2** - Identify the limitations of some computational models.
- CO3** - Apply the theoretical knowledge the design of compilers.
- CO4** - Student can Analyze and verify the correctness of CPS implementations against system requirements and timing constraints.
- CO5** - Categorize the essential modelling formalisms of Cyber-Physical Systems (CPS).
- CO6** - Ability to understand cyber modelling system

TEXT / REFERENCE BOOKS

1. "Industry 4.0: The Industrial Internet of Things", Alasdair Gilchrist (Apress)
2. "Industrial Internet of Things: Cyber manufacturing Systems" Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer)
3. Edward A. Lee and Sanjit A. Seshia, Introduction to Embedded Systems, A Cyber-Physical Systems Approach, Second Edition,
4. Rajeev Alur. Principles of Cyber-Physical Systems. MIT Press. 2015.
5. K. J. Astrom and R. M. Murray. Feedback Systems: An Introduction for Scientists and Engineers. Prince- ton University Press, 20012.
6. http://www.cds.caltech.edu/~murray/amwiki/index.php/Main_Page.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 6 Questions of 5 marks each - No choice

30 Marks

PART B: 2 Questions from each unit with internal choice, each carrying 14 marks

70 Marks

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB5302	WIRELESS SENSOR NETWORKS	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To provide awareness about challenges wireless sensor networks.
- To acquire knowledge of various networking sensors
- To comprehend the infrastructure establishment

UNIT 1 NETWORK ARCHITECTURE**12 Hrs.**

Concept of sensor network - Introduction, Applications, Sensors. Single Node Architecture: Hardware and software component of a sensor node-Tiny OS operating system-C language. Wireless Sensor Network architecture: Typical network architectures- Data relaying strategies Aggregation-Role of energy in routing decisions.

UNIT 2 MAC LAYER**12 Hrs.**

MAC Layer Strategies: MAC Layer Protocols-Scheduling Sleep Cycles-Energy Management-Contention Based Protocols- Schedule Based Protocols, 802.15.4 Standard. Naming and Addressing: Addressing Services - Publish-Subscribe Topologies. Clock Synchronization: Clustering For Synchronization-Sender-Receiver-Receiver Synchronization-Error Analysis. Power Management - Per Node -System-Wide-Sentry Services-Sensing Coverage.

UNIT 3 NODE LOCALIZATION AND DATA GATHERING**12 Hrs.**

Node Localization: Absolute and Relative Localization-Triangulation-Multi-Hop Localization and Error Analysis-Anchoring - Geographic Localization-Target Tracking - Localization and Identity Management-Walking GPS-Range Free Solutions. Data Gathering - Tree Construction Algorithms and Analysis - Asymptotic Capacity- Lifetime Optimization Formulations- Storage and Retrieval. Deployment & Configuration - Sensor deployment, scheduling and coverage issues-Self configuration and topology control.

UNIT 4 ROUTING AND DISTRIBUTED COMPUTATION**12 Hrs.**

Routing: Agent-Based Routing -Random Walk-Trace Routing Data Centric-Hierarchical - Location-Based - Energy Efficient Routing Querying-Data Collection And Processing-Collaborative Information Processing And Group Connectivity.

UNIT 5 SENSOR NETWORK TOOLS**12 Hrs.**

Sensor Network Platforms and Tools: Sensor node hardware- Programming challenges-Node level software platform-Node level simulators-Programming beyond individual nodes-Security-Privacy issues-Attacks and counter measures.

Max.60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - An Ability to understand the concepts of sensors.
- CO2** - An Ability to analyse modelling and simulation of various communication networks.
- CO3** - Demonstrate knowledge of MAC protocols developed for WSN.
- CO4** - Demonstrate knowledge of routing protocols developed for WSN.
- CO5** - Understand and explain mobile data-centric networking principles
- CO6** - An Ability to understand the security features in WSN

TEXT / REFERENCE BOOKS

1. Feng Zhao and LeonidasJ Guibas, "Wireless Sensor Networks" Morgan Kaufmann Publishers, Elsevier, 2004.
2. Raghavendra. C.S., Krishna M. Sivalingam, Taieb F. Znati, "Wireless Sensor Networks", 2nd edition, Springer,2004.
3. Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John WileyandSons,2005.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks**70 Marks**

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB5303	DATA SCIENCE	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To study the basic concepts of Data Science and data life cycle
- To understand the theoretical and mathematical aspects of Data Science models
- To learn common random variables and their uses, and with the use of empirical distributions

UNIT 1 INTRODUCTION TO DATA SCIENCE**12 Hrs.**

What is Data Science? -The data life cycle: pre-processing, analysis, post-processing - Preprocessing: Data gathering, cleansing, visualization, and understanding (Mean, Variance, Standard Deviation, Percentiles.)-Data Storage (Relational databases, e.g. MySQL).

UNIT 2 APPROACHING ANALYTICS PROBLEMS**12 Hrs.**

Key roles for successful Analytics project- Discovery- Business domain, Resources, Problem framing, Key stakeholders, Analytics sponsors, Initial hypotheses, Data sources- Data Preparation- Learning about the data, conditioning- Model Planning- Data exploration, Model selection- Model Building- Common tools for model building- Communicate Results- Analysis over the different models- Operationalize- Moving the model to deployment environment-Analytics Plan.

UNIT 3 INTRODUCTION TO R**12 Hrs.**

Introduction to R- R Graphical user interfaces- Data Import and Export- Attributes and Data Types- Vectors- Arrays and Matrices- Data Frames- Lists- Factors- Contingency Tables- Descriptive statistics- Model building, Evaluation and Deployment- Hypotheses Testing- Null hypotheses and Alternative hypotheses- Probability distributions- Statistical models in R- Data distribution.

UNIT 4 MODELING METHODS**12 Hrs.**

Choosing and evaluating models - mapping problems to machine learning, evaluating clustering models, validating models - cluster analysis - K-means algorithm, Naïve Bayes - Memorization Methods - Linear and logistic regression - unsupervised methods.

UNIT 5 DELIVERING RESULTS**12 Hrs.**

Documentation and deployment - producing effective presentations - Introduction to graphical analysis - plot() function - displaying multivariate data - matrix plots - multiple plots in one window - exporting graph - using graphics parameters. Case studies.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Understand the key concepts in data science, including tools and approaches.
- CO2** - Apply a suitable data science technique to solve an information analytics problem.
- CO3** - Able to comprehend basic methods of processing data from real world problems
- CO4** - Analyse and validate the models using appropriate performance metrics
- CO5** - Understand the various techniques in data science
- CO6** - Present the results using effective visualization techniques

TEXT / REFERENCE BOOKS

1. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big Data Analytics", EMC Education Services, 2015
2. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014
3. Jure Leskovec, and Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014
4. Glenn J. Myatt, Wayne P. Johnson, Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, John Wiley & Son Publication, Second Edition, 2014.
5. Saltz Jeffrey S, An Introduction to Data Science, Sage Publications Inc, Second Edition, 2012
6. W.N.Venables, D.M.Smith and the R Core Team, "An Introduction to R", 2013

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks**70 Marks**

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB6301	CYBER PHYSICAL SYSTEMS LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Study about embedded components such as sensors and actuators
2. Study about Industrial Revolution and Cyber physical system opportunities and challenges
3. Create a program that blinks the LED on the development board using MBED software
4. Pick one-one from the available sensors and actuators and find or create code that will display the sensed data on the PC
5. Create a program that displays data from the sensor in regular intervals in a compact format.
6. To Design Basic weather station using embedded components using Lab view software.
7. Login to devicehub.net and create a project then create a virtual device. Add the corresponding sensor and actuator to the virtual device.
8. Study the MQTT protocol. Examine the components of the protocol.
9. Create a connection from an MQTT capable device/software with an MQTT broker then send and receive data using it.
10. To configuring the gateways and exchange the data to local database using Dream factory
11. To configuring the gateways and upload the data to cloud server using Dream factory or Ubidots
12. To configuring the gateways and upload the data to cloud server using Dream factory or Ubidots

DISCIPLINE SPECIFIC ELECTIVES

SBSB3001	CYBER LAW	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To know all the aspects of Cyber law as per Indian/IT act
- It also covers overview of Intellectual I Property Right and Trademark Related laws with respect to Cyber Space.
- To understand the concept of data and recovery evidence for different platforms.

UNIT 1**9 Hrs.**

Cyber space -Meaning and characteristics - Need for regulation of cyber space - Cyber-libertarianism, Cyber-paternalism, Lessig's model of regulation- Regulators in cyberspace - Introduction to Internet - ACLU v Reno Digitization and Society, Legal Challenges of the Information Society - Information Technology Act, 2000.

UNIT 2**9 Hrs.**

Contracts - Meaning and essential requirements - E-contracts - Application of rules of contract - Incorporation of terms, Identity of contracting parties, extent of details - E-commerce directives and Regulations-Provisions under IT Act, certifying authorities, Issuing authorities, PKI, Electronic Signature Certificate, Grant, Revocation and withdrawal of ESC.

UNIT 3**9 Hrs.**

Digital Copyrights, Open Source -Linking and caching- Digital Rights Management, DMCA, - Patents, Software Patents Trademarks and domain names, Brand identities, search engines and secondary market, ICANN, Database Right.

UNIT 4**9 Hrs.**

Digitization, personal data and data industry, Data protection principles, Conditions for processing of personal data, CCTV, RFID tracking, Data retention and identity - Taxation issues of e-commerce.

UNIT 5**9 Hrs.**

Computer misuse - identity theft, grooming and harassment, Hacking, Viruses, criminal damage and mail bombing, Denial of service attack, Obscenity, child abuse, Stalking. Morphing, web jacking, phishing etc., Cyber terrorism, Bandwidth theft, Convention on cybercrime.

Max. 45 Hrs.**COURSE OUTCOMES**

CO1 - To know all the aspects of Cyber law as per Indian/IT act

CO2 - It also covers overview of Intellectual I Property Right and Trademark Related laws with respect to Cyber Space.

CO3 - To understand the concept of data and recovery evidence for different platforms.

CO4 - To designed Forensics Investigation and laws.

CO5 - To understand the concepts of cyber security and legal systems of information technology.

CO6 - To gain knowledge on reverse engineering and cracking techniques.

TEXT / REFERENCE BOOKS

1. Senthil, Surya, and Lakshmi Devi. Manual of Cyber Laws. New Delhi: Aditya Book Company, 2010.
2. Singh, Ranbir and Ghanshyam Singh. Cyber Space and the Law: Issues and Challenges. Hyderabad: NALSAR University, 2004.
3. Rowland, Diane, and Elizabeth Macdonald. Information Technology Law, Cavendish Publishing Ltd, 1997.
4. Sharma, Vakul. Information Technology: Law & Practice. 2nd Edition, New Delhi: Universal Law Publishing Co.
5. Singh, Yatindra (Justice). Cyber Laws. 3rd Edition, Universal Law Publishing.
6. Jayashankar K. K., and Philip Johnson. Cyber Law. Pacific Books International, 2011.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 marks each uniformly distributed - No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 marks****80 Marks**

SBSB3002	NETWORK SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To identify some of the factors driving the need for network security
- To identify and classify examples of attacks
- To define the terms vulnerability, threat and attack

UNIT 1**9 Hrs.**

Introduction: The OSI Security Architecture- Network security model - Classical Encryption techniques – Cryptography Symmetric Cipher Model - Substitution Techniques- Caesar Cipher- Crypt analysis Mono alphabetic Ciphers- Playfair Cipher- Hill Cipher- Transposition Techniques.

UNIT 2**9 Hrs.**

Block cipher - DES- Stream Cipher Structure - RC4 Algorithm- AES- Block Chaining Techniques.

UNIT 3**9 Hrs.**

Public Key Encryption: Principles of Public-Key Cryptosystems- Public-Key Cryptosystems- Applications for Public-Key Cryptosystems- Requirements for Public-Key Cryptography- Public-Key Cryptanalysis -The RSA Algorithm - Description of the Algorithm - Computational Aspects - The Security of RSA algorithm - Key Management - Distribution of Public Keys - Distribution of Secret Keys Using Public-Key Cryptography.

UNIT 4**9 Hrs.**

Authentication Requirements - Authentication Functions-Message Encryption-Message Authentication Code -Hash Function -Message Authentication Codes -Requirements for MACs - Message Authentication Code Based on DES - Hash Functions Requirements for a Hash Function -Simple Hash Functions - Birthday Attacks - Brute-Force Attacks -Cryptanalysis.

UNIT 5**9 Hrs.**

Intruders - Intrusion Techniques - Intrusion Detection - Audit Records - Statistical Anomaly Detection Rule-Based Intrusion Detection -Intrusion Detection Exchange Format - Password Management - Password Protection- Password Selection Strategies- Viruses and Related Threats -Malicious Programs -The Nature of Viruses -Types of Viruses -Macro Viruses - Email Viruses - Worms - State of Worm Technology - Firewall Design Principles - Firewall Characteristics -Types of Firewalls - Firewall Configurations.

Max. 45 Hrs.**COURSE OUTCOMES**

CO1 - Implement various symmetric encryption techniques for given applications

CO2 - Illustrate various public key encryption techniques

CO3 - Understand various key encryption mechanisms and key management strategies that can be applied for real time transactions.

CO4 - Evaluate authentication and hash algorithms.

CO5 - Summarize the basic network security mechanisms

CO6 - Basic concepts of system level security.

TEXT / REFERENCE BOOKS

1. Behrouz A. Forouzan "cryptography and network security", ACM Digital Library, 2007
2. Man Young Rhee, "Internet security: cryptographic principles", "Algorithms and Protocols" Wiley publications, 2003
3. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.
4. Joey Holland, "Cryptography: Principles and Practice" Larsen and Keller, 2017. Sahadeo
5. Padhye, Rajeev A. Sahu, Vishal Saraswat, "Introduction of Cryptography", CRC press, 2018.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 marks each uniformly distributed - No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 marks****80 Marks**

SBSB3003	AUGMENTED REALITY AND VIRTUAL REALITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To make students to know the basic concepts and framework in virtual reality.
- To teach students the principles and multidisciplinary features in virtual reality.
- To teach students the technology for multimodal user interaction and perception in VR, the visual, audial, and haptic interface and behavior.

UNIT 1 INTRODUCTION OF VIRTUAL REALITY**9 Hrs.**

Fundamental Concept and Components of Virtual Reality- Primary Features and Present Development on Virtual Reality - VR systems - VR as a discipline-Basic features of VR systems-Architecture of VR systems-VR hardware -VR input hardware: tracking systems, motion capture systems, data gloves-VR output hardware: visual displays.

UNIT 2 I/O INTERFACE & TECHNIQUES IN VR**9 Hrs.**

Multiple Modals of Input and Output Interface in Virtual Reality: Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual / Auditory / Haptic Devices. Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, Object Grasp.

UNIT 3 VISUAL COMPUTATION IN VIRTUAL REALITY**9 Hrs.**

Fundamentals of Computer Graphics-Software and Hardware Technology on Stereoscopic Display-Advanced Techniques in CG: Management of Large-Scale Environments & Real Time Rendering - Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega, Multi Gen, Virtools etc.

UNIT 4 INTRODUCTION OF AUGMENTED REALITY**9 Hrs.**

System Structure of Augmented Reality-Key Technology in AR-- software development - AR software. Camera parameters and camera calibration. Marker-based augmented reality. Pattern recognition. AR Toolkit.

UNIT 5 APPLICATION OF VR IN DIGITAL ENTERTAINMENT**9 Hrs.**

VR Technology in Film & TV Production- VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.3D user interfaces - Why 3D user interfaces. Major user tasks in VE. - Interaction techniques for selection, manipulation and navigation.3D UI evaluation.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, the student will be able to

- CO1** - Design and implement the VR system.
- CO2** - Implement the Augmented Reality software.
- CO3** - Analyse and design the framework in VR using various software development tools in VR.
- CO4** - Design the multi modal user interface.
- CO5** - Describe the principles and features of VR and AR.
- CO6** - Recognize the technologies used to manage the large-scale VR environment in real time.

TEXT / REFERENCE BOOKS

- Sherman, William R. and Alan B. Craig. Understanding Virtual Reality - Interface, Application, and Design, Morgan Kaufmann, 2002.
- Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
- Guangran LIU. Virtual Reality Technology, Tsinghua Press, Jan. 2011.
- Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB3004	INTRODUCTION TO IoT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of Internet of Things.
- To identify the various elements of an IoT System
- To understand the various means of communication from Node/Gateway to Cloud Platforms

UNIT 1**9 Hrs.**

Introduction to AR , Current technological trends and future prospects, - Evolution of IoT, Business Scope, Relation with embedded system, - Basic Architecture of an IoT, Introduction of M2M- M2M vs IoT.

UNIT 2**9 Hrs.**

Application Sensors & Actuators - Edge Networking (WSN) - Gateways - IoT Communication Model - WPAN & LPWA, Overview of IoT supported Hardware platforms such as: Raspberry pi, Wearable Development Boards, Applications of IOT.

UNIT 3**9 Hrs.**

IoT Communication Model, Cloud computing in IoT, IoT in cloud architecture, logging on to cloud, Selecting and Creating cloud service, cloud based IoT platforms-IBM Watson-Google cloud.

UNIT 4**9 Hrs.**

Big Data Analytics, Apache Hadoop, Apache Storm-Data Visualization-Visualization tools for IoT

UNIT 5**9 Hrs.**

Industry 4.0 concepts -The fourth revolution- Basic of Industrial IOT- Industrial Processing- Industrial Sensing & Actuator- Industrial internet process- Application of Industrial IOT.

Max. 45 Hrs.**COURSE OUTCOMES**

On Completion of course, student will be able to

- CO1** - To learn and understand the technology and current trends in Internet of things.
- CO2** - To understand the various elements of IoT system and hardware devices.
- CO3** - To learn the programming languages and platforms for building IoT applications.
- CO4** - To understand the cloud computing and its relevance for developing IoT applications.
- CO5** - To design and implement IoT applications that manages big data with data analytics and visualization tools.
- CO6** - To implement hands-on projects using an appropriate software and hardware devices in various applications.

TEXT / REFERENCE BOOKS

1. The Internet of Things: Applications and Protocols, Wiley publications. Author(s): Oliver Hersent, David Boswarthick ,Omar Elloumi
2. Architecting the Internet of Things, Springer publications. Author(s): Dieter Uckelmann, Mark Harrison, Florian Michahelles
3. Internet of Things with Arduino Cookbook, Packt Publications. Author(s): Marco Schwatz
4. Internet of Things and Data Analytics, Wiley Publications.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB3005	SOFTWARE TESTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Finding defects which may get created by the programmer while developing the software
- To understand the Software Testing Concepts
- To implement the Software Quality and Control Concepts

UNIT 1**9 Hrs.**

Introduction: Software testing - Role of software testing -Three step process to becoming a world class testing organization- A structural approach to testing - Test strategy - methods for developing test strategy.

UNIT 2**9 Hrs.**

Seven- Step Software testing process-Developing a Test plan-Profile the software project-understand the project risk-select a testing techniques-plan unit testing and analysis-build the test plan.

UNIT 3**9 Hrs.**

Requirements testing - Walk through test tool - Risk matrix Test tool - Testing for requirements phase and design phase - Conducting a design review-Inspecting Design Deliverables.

UNIT 4**9 Hrs.**

Acceptance and operational testing: Defining the acceptance criteria-Developing an Acceptance plan Executing the acceptance the acceptance plan-Developing Test Cases. Developing and updating test plan and test data.

UNIT 5**9 Hrs.**

Testing Strategy: Rapid prototyping- Spiral testing - Structural System Testing Techniques-Functional System Testing Techniques-Evaluate the effectiveness of testing.

Max. 45 Hrs.**COURSE OUTCOME**

CO1 - Finding defects which may get created by the programmer while developing the software

CO2 - To understand the Software Testing Concepts

CO3 - To implement the Software Quality and Control Concepts

CO4 - To Design the Test cases and to get familiarity over Automated Testing tools

CO5 - To understand the significance of testing

CO6 - To learn the essentials of testing

TEXT / REFERENCE BOOKS

1. Effective Methods for Software Testing, William Perry - John Wiley & Sons, USA, 1995
2. Ron Patton, Software Testing-Second Edition, Sams,2005
3. Watts S .Humphrey, Managing The Software process, Second Edition, Addison-Wesley Professional,1989
4. Glenford J. Myers, (2008), "The Art of Software Testing", Second Edition, John Wiley & Sons, New Delhi. (UNIT I -III)
5. Ron Patton, (2007) , "Software Testing", Second Edition, SAMS Techmedia
6. William E.Perry, (2000), "Effective Methods for Software Testing", Second edition, John Wiley & Sons, New Delhi.
7. Boris Beizer, (1995), "Black-Box Testing: -Techniques for Functional Testing of Software and Systems", Second edition, John Wiley & Sons, New Delhi.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB3006	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To analyze the performance of algorithms under various scenarios.
- To learn mathematical background for algorithm analysis & solving the recurrence equations.
- To learn various algorithm design techniques.

UNIT 1 INTRODUCTION**9 Hrs.**

Fundamentals of algorithmic problem solving - time complexity - space complexity with examples - growth of functions - asymptotic notations: need, types - big oh, little oh, omega, theta - properties - complexity analysis examples - performance measurement - instance size, test data, experimental setup. - probabilistic analysis, amortized analysis.

UNIT 2 MATHEMATICAL FOUNDATIONS**9 Hrs.**

Solving recurrence equations - substitution method - recursion tree method - master method - best case - worst case - average case analysis - sorting in linear time - lower bounds for sorting: - counting sort - radix sort - bucket sort- disjoint sets- disjoint set operations, union and find algorithms, spanning trees, connected components and biconnected components.

UNIT 3 BRUTE FORCE AND DIVIDE – AND – CONQUER**9 Hrs.**

Brute force: - travelling salesman problem - knapsack problem - assignment problem - closest pair and convex hull problems - divide and conquer approach: - binary search - quick sort - merge sort - strassen's matrix multiplication.

UNIT 4 GREEDY APPROACH AND DYNAMIC PROGRAMMING**9 Hrs.**

Greedy approach: - optimal merge patterns- huffman code - job sequencing problem- -- tree vertex splitting dynamic programming: - dice throw-- optimal binary search algorithms.

UNIT 5 BACKTRACKING AND BRANCH AND BOUND**9 Hrs.**

Backtracking: - 8 queens - hamiltonian circuit problem - branch and bound - assignment problem - knapsack problem: - travelling salesman problem - np complete problems - clique problem - vertex cover problem.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course the student will be able to

CO1 - Determine the Suitable Algorithmic Design Technique for A Given Problem.

CO2 - Identify the Limitations of Algorithms in Problem Solving

CO3 - Analyse the Efficiency of The Algorithm Based on Time and Space Complexity.

CO4 - Implement Asymptotic Notations to Analyse Worst-Case and Average Case Running Times Of Algorithms.

CO5 - Interpret the Fundamental Needs of Algorithms in Problem Solving.

CO6 - Describe the Various Algorithmic Techniques and Its Real Time Applications.

TEXT / REFERENCE BOOKS

1. Thomas H. Cormen, Charles e. Leiserson, Ronald I. Rivest and Clifford stein, "introduction to algorithms", third edition, phi learning private limited, 2012.
2. Alfred v. Aho, john e. Hopcroft and Jeffrey d. Ullman, "data structures and algorithms David e. Goldberg, "genetic algorithm in search optimization and machine learning" Pearson education India, 2013.
3. Anany Levitin, "introduction to the design and analysis of algorithms", third edition, Pearson education, 2012.
4. Ellis Horowitz, Sartaj Sahni and Sangu Thevar Rajasekaran, fundamentals of computer algorithms, second edition, universities press, 2007.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B :** 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB3007	SOFTWARE ARCHITECTURE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the advanced software design and the issues associated with large-scale software architectures, frameworks, patterns, and components.
- To understand the techniques used for the automatic analysis and evaluation of software.
- To understand the software process and develop architectural thinking

UNIT 1**9 Hrs.**

Architecture Business cycle, what is software architecture, why software architecture is important, documenting software architectures. Understanding quality attributes, architecture, and quality attributes, achieving quality attributes.

UNIT 2**9 Hrs.**

Design patterns: History, Important principles behind design patterns, programming the interface and concept of delegation. Study of a commonly used representative design patterns Singleton, Adapter, Factory method, Strategy, State, Façade, Observer, Iterator.

UNIT 3**9 Hrs.**

Types of architectures styles and their comparison. Introduction to Three tier architecture presentation, business, and persistence layers]. Concept of loose coupling, Addressing Quality attributes through multi tier architecture. Introduction to XML, Advantages of coupling through xml, structure of XML.

UNIT 4**9 Hrs.**

Introduction to Web servers and Application servers, Introduction to Java EE, Introduction to concept of Messaging, Introduction to Enterprise Java Beans, concept of Entity beans, Session bean, message beans, use of EJBs in three tier architecture. Introduction to Web services.

UNIT 5**9 Hrs.**

Components, Interfaces, IUNKNOWN, DLL servers, Introduction to .NET architecture, .NET assemblies, .NET remoting, .NET web services.

Max. 45 Hrs.**COURSE OUTCOMES**

- CO1** - Analyze software process and process modelling.
- CO2** - Ability to draw UML diagrams for a given problem statement.
- CO3** - Understand various design patterns.
- CO4** - Evaluate the applicability of an architectural style for a product.
- CO5** - Build web application architecture using ADL tools.
- CO6** - Compare and contrast formal languages and description languages

TEXT / REFERENCE BOOKS

1. Len Bass , Paul Clements , Rick Kazman, Software Architecture in practice , second edition.
2. Eric J. Braude, Software Design From programming to architecture, Boston Univ ISBN:0-47120459- 5, 2004
3. Dale Rogerson, InsideCom Microsoft Programming series
4. James L. Weaver, Kevin Mukhar, James p. Crume(Publisher) Begineeing J2EE1.4 from Novice to Professional (Apress Beginner series)
5. Lenn Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Third Edition, Addison- Wesley Publication,201
6. George H. Fairbanks Just, "Enough Software Architecture: A Risk-Driven Approach", First Edition, Marshal Publication, 2010

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 marks each uniformly distributed - No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**

SBSB3008	SOFTWARE QUALITY MANAGEMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Understand the fundamental principles of Software Quality management.
- To understand the issues and challenges faced while doing the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation
- To define quality assurance plans

UNIT 1**9 Hrs.**

Software Quality - Hierarchical models of Boehm and McCall - Quality measurement - Metrics measurement and analysis - ilb's approach - QQM Model.

UNIT 2**9 Hrs.**

Quality tasks - SQA plan - Teams - Characteristics - Implementation - Documentation - Reviews and Audits.

UNIT 3**9 Hrs.**

Tools for Quality - Ishikawa's basic tools - CASE tools - Defect prevention and removal - Reliability models - Rayleigh model - Reliability growth models for quality assessment.

UNIT 4**9 Hrs.**

Elements of QMS - Rayleigh model framework - Reliability Growth models for QMS - Complexity metrics and models - Customer satisfaction analysis.

UNIT 5**9 Hrs.**

Need for standards - ISO 9000 Series - ISO 9000-3 for software development - CMM and CMMI - Six Sigma concepts.

Max. 45 Hrs.**COURSE OUTCOMES**

CO1 - Learn software quality factors

CO2 - Apply common software testing strategies

CO3 - Demonstrate about the project process control and software Metrics **CO4** - Implement all the common software testing strategies.

CO5 - Understand the SQA standards and software process assessments

CO6 - To deploy quality engineering models in projects

TEXT / REFERENCE BOOKS

1. Allan C. Gillies, Software Quality: Theory and Management, Thomson Learning, 2003
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Pearson Education (Singapore) Pte Ltd., 2002
3. Norman E. Fenton and Shari Lawrence Pfleeger, Software Metrics Thomson, 2003
4. Mordechai Ben - Menachem and Garry S. Marliss, Software Quality, Thomson Asia Pte Ltd, 2003.
5. Mary Beth Chrissis, Mike Konrad and Sandy Shrum, CMMI, Pearson Education (Singapore) Pte Ltd, 2003.
6. ISO 9000-3 Notes for the application of the ISO 9001 Standard to software development.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each uniformly distributed - No choice

20 Marks

PART B : 2 Questions from each unit of internal choice, each carrying 16 marks

80 Marks

SBSB3009	KNOWLEDGE MANAGEMENT SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To study the basic rudiments of knowledge management
- To understand of the knowledge management system life cycle.
- To learn the coding tools and procedures

UNIT 1**9 Hrs.**

KNOWLEDGE MANAGEMENT: KM Myths - KM Life Cycle - Understanding Knowledge - Knowledge, intelligence - Experience - Common Sense - Cognition and KM - Types of Knowledge - Expert Knowledge - Human Thinking and Learning.

UNIT 2**9 Hrs.**

KNOWLEDGE MANAGEMENT SYSTEM LIFE CYCLE: Challenges in Building KM Systems - Conventional Vrs KM System Life Cycle (KMSLS) - Knowledge Creation and Knowledge Architecture - Nonaka's Model of Knowledge Creation and Transformation. Knowledge Architecture.

UNIT 3**9 Hrs.**

CAPTURING KNOWLEDGE: Evaluating the Expert - Developing a Relationship with Experts - Fuzzy Reasoning and the Quality of Knowledge - Knowledge Capturing Techniques, Brain Storming - Protocol Analysis - Consensus Decision Making - Repertory Grid-Concept Mapping-Blackboarding.

UNIT 4**9 Hrs.**

KNOWLEDGE CODIFICATION: Modes of Knowledge Conversion - Codification Tools and Procedures - Knowledge Developer's Skill Sets - System Testing and Deployment - Knowledge Testing - Approaches to Logical Testing, User Acceptance Testing-KM System Deployment Issues-User Training- Postimplementation.

UNIT 5**9 Hrs.**

KNOWLEDGE TRANSFER AND SHARING: Transfer Methods - Role of the Internet - Knowledge Transfer in e-world - KM System Tools - Neural Network - Association Rules - Classification Trees - Data Mining and Business Intelligence - Decision Making Architecture - Data Management - Knowledge Management Protocols - Managing Knowledge Workers.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course the student will be able to

- CO1** - Understand the concept of knowledge and its types
- CO2** - Analyse the challenges in building Knowledge Management systems
- CO3** - Develop knowledge management capturing techniques
- CO4** - Test the coding tools for knowledge management systems.
- CO5** - Understand the architecture and development of knowledge systems
- CO6** - Develop models with Knowledge management system tools

TEXT / REFERENCE BOOKS

1. Elias.M. Award & Hassan M. Ghaziri - "Knowledge Management" Pearson Education 2000
2. Guus Schreiber, Hans Akkermans, AnjoAnjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, "Knowledge Engineering and Management", Universities Press, 2001.
3. C.W. Holsapple, "Handbooks on Knowledge Management", International Handbooks on Information Systems, Vol 1 and 2, 2003
4. Becerra-Fernandez, I.; Sabherwal, R.: Knowledge Management: Systems and Processes. M.E.
5. Sharpe Inc., 2010.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 marks each uniformly distributed - No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 marks****80 Marks**

SBSB7001	ADVANCED DISTRIBUTED COMPUTING	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To study the basic concepts of Data Science and data life cycle
- To understand the theoretical and mathematical aspects of Data Science models
- To learn common random variables and their uses, and with the use of empirical distributions

UNIT 1 INTRODUCTION TO DATA SCIENCE**12 Hrs.**

What is Data Science? -The data life cycle: pre-processing, analysis, post-processing - Preprocessing: Data gathering, cleansing, visualization, and understanding (Mean, Variance, Standard Deviation. Percentiles.)-Data Storage (Relational databases, e.g. MySQL)

UNIT 2 APPROACHING ANALYTICS PROBLEMS**12 Hrs.**

Key roles for successful Analytics project- Discovery- Business domain, Resources, Problem framing, Key stakeholders, Analytics sponsors, Initial hypotheses, Data sources- Data Preparation- Learning about the data, conditioning- Model Planning- Data exploration, Model selection- Model Building- Common tools for model building- Communicate Results- Analysis over the different models- Operationalize- Moving the model to deployment environment-Analytics Plan.

UNIT 3 INTRODUCTION TO R**12 Hrs.**

Introduction to R- R Graphical user interfaces- Data Import and Export- Attributes and Data Types- Vectors- Arrays and Matrices- Data Frames- Lists- Factors- Contingency Tables- Descriptive statistics- Model building, Evaluation and Deployment- Hypotheses Testing- Null hypotheses and Alternative hypotheses- Probability distributions- Statistical models in R- Data distribution.

UNIT 4 MODELING METHODS**12 Hrs.**

Choosing and evaluating models - mapping problems to machine learning, evaluating clustering models, validating models - cluster analysis - K-means algorithm, Naïve Bayes - Memorization Methods - Linear and logistic regression - unsupervised methods.

UNIT 5 DELIVERING RESULTS**12 Hrs.**

Documentation and deployment - producing effective presentations - Introduction to graphical analysis - plot() function - displaying multivariate data - matrix plots - multiple plots in one window - exporting graph - using graphics parameters. Case studies.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Understand the key concepts in data science, including tools and approaches.
- CO2** - Apply a suitable data science technique to solve an information analytics problem.
- CO3** - Able to comprehend basic methods of processing data from real world problems
- CO4** - Analyze and validate the models using appropriate performance metrics
- CO5** - Understand the various techniques in data science
- CO6** - Present the results using effective visualization techniques

TEXT / REFERENCE BOOKS

1. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big Data Analytics" , EMC Education Services,2015
2. Nina Zumel, John Mount, "Practical Data Science with R",Manning Publications, 2014
3. Jure Leskovec, and Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014
4. Glenn J. Myatt, Wayne P. Johnson, Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, John Wiley & Son Publication, Second Edition, 2014.
6. Saltz Jeffrey S, An Introduction to Data Science, Sage Publications Inc, Second Edition, 2012
7. W.N.Venables,D.M.Smith and the R CoreTeam,"AnIntroductiontoR",2013

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks**70 Marks**

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB7002	BIG DATA TOOLS AND TECHNIQUES	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To understand Big Data and its concepts
- To have knowledge on accessing, storing and manipulating the huge data from different resources.
- To analyze big data with Hadoop and work with Hadoop environment.

UNIT 1 INTRODUCTION TO BIG DATA**12 Hrs.**

Introduction to Big Data Platform - Challenges of Conventional Systems - Intelligent data analysis - Nature of Data - Analytic Processes and Tools - Analysis Vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re - Sampling - Statistical Inference - Prediction Error.

UNIT 2 MINING DATA STREAMS**12 Hrs.**

Introduction To Streams Concepts - Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream - Filtering Streams - Counting Distinct Elements in a Stream - Estimating Moments - Counting Oneness in a Window - Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT 3 HADOOP**12 Hrs.**

History of Hadoop - The Hadoop Distributed File System - Components of Hadoop - Analyzing the Data with Hadoop - Scaling Out - Hadoop Streaming - Design of HDFS - Java interfaces to HDFS - Basics - Developing a Map Reduce Application - How Map Reduce Works - Anatomy of a Map Reduce Job run - Failures - Job Scheduling - Shuffle and Sort - Task execution - Map Reduce Types and Formats - Map Reduce Features.

UNIT 4 HADOOP ENVIRONMENT**12 Hrs.**

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration - Security in Hadoop - Administering Hadoop - HDFS - Monitoring - Maintenance - Hadoop benchmarks - Hadoop in the cloud.

UNIT 5 FRAMEWORKS**12 Hrs.**

Applications on Big Data Using Pig and Hive - Data processing operators in Pig - Hive services - HiveQL - Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - Understand the usage of data on different Big data ecosystems.
- CO2** - To apply translation of vast data in to abstract concepts and to understand database reasoning
- CO3** - Able to comprehend big data processing methods
- CO4** - Analyze and validate the big data using Hadoop
- CO5** - Understand the storage, monitoring and maintenance of big data.
- CO6** - Understand the working environment of Pig and Hive for processing the structured and unstructured data.

TEXT / REFERENCE BOOKS

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007
2. Tom White, Hadoop: The Definitive Guide, Third Edition, O'reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill Publishing, 2012
4. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
5. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons, 2012.
6. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007.
7. Pete Warden, Big Data Glossary, O'Reilly, 2011.
8. Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, Second Edition, Elsevier, Reprinted 2008.
9. Da Ruan, Guoqing Chen, Etienne E. Kerre, Geert Wets, Intelligent Data Mining, Springer, 2007.
10. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, 2012.
11. Michael Minelli, Michele Chambers, Ambiga Dhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications, 2013.
12. Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, 2011.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks**70 Marks**

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB7003	COMPUTER VISION	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To review image processing techniques for computer vision.
- To understand shape and region analysis, Hough Transform and its applications to detect lines, circles, ellipses.
- To understand three-dimensional image analysis techniques, motion analysis.

UNIT 1 IMAGE PROCESSING FOUNDATIONS**12 Hrs.**

Review of image processing techniques - classical filtering operations - thresholding techniques - edge detection techniques - corner and interest point detection - mathematical morphology - texture.

UNIT 2 SHAPES AND REGIONS**12 Hrs.**

Binary shape analysis - connectedness - object labelling and counting - size filtering - distance functions - skeletons and thinning - deformable shape analysis - boundary tracking procedures - active contours - shape models and shape recognition - centroidal profiles - handling occlusion - boundary length measures - boundary descriptors - chain codes - Fourier descriptors - region descriptors - moments.

UNIT 3 HOUGH TRANSFORM**12 Hrs.**

Line detection - Hough Transform (HT) for line detection - foot-of-normal method - line localization - line fitting - RANSAC for straight line detection - HT based circular object detection - accurate center location - speed problem - ellipse detection - Case study: Human Iris location - hole detection - generalized Hough Transform (GHT) - spatial matched filtering - GHT for ellipse detection - object location - GHT for feature collation.

UNIT 4 3D VISION AND MOTION**12 Hrs.**

Methods for 3D vision - projection schemes - shape from shading - photometric stereo - shape from texture- shape from focus - active range finding - surface representations - point-based representation - volumetric representations - 3D object recognition - 3D reconstruction - introduction to motion - triangulation - bundle adjustment - translational alignment - parametric motion - spline-based motion - optical flow - layered motion.

UNIT 5 APPLICATIONS**12 Hrs.**

Application: Photo album - Face detection - Face recognition - Eigen faces - Active appearance and 3D shape models of faces Application: Surveillance - foreground-background separation - particle filters - Chamfer matching, tracking, and occlusion - combining views from multiple cameras - human gait analysis Application: In- vehicle vision system: locating roadway - road markings - identifying road signs - locating pedestrians.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course the student will be able to

- CO1** - Implement fundamental image processing techniques required for computer vision
- CO2** - Understand Image formation process
- CO3** - Extract features form images and do analysis of images
- CO4** - Generate 3D model from images
- CO5** - Understand video processing, motion computation and 3D vision and geometry
- CO6** - Develop applications using computer vision techniques

TEXT / REFERENCE BOOKS

1. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012.
2. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
3. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.
4. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
5. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.
6. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks**70 Marks**

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB7004	INFORMATION SECURITY	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To have a knowledge on security and controls against program threats
- To learn security implemented on operating system
- To learn security implemented on Database Security

UNIT 1 INTRODUCTION**12 Hrs.**

Introduction: Security- Attacks- Computer criminals- Method of defense Program Security: Secure programs- Non-malicious program errors- Viruses and other malicious code- Targeted malicious code- Controls against program threats.

UNIT 2 OPERATING SYSTEM SECURITY**12 Hrs.**

Operating System Security: Protected objects and methods of protection- Memory address protection- Control of access to general objects- File protection mechanism- Authentication: Authentication basics- Password- Challenge-response- Biometrics.

UNIT 3 DATABASE SECURITY**12 Hrs.**

Database Security: Security requirements- Reliability and integrity- Sensitive data Interface-Multilevel database- Proposals for multilevel security.

UNIT 4 SECURITY IN NETWORKS**12 Hrs.**

Security in Networks: Threats in networks- Network security control- Firewalls- Intrusion detection systems- Secure e-mail- Networks and cryptography- Example protocols: PEM- SSL- Ipsec.

UNIT 5 ADMINISTRATING SECURITY**12 Hrs.**

Administrating Security: Security planning- Risk analysis- Organizational security policies-Physical security - Legal- Privacy- and Ethical Issues in Computer Security - Protecting programs and data- Information and law- Rights of employees and employers- Software failures- Computer crime Privacy- Ethical issues in computer society- Case studies of ethics.

Max. 60 Hrs.**COURSE OUTCOMES**

On the completion of the course, the students will be able to

- CO1** - Describe fundamental concepts of information security.
- CO2** - Understand administrating security and legal and ethical issues.
- CO3** - Knowledge on Vulnerability Management.
- CO4** - Analyze the latest trend of network and host security threats and its defense.
- CO5** - Knowledge on Vulnerability Management.
- CO6** - Apply the vulnerabilities in various countermeasures.

TEXT / REFERENCE BOOKS

1. C. P. Pfleeger, and S. L. Pfleeger, Security in Computing, Pearson Education, 4th Ed, 2003
2. MattBishop, Computer Security: Art and Science, Pearson Education, 2003.
3. Cryptography & N/w Security: Principles and practice, 4th Edition, 2006
4. Kaufman, Perlman, Speciner, Network Security, Prentice Hall, 2nd Edition, 2003
5. Eric Maiwald, Network Security : A Beginner's Guide, TMH, 1121212
6. Macro Pistoia, Java Network Security, Pearson Education, 2nd Edition, 1121212
7. Whitman, Mattord, Principles of information security, Thomson, 2nd Edition, 2005

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks**70 Marks**

(Out of 100 marks, maximum of 10% problems may be asked)

SBSB7005	OPEN-SOURCE TOOLS	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To understand how to investigate various open-source tools and can learn the importance of program management.
- To understand how to perform shell programming.
- To have a better knowledge on Free OS and their Security, Quality, Customizability, Freedom of access, Flexibility, Interoperability, Auditability, Support Options

UNIT 1 INTRODUCTION**12 Hrs.**

Introduction : Open Source - Open Source vs. Commercial Software - Introduction to Linux - Linux Distributions - Operating Systems and Linux - Open Source Software - Software Repositories - Third-Party Linux Software Repositories - Linux Office and Database Software - Internet Servers - Development Resources - Online Linux Information Sources - Install Issues - accessing Your Linux System - The Display Managers: GDM and KDM - Switching Users - Accessing Linux from the Command Line Interface- Command Line Interface - Help Resources - Context-Sensitive Help - Application Documentation - The Man Pages - The Info Pages - Software Repositories.

UNIT 2 THE SHELL**12 Hrs.**

The Shell - The Command Line - History - Filename Expansion: *, ?, [] - Standard Input/Output and Redirection - Pipes - Redirecting and Piping the Standard Error: >&, 2> - Jobs: Background, Kills, and Interruptions - Ending Processes: ps and kill - The C Shell: Command Line Editing and History - The TCSH Shell - The Z-shell.

UNIT 3 SHELL SCRIPTS**12 Hrs.**

The Shell Scripts and Programming - Shell Variables - Shell Scripts - User-Defined Commands - Environment Variables and Subshells: export and setenv - Conditional Control Structures - Linux Files, Directories, and Archives- Linux Files - The File Structure - Listing, Displaying, and Printing File - Managing Directories - File and Directory Operations - Archiving and Compressing Files - vi editor.

UNIT 4 PHP**12 Hrs.**

PHP - Create and run PHP page - Mixing PHP and HTML - Printing text and HTML - Echo - Here - Command Line PHP - Comments - Variables - Strings - Constants - Data types - Operators and flow control.

UNIT 5 STRING AND ARRAY**12 Hrs.**

String and Array - String functions - Convert and format string - Arrays - Creating function - Reading data in web pages.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - explain common open-source licenses and the impact of choosing a license

CO2 - explain open-source project structure and how to successfully setup a project

CO3 - be competent with distributed software engineering tools.

CO4 - processes the tools such as test-driven development, issues tracking, unit testing, code review, distributed version control, and continuous integration.

CO5 - Able to understand about Web Server.

CO6 - Analyze the concept of Open-Source Software

TEXT / REFERENCE BOOKS

1. R. Peterson , 2007, Linux: The Complete Reference, Sixth Edition, TM
2. S. Holzner, 2008, PHP: The Complete Reference, TMH
3. R. Stones, N. Matthew, 2011, Beginning Linux Programming, 4th Edition, Wiley India Pvt. Ltd.- New Delhi
4. R. Nixon, Learning PHP, MySQL, JavaScript, and CSS, 2012, 2nd Edition, O'Reilly Media.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks
(Out of 100 marks, maximum of 10% problems may be asked)**70 Marks**

SBSB7006	SOCIAL NETWORK ANALYSIS	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behavior in social web and related communities.

UNIT 1 INTRODUCTION**12 Hrs.**

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web Social Network Analysis: Social Networks Perspective - Analysis of Network Data - Key concepts and measurements in network analysis - Interpretation of Network Data - Social Network Analysis in the Social and Behavioural Sciences - Metrics in social network analysis.

UNIT 2 SOCIAL NETWORK ANALYSIS SOFTWARE, TOOLS, AND LIBRARIES**12 Hrs.**

Modelling and aggregating social network data: Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - (Advanced representations) multi-Relational characterization of dynamic social network communities - Social network analysis software - Tools - Libraries.

UNIT 3 CLIQUES, CLUSTERS AND COMPONENTS**12 Hrs.**

Components and Sub graphs: Sub graphs - Ego Networks, Triads, and Cliques, Hierarchical Clustering, Triads, Network Density and conflict. Density: Egocentric and Sociocentric - Digression on Absolute Density - Community structure and Density, Centrality: Local and Global - Centralization and Graph Centres, Cliques and their intersections, Components and Citation Circles - Positions, Sets and Clusters.

UNIT 4 PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES**12 Hrs.**

Development of Social Network Analysis - Understanding and predicting human behaviour for social communities - User data management - policy, legal, and technical challenges. Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT 5 VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS**12 Hrs.**

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Modelling and aggregating social network data - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

Max. 60 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1** - An ability to identify metrics used in network analysis.
- CO2** - An ability to classify the network related data.
- CO3** - Identify the aim of graph in computational models.
- CO4** - Apply the knowledge in predicting the user behaviours.
- CO5** - Visualization of a social network using tools.
- CO6** - Ability to analyze metrics in social network analysis.

TEXT / REFERENCE BOOKS

1. Jeffrey C Johnson, Martin G Everett, Stephen P Borgatti, "Analyzing Social Networks", sage publication, 2013.
2. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking - Techniques and applications", 1st Edition, Springer, 2011.
3. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Sippet, 2008.
4. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 20012.
5. John Scott, "Social Network Analysis", 3 rd Edition, SAGE Publications Ltd 2013.
6. Peter Mika, "Social Networks and the Semantic Web", 1st Edition, Springer 2007.
7. Maksim Tsvetovat, Alexander Kouznetsov, "Social Network Analysis for Startups", 1 st Edition, O'Reilly Media, 2011.
8. John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 20012.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 6 Questions of 5 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 14 marks
(Out of 100 marks, maximum of 10% problems may be asked)**70 Marks**