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 etal. (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-Baye"s theorem (without proof)-problems.

Max. 45 Hrs.

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 McGraw S 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 IN 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

Max. 45 Hrs.

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
1. Alexix Leon and Methews Leon "Fundamentals of information Technology" Vikas Publishing House Pvt. Ltd.
2. Introduction to Information Technology, P.Rizwan Ahmed, Second Edition, Margham Publications,2016.
3. 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

TEXT / REFERENCE BOOKS
1. Sen S, Mahendra etal. (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 II 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.

UNIT1   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 1/3rd and 3/8 th rule.

Max. 45 Hrs.

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	Credits	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
- To understand terms related to database design and management
- To gain knowledge in relational model and relational database management system
- To implement relational databases using SQL & My SQL

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 - Familiar 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", 4. 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 Distinguish logical and combinational circuits
➢ 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 (upto 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
On completion of the course, student will be able to
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 Sevies , 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.   MorisMano.M,(2001),"Digital Logic and Computer Design", Forth Edition,
6.   AnanthiShashasaayee, Sheshasaayee.J.G,(2003), "Digital Logic Fundamentals",First Edition, Margham Publications

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END SEMESTER EXAM QUESTION PAPER PATTERN
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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 – JavaThreadModel – 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 Writer J2EEPlatform– – 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– Servlet Context Life cycle–Event Handling– Servlet Collaboration–Servlet Chaining–Request Dispatching.

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.

COURSE OUTCOMES

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 / REFERENCE BOOKS

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, Herbert Schildt, "The Complete Reference Java 2", Third Edition, Tata McGrawhill
4. Thomas A.Powell, Fritz Schneider, "Java Script: The Complete Reference", Third Edition, McGrawHill / Osborne
5. Jayson Falkner, Kevin Jones, "Servletsand 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 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

On completion of the course, student will be able to

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.
➢ To observe the concept of storage management.
➢ To understand the concept of I/O and file systems.
➢ To learn the basics of Linux Programming

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- Interprocess 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**

SBSB1305	FOUNDATION OF AI	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

➢ To understand the various characteristics of intelligent agents
➢ To learn the different search strategies in AI.
➢ To understand the knowledge in solving AI problems.

UNIT 1   9 Hrs.

Introduction – Foundations of AI – History of AI – Intelligent agent – Types of agents - Structure – Problem solving agents – Uninformed search strategies – Breadth first search – Uniform cost search – Depth first search – Depth limited search – Bidirectional search – Searching with partial Information.

UNIT 2   9 Hrs.

Informed search – Strategies – A* Heuristic function – Hill Climbing – Simulated Annealing – Constraint Specification problem Local Search in continuous space – Genetic algorithm – Optimal decisions in games - Pruning - Imperfect decisions –Alpha- Beta pruning – Games that include an element of chance.

UNIT 3   9 Hrs.

Knowledge based agent – The Wumpus world environment – Propositional logic – Inference rules – First-order logic – Syntax and semantics – Situation calculus – Building a knowledge base – Electronic circuit domain – Ontological Engineering –Forward and backward chaining – Resolution – Truth maintenance system-Mental Events and Mental Objects.

UNIT 4   9 Hrs.

Planning – Representation of planning – Partial order planning –Planning and acting in real world – Acting under uncertainty – Bayes"s rules – Semantics of Belief networks – Inference in Belief networks – Making simple decisions – Making complex decisions.

UNIT 5   9 Hrs.

AI applications – Language Models – Information Retrieval- Information Extraction –Fields of Natural Language Processing,Chatbots and its types , Artificially Intelligent Chatbots, Introduction to Chatbot Applications(Retrieval based- Conversation based)-Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1 - An ability to identify, analyze the search algorithm for the AI problems.
CO2 - Represent a problem using first order logic.
CO3 - Provide the knowledge based agent to solve the problem.
CO4 - Understand the Informed search strategies.
CO5 - Apply the baye"s rule to solve the problem for societal concern.
CO6 - Design user centric applications that use AI concepts

TEXT / REFERENCE BOOKS

1. Stuart J.Russel, Peter Norvig, "Artificial Intelligence A Modern Approach ", 3rdEdition, Pearson Education, 2009.
2. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009.
3. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc., First Edition, 2008.
4. Artificial Intelligence: Foundations of Computational Agents, 2nd Edition,David L. Poole and Alan K. Mackworth,2010
5. Introduction to Artificial Intelligence , Ertel, Wolfgang, I stEdition ,2017

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 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	Credits	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 Virtualization – 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, ZaighamMahmood, Ricardo Puttini, Pearson , 2017.
2. Instant Guide to Cloud Computing, AnandNayar(Ed), Ashokkumar, sudeepTanwar, 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**

SBSB1405	INTRODUCTION TO ROBOTICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

➢ To develop the student"s knowledge in various aspects of robotic system.
➢ To develop student"s skills in perform kinematics analysis of robot systems.
➢ To develop student"s skills in selecting various sensors associated with the robotic operations.

UNIT 1   9 Hrs.

Types and components of a robot, Classification of robots, closed-loop and open- loop control systems. Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.

UNIT 2   9 Hrs.

Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT 3   9 Hrs.

Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity/Affine/Projective transformations.

UNIT 4   9 Hrs.

Basics of control: Transfer functions, Control laws: P, PD, PID Non-linear and advanced controls

UNIT 5   9 Hrs.

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.Control Hardware and Interfacing: Embedded systems: Architecture –Robotic applications.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1 - Perform kinematic and dynamic analyses with simulation.
CO2 - Design control laws for a robot.
CO3 - Integrate mechanical and electrical hardware for a real prototype of robotic device.
CO4 - Select a robotic system for given application.
CO5 - Simulate Real time Robot for Industrial applications.
CO6 - Create an AI based Robot for any real time applications.

TEXT / REFERENCE BOOKS

1. Saha, S.K., "Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., "Robotics", Oxford, New Delhi, 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**

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
12. b) Multilevel Inheritance
13. Scipy Library

SBSB2402	INTRODUCTION TO ROBOTICS LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

COURSE OBJECTIVES

➢ To introduce different types of robotics and demonstrate them to identify different parts and components.
➢ To learn the fundamentals of Robot program to perform various operations
➢ To model and simulate a Robot with pick and place operations.

LIST OF EXPERIMENTS

1. Determination of maximum and minimum position of links.
2. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
3. Estimation of accuracy, repeatability and resolution.
4. Robot programming and simulation for pick and place
5. Robot programming and simulation for Color identification
6. Robot programming and simulation for Shape identification
7. Robot programming and simulation for machining (cutting, welding)
8. Robot programming and simulation for writing practice
9. Robot programming and simulation for any industrial process (Packaging, Assembly)
10. Robot programming and simulation for multi process.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1 - Remember the concept of Robotics programming
CO2 - Understand basic concepts about Robot operations
CO3 - Apply and implement various Robot operations through simulation
CO4 - Analyze Robot programs for industrial applications
CO5 - Design a Robot to perform machining operations.
CO6 - Create a AI Robot to perform the task navigation, sense and calculate their reaction.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student 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.

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 PERIPERALS 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 microprocessor.
CO4 - Examine various I/O devices with 8051 microcontroller
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. Kennith J.Ayala, 8051 Microcontroller, Thomson, 2005.
3. Charless 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**

SBSB1503	HUMAN COMPUTER INTERACTION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES
- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.

UNIT 1   **9 Hrs.**
The Components The Human : Human Memory – Thinking – Emotion – Individual Preferences – Psychology and Design of Interactive Systems. The Computer : Text Entry Devices – Pointing Devices – Display Devices – Devices for Virtual Reality and 3D interaction – Physical Controls, Sensors and Special Devices – Memory – Processing and Networks.

UNIT 2   **9 Hrs.**
HCI in the software process: Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design Rules: Introduction – Principles to support usability – Standards – Guidelines – Golden rules and heuristics – HCI patterns.

UNIT 3   **9 Hrs.**
Models and Theories HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models- Face-toface communication – conversation – text based – group working; Task analysis – difference between other techniques – task decomposition – Knowledge based analysis – ER based techniques – uses.

UNIT 4   **9 Hrs.**
Implementation support: Windowing system elements – using tool kits – user interface management; Evaluation techniques– goals – expert analysis – choosing a method; universal design principles – multimodal interaction; user support –requirements – Approaches – adaptive help systems – designing user support systems.

UNIT 5   **9 Hrs.**
Web Interface Design: Designing Web Interfaces – Drag and Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies

                                                                              Max. 45 Hrs.

COURSE OUTCOMES
On completion of the course, student will be able to
CO1 - Design effective dialog for HCI
CO2 - Design effective HCI for individuals and persons with disabilities.
CO3 - Assess the importance of user feedback.
CO4 - Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO5 - Develop meaningful user interface.
CO6 - Analyze and identify user models and the appropriate tools.

TEXT / REFERENCE BOOKS
1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, 3rd Edition, Pearson Education, 2004 (Unit I, II and III).
2. Human Computer Interaction, Springer publications,2018.
3. Brian Fling, Mobile Design and Development, First Edition, OReilly Media Inc., 2009 (Unit -IV)
4. Bill Scott and Theresa Neil, Designing Web Interfaces, First Edition, OReilly, 2009. (Unit-V)

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**

SBSB1504	COMPUTER COMMUNICATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES
- To understand the basics of communication
- To impart knowledge on basics of analog and digital communication.
- To analyze the data communication models and understand how to employ.

UNIT 1   **9 Hrs.**
Introduction to Communication systems – basic model, point to point, broadcast communication; modulation need for modulation, types of modulation, Base band and Pass band transmission; Demodulation (detection) – Coherent and Noncoherent detection; Noise – types of noise; Analog to Digital Conversion (ADC) process– Sampling , Quantization and Coding; Sampling theorem, types of sampling – ideal, natural and flat –top sampling; Nyquist rate, Signal reconstruction, types of quantization, Quantization noise, Aliasing.

UNIT 2   **9 Hrs.**
Amplitude modulation – types of amplitude modulation- Standard AM with Full Carrier ,Comparison of different amplitude modulations; Angle modulation (FM and PM), FM generation using PM, PM generation using FM, Comparison of Narrowband and Wideband FM, Comparison of AM,FM and PM. Analog pulse modulation – PAM,PWM,PPM; Digital pulse modulation – Pulse Code Modulation (PCM), Delta modulation (DM), Adaptive Delta modulation (ADM), Multiplexing – Frequency Division Multiplexing (FDM), Time Division Multiplexing.

UNIT 3   **9 Hrs.**
Introduction to computer communication: Transmission modes - Switching: circuit switching and packet switching, OSI model, Layers in OSI model, TCP/IP protocol suite.Physical Layer: Guided and unguided transmission media (Co-axial cable, UTP,STP, Fiber optic cable),Data Link Layer: Framing, Flow control (stop and wait, sliding window flow control) ,Error control, HDLC, Media access control: Ethernet (802.3), CSMA/CD, Logical link control, Wireless LAN (802.11), CSMA/CA.

UNIT 4   **9 Hrs.**
Network Layer Logical addressing: IPv4 & IPV6, Subnetting, DHCP, Virtual LAN, Networking devices (Hubs, Bridges & Switches), Network topologies.Routing: Routing and Forwarding, Static routing and Dynamic routing, Routing Algorithms: Distance vector routing algorithm, Link state routing (Dijkstra"s algorithm), Routing Protocols: Routing Information protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), MPLS.

UNIT 5   **9 Hrs.**
Transport Layer –UDP, TCP, Congestion Control & Quality of Service – Data traffic, Congestion, Congestion Control, QoS and Flow Characteristics, Application Layer – DNS, Remote Logging (Telnet), SMTP, FTP, WWW, HTTP, POP3, MIME, SNMP.

Max. 45 Hrs

COURSE OUTCOMES
On completion of the course, student will be able to
CO1 - Describe the essential basics of communication
CO2 - Classify different types of analog and digital modulation schemes
CO3 - Comprehend the need of data communication models
CO4 - Identify the required network layer components and functions
CO5 - Analyze the various protocols required in various layers
CO6 - Acquire the needs for building a communication model

TEXT / REFERENCE BOOKS

1.   William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2014.
2.   Wayne Thomasi, "Advanced Electronic Communication Systems", 6th Edition, PHI Publishers, 2003.
3.   Simon Haykins, "Communication Systems" John Wiley, 5th Edition, March 2009.
4.   John G. Proakis, MasoudSalehi, "Digital Communication", McGraw Hill 5th edition November 6, 2007.
5.   Behrouz A. Forouzen, "Data communication and Networking", Fourth Edition, Tata McGraw – Hill, 2011.
6.   Andrew S.Tanenbaum, "Computer Networks", 5th Edition, Pearson, 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**

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

SBSB1603	BLOCK CHAIN TECHNOLOGY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES
➢ To introduce Bit coin and other crypto currencies.
➢ To study the algorithms and techniques in block chain.
➢ To understand the practical aspects in the design of crypto currency.

UNIT 1   **9 Hrs.**
Basics of blockchain-Public Ledgers-Block Chain as Public Ledgers-Types of Block chains- Pillars of Block chain- Government Initiatives of BlockChain – Bitcoin – SmartContracts.

UNIT 2   **9 Hrs.**
Block in a Block chain-find Transactions-Distributed Consensus-Proof of work, Stake, Space-Attacks on POW-EthereumPos/POW Hybrids-Crypto currency to block chain 2.0, Model of Blockchain-Algorand.

UNIT 3   **9 Hrs.**
Hash Function and Merle Tree-Security Properties-Security Considerations for block chain-Digital Signature-Public Key Cryptography-Bit coinblock chain incentive structures- Nash Equilibriums-evolutionary stable strategies, -and Pareto efficiency (game theory) Weaknesses and news Points of Failure- Mitigation Methods-Redundancies and falback methods.

UNIT 4   **9 Hrs.**
Mining-Pools-Impact of CPU and GPU-Transaction in Bit coin Network- Block Mining- Block propagation and block relay.

UNIT 5   **9 Hrs.**
Industry applications of Blockchain-Blockchain in Government-Government use cases- Preventing Cybercrime through blockchain-Block Chain in defense, tax payments.

                                                                                          Max. 45 Hrs.

COURSE OUTCOMES
On completion of the course, student will be able to
CO1 - Explain the structure of a block chain.
CO2 - Analyze the incentive structure in a block chain-based system.
CO3 - Judge the scenario where "smart" contract is most appropriate.
CO4 - Identify Basic knowledge of Bitcoin, Ethereum.
CO5 - Apply Blockchain in future use cases for security.
CO6 - Understand the various Block Chain applications.

TEXT / REFERENCE BOOKS
1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos O"Reilly, Second Edition, 2018.
2. Blockchain by Melanie Swa, O"Reilly Media 2015.
3. Zero to Block chain - An IBM Redbooks course, by Bob Dill, David Smits.

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.
- ➢ To discuss about Challenges and Technologies towards Society 5.0, Security of Cyber Physical Systems

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
On completion of the course, student will be able to
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-Centered 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 Industy of the Future Technologies Methods and Tools By Bruno Salgues,Willey, 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**

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 l 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
On completion of the course, student will be able to
CO1 - To know all the aspects of Cyber law as per Indian/IT act
CO2 - It also covers overview of Intellectual l 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

On completion of the course, student will be able to

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" Whey 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, in particular 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, 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
1. Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann, 2002.
2. Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
3. Guangran LIU. Virtual Reality Technology, Tsinghua Press, Jan. 2011.
4. 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 INTERNET OF THINGS	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 IoT, 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 the 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): MarcoSchwatrz
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 planExecuting 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 OUTCOMES
On completion of the course, student will be able to
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. WattsS.Humphrey,ManagingThe Software process, Second Edition, Addison-Wesley Professional,1989
4. Glenford J. Myers, (2008), "The Art of Software Testing", Second Edition,JohnWiley&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, 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 l. 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

On completion of the course, student will be able to

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, Inside Com 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 – GQM 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
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. 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, 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**