



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

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SCHOOL OF SCIENCE AND HUMANITIES

DEPARTMENT OF COMPUTER SCIENCE

1.1.2 Courses revised and newly introduced in 2022 -2023

S. No.	Course Code	Course Name	Programme	Page No.
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SCHOOL OF SCIENCE AND HUMANITIES

DEPARTMENT OF COMPUTER SCIENCE

Minutes of meeting

Date: 22.6.2022

Time: 10:00AM

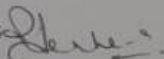
Venue: COMPUTER SCIENCE LAB

Agenda:

- Newly added courses for the following courses for B.Sc CS Specialization in AI:
 - Block Chain Technology - SBSA1306
 - Computer Communication - SBSA1307
- Newly added courses for the following courses for M.Sc CS:
 - Cyber Physical Systems – SBSA5301
 - Data Science – SBSA5303
 - Cyber Physical Systems Lab – SBSA6301
- Updating the course contents for the following courses for B.Sc CS :
 - Object Oriented Analysis and Design – SBSA1403

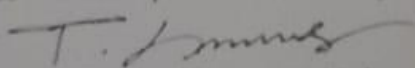
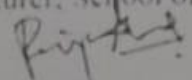
Minutes:

- Block Chain Technology and Computer Communications are newly added courses for the B.Sc CS specialization in AI students, to enrich their knowledge in bit coins and various communication models and communication layers
- Cyber Physical Systems, Data Science and Cyber Physical Systems are newly added courses for M.Sc CS students to delve deep into radically developing technologies
- Based on the staff and students feedback, Object Oriented Analysis and Design course is modified to include more key topics.
- The updates and new courses were well-received by all the external members as beneficial for the students.

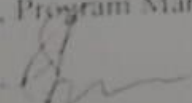
Convener: Dr.Rekha Chakravarthi, Dean of Science and Humanities 

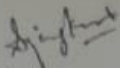
External Members:

Academic Expert

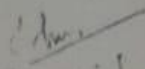
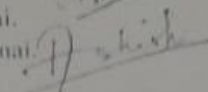
- Dr. I.G.Sambanthan, Professor & Head, Department of Computer Science & Engineering NIFTTIR, Chennai. 
- Dr. Riyaz Ahamed, Senior lecturer, School of Computer Science and Engineering, Taylor's University, Malaysia. 

Industry Experts

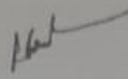
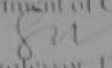
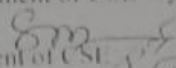
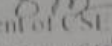
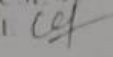
- Dr.V.Sankaran, Program Manager, Engineering and R&D Services, HCL Technologies. 

- Mr. Aray Kumar, CTO, Cognibot Robotics, Chennai. 

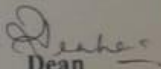
Alumni

- Mr. Johnson S, Project Test Manager, TCS, Chennai. 
- Mr. Ashish Chopra, Senior BDI, Freshworks, Chennai. 

Internal Members:

- Dr. L. Lakshminanan, HoD, Department of CSE. 
- Dr. S. Vigneswari, HoD of CSE. 
- Dr. Ulagamuthalvi, Associate Professor, Department of CSE. 
- Dr. S. Murugan, Professor, Department of CSE. 
- Dr. Prem Jacob, Associate Professor, Department of CSE. 
- Dr. Usha Nandini, Associate Professor, Department of CSE. 
- Dr. Ranya Franklin, Asst. Professor, Department of CSE. 

Dr. REKHA CHAKRAVARTHI, M.E., Ph.D.
 DEAN, ARTS AND SCIENCES
SATHYABAMA
 INSTITUTE OF SCIENCE AND TECHNOLOGY
 (DEEMED TO BE UNIVERSITY)
 Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.


 Dean

SBSA1301	OPERATING SYSTEMS	L	T	P	Credits	TotalMarks
		3	0	0	3	100

COURSE OBJECTIVES:

- To learn how computers work and to learn about system design(performancevs.simplicity,HWvs.SW,etc.)
- To have a view 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

9Hrs.

Introduction: Operating system –Views and Goals - Types of System- OS Structure - Components - Services – System Structure - Layered Approach - Process Management: Process - Process Scheduling - Cooperating Process - Threads - Inter-process Communication.

UNIT 2

9Hrs.

CPU Scheduling: CPU Schedulers - Scheduling Criteria - Scheduling Algorithms. Process Synchronization: Critical-Section Problem-Synchronization Hardware-Semaphores Classical Problems of Synchronization-Critical Region-Monitors.

UNIT 3

9Hrs.

Deadlocks:Characterization-Methods for Handling Deadlocks-Deadlock Prevention-Avoidance-Detection-Recovery.

UNIT 4

9Hrs.

Memory Management: Address Binding - Dynamic Loading and Linking - Overlays - Logical and Physical Address Space – Contiguous Allocation-Non-Contiguous Allocation.

UNIT 5

9Hrs.

File System: File Concepts - Access Methods - Directory Structures - Protection Consistency Semantics - File System Structures- Allocation Methods-Free Space Management.

Max.45hours

COURSE OUTCOMES:

CO1Understand 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/ReferenceBook:

1. A.SilberschatzP.B.Galvin,Gange.,Operating System Concepts,6thEdition.,Addison-WesleyPublishingCo.,2002.
2. William Stallings,OperatingSystems,FourthEdition,PHI.
3. AndrewS Tanenbaum,Operating Systems:Design and Implementation,ThirdEdition,

New Course

SBSA1302	JAVA PROGRAMMING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES:

- To understand and apply the fundamentals core java, packages, database connectivity for computing
- To provide knowledge on advanced features like Swing, JavaBeans, Sockets
- To understand the principles and concepts of object oriented programming
- To Store and retrieve the information from Files.
- To learn multithreading concepts

UNIT 1

9 Hrs.

An Overview of Java - Features of Java - Object oriented concepts - Lexical Issues - Data Types - Variables - Type Conversions and Casting - Arrays - Operators - Control Statements.

UNIT 2

9 Hrs.

Introduction to Classes and Objects - Declaring Objects and Methods - Constructors - this keyword - finalize() method- Overloading Methods - Overloading Constructors - Recursion - Access Control - Static and Final methods and variables - Nested and Inner class - String class - String Handling

UNIT 3

9 Hrs.

Inheritance - Using super - Overriding Methods - Abstract classes - Final with Inheritance – Multi Threaded programming

UNIT 4

9 Hrs.

Packages - Access Protection – Importing Packages – Interfaces – Exception Handling – throw and throws. – Sting tokenizer – Date – Calendar- Random.

UNIT 5

9 Hrs.

Applet - AWT Controls - Layout Managers and Menus- -Swing - JDBC/ODBC Connection

Max. 45 hours

COURSE OUTCOME :

CO1 - To understand the principles and concepts of object oriented programming

CO2 - To Store and retrieve the information from Files.

CO3 - To learn multithreading concepts

C04- Implement the interface, package and multithread concepts

C05- Implement various built in package and its applications

C06- Develop web based applications using applet programming

TEXT /REFERENCE BOOKS:

1. Herbert Schildt, The Complete Reference JAVA2, 7th Edition, McGraw-Hill/Osborne Media.
2. Bruce Eckel, Thinking in Java, 4th edition, Prentice Hall
3. Michael Morrison, Java Unleashed, 3rd edition, SAMS Publishing
4. Clayton Walnum, Java By Example, QUE Publications, 2000.
5. K. Arnold and J. Gosling, The JAVA programming language, Third edition, Pearson Education, 2000

New Course

SBSA1303	COMPUTER ARCHITECTURE	L	T	P	Credits	Total Marks
		3	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.
- To discuss about the registers, interface and communication in I/O devices.
- To analyze about the characteristics, structure communication and synchronization of multiprocessors.

UNIT1

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 - Subtractors - 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-

UNIT 4

9 Hrs.

Introduction to micro computers, 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 hours

COURSE OUTCOMES

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

TEXT /REFERENCE BOOKS:

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

New Course

SBSA1306	BLOCKCHAIN TECHNOLOGY	L	T	P	Credits	TotalMarks
		3	0	0	4	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.
- To understand the function of Block chains as a method of securing distributed ledgers.
- To design, code, deploy and execute a smart contract.

UNIT 1

12 Hrs.

Basics of blockchain-Public Ledgers-Block Chain as Public Ledgers-Types of Block chains- Pillars of Block chain- Government Initiatives of BlockChain – Bitcoin – Smart Contracts.

UNIT 2

12 Hrs.

Block in a Block chain-find Transactions-Distributed Consensus-Proof of work, Stake, Space-Attacks on POW- Ethereum Pos/POW Hybrids-Crypto currency to block chain 2.0, Model of Blockchain-Algorand.

UNIT 3

12 Hrs.

Hash Function and Merkle Tree-Security Properties-Security Considerations for block chain-Digital Signature-Public Key Cryptography-Bit coin block chain incentive structures- Nash Equilibriums- evolutionary stable strategies,-and Pareto efficiency (game theory) Weaknesses and new Points of Failure - Mitigation Methods -Redundancies and fall-back methods.

UNIT 4

12 Hrs.

Mining – Pools – Impact of CPU and GPU – Transaction in Bit coin Network – Block Mining – Block Propagation and block relay

UNIT 5

12 Hrs.

Industry applications of Blockchain-Blockchain in Government-Government use cases-Preventing Cybercrime through block chain-Block Chain in defense, tax payments.

Max. 60Hours

COURSE OUTCOMES:

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

- CO1 - Explain the structure of a block chain.
- CO2 - Analyze the incentive structure in a blockchain 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.

New Course

SBSA1307	COMPUTER COMMUNICATION	L	T	P	Credits	TotalMarks
		3	0	0	4	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.
- To explore the various layers and its functionalities in data communication model

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 Hours

COURSE OUTCOMES

- 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.

SBSA2301	JAVA PROGRAMMING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

LIST OF PROGRAMS

1. Substring removal from a String using StringBuffer class.
2. Determining the orders of the numbers generated randomly using Random class
3. Usage of Calendar class and manipulation
4. String manipulation using CharArray
5. Usage of Vector class
6. Implementing Thread based applications and exception handling
7. Application using synchronization such as Thread based, Class based and synchronized Statement Using Applets and swings
8. Working with frames and other controls
9. Working with Dialog and Menus
10. Working with Panel and Layout
11. Incorporating Graphics
12. Database creation for storing email addresses and manipulation using Swing

 New Course

SBSA5301	CYBER PHYSICAL SYSTEM	L	T	P	Credits	TotalMarks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce basics of cyber-physical system and Industrial revolution 4.0 concepts
- To develop an exposition of the challenges in implementing a cyber-physical system
- To analyze the functional behaviour of CPS based on standard modeling formalisms.
- To design CPS requirements based on operating system and hardware architecture constraints.
- To understand the concepts involved in Cyber Physical Systems Security

UNIT1 INTRODUCTION TO INDUSTRY 4.0 & CYBER PHYSICAL SYSTEM

9Hrs.

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

UNIT2 EMBEDDED SYSTEMS MODELING AND DESIGN AND CPS

9Hrs.

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

UNIT3 SENSORS, ACTUATORS AND SENSOR NETWORKS

9Hrs.

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

UNIT4 SECURITY OF CYBER PHYSICAL SYSTEMS

9Hrs.

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

UNIT5 CYBER-PHYSICAL SYSTEMS CASE STUDIES AND PROJECTS

9Hrs.

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

Max.45Hours

COURSE OUTCOMES

On completion of the course, student will be able to

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

TEXT/REFERENCE BOOKS

1. "Industry4.0:TheIndustrialInternetofThings",AlasdairGilchrist(Apress)
2. "IndustrialInternetofThings:CybermanufacturingSystems"SabinaJeschke,ChristianBrecher,HoubingSong,DandaB. Rawat(Springer)
3. EdwardA.LeeandSanjitA.Seshia,IntroductiontoEmbeddedSystems,ACyber-PhysicalSystemsApproach,Second Edition,<http://LeeSeshia.org>,ISBN978-1-312-42740-2,2015.
4. RajeevAlur.PrinciplesofCyber-PhysicalSystems.MITPress.2015.
5. K.J.AstromandR.M.Murray.FeedbackSystems:AnIntroduction for ScientistsandEngineers.Prince- tonUniversity Press, 2009.http://www.cds.caltech.edu/~murray/amwiki/index.php/Main_Page.

 New Course

SBSA5302	INTRODUCTION TO ARTIFICIAL INTELLIGENCE	L	T	P	Credits	Total Marks
		3	0	0	3	100

- To know the principles and approaches of artificial intelligence(AI).
- To develop a basic understanding of the building blocks of AI.
- To identify the solution to a problem through reasoning and planning.
- To learn various types and concepts of machine learning.
- To list out various domains and applications of AI.

UNIT 1 AI: FOUNDATIONS

9 Hrs.

Introduction – History – Intelligent Agents – Environment – Good behavior – Structure of an Agent – Concept of rationality – Types of agents – Search strategies and its types: BFS and DFS – Uniform Cost Search

UNIT 2 AI: SEARCHING AND SOLVING

9 Hrs.

Agents for problem solving – Informed search strategy – heuristic functions – Optimization: local and global search – Constraint Satisfaction Problems – Pruning - Case Study: Backtracking for CSP

UNIT 3 AI: KNOWLEDGE, REASONING AND PLANNING

9 Hrs.

Logical agents – Propositional Logic – Inference rules - First Order Logic – Syntax and Semantics – Building a knowledge base – Probabilistic reasoning – Classical Planning and its algorithm

UNIT 4 AI: LEARNING CONCEPTS

9 Hrs.

Types of learning: Supervised, Unsupervised and Reinforcement Learning – Theory of learning – Classification and Regression problems – Model selection and optimization – Case Study: Linear Regression for Classification

UNIT 5 AI: APPLICATIONS

9 Hrs.

Speech Processing: NLP basics and tasks – Chatbot applications and its types – Computer Vision: Classifying images and Detecting objects – Robotics: Hardware – Perception – Planning – Control

Max.45 Hours

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 :** Identify and analyze various search algorithms for solving the AI problems.
- CO2 :** Apply search algorithms for various AI related problems.
- CO3 :** Use various logical forms to represent knowledge.
- CO4 :** Discriminate between different types of learning techniques
- CO5 :** Recognize the working behind chatbot applications
- CO6 :** Design user centric applications that use AI concepts

TEXT/REFERENCE BOOKS

1. Stuart J.Russel, Peter Norvig, "Artificial Intelligence A Modern Approach", 4thEdition, Pearson Education, 2020.
2. Kevin Warwick, "Artificial Intelligence: the basics", Routledge Publishers, 2011.
3. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009.
4. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc., First Edition, 2008

New Course

SBSA5303	DATA SCIENCE	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES:

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

UNIT 1 INTRODUCTION TO DATA SCIENCE

9 Hrs.

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

UNIT 2 APPROACHING ANALYTICS PROBLEMS

9 Hrs.

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

UNIT 3 INTRODUCTION TO R

9 Hrs.

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

UNIT 4 MODELING METHODS

9 Hrs.

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

UNIT 5 DELIVERING RESULTS

9 Hrs.

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

Max.45 Hours

COURSE OUTCOMES

On completion of the course, student will be able to

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

TEXT/REFERENCE BOOKS

1. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big Data Analytics” , EMC Education Services,2015
2. NinaZumel,JohnMount,“PracticalDataSciencewithR”,ManningPublications,2014
3. JureLeskovec,AnandRajaraman,JeffreyD.Ullman,“MiningofMassiveDatasets”,Cambridge University Press,2014
4. Glenn J. Myatt, Wayne P. Johnson, Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, John Wiley & Son Publication, Second Edition, 2014.

New Course

SCSA6301	CYBER PHYSICAL SYSTEMS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To introduce basics of cyber-physical system and Industrial revolution 4.0 concepts
- To develop an exposition of the challenges in implementing a cyber-physical system
- To analyze the functional behaviour of CPS based on standard modeling formalisms.
- To design CPS requirements based on operating system and hardware architecture constraints.

SUGGESTED LIST OF EXPERIMENTS

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

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 : An ability to expose the student to real world problems in CPS and Industrial revolution 4.0 best practices.

CO2 : Identify the limitations of some computational models

CO3 : Apply the theoretical knowledge the design of compilers.

CO4 : Student can Analyze and verify the correctness of CPS implementations against system requirements and timing constraints.

CO5 : Categorize the essential modeling formalisms of Cyber-Physical Systems (CPS)

CO6 : Implement the real time use case and problem statements

TEXT/REFERENCE BOOKS

1. wa, O'Reilly Media 2015.
2. Zero to Block chain - An IBM Redbooks course, by Bob Dill, David Smits.

New Course

SBSA1403	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	Credits	TotalMarks
		3	0	0	3	100

COURSE OBJECTIVES:

- To Understand the fundamentals of Object Oriented System Development
- To understand the object oriented methodologies.
- To use UML in requirements elicitation and designing.
- To understand concepts of relationships and aggregations.
- To test the software against its requirements specification

UNIT I INTRODUCTION

(9 hrs.)

Overview of object oriented language systems development – Object basics hierarchy – Object and identity – Static and dynamic binding – Object oriented SDLC.

UNIT II OBJECT ORIENTED METHODOLOGIES

(9 hrs.)

Rumbaugh et al.'s technique – Booch, Jacobson Methodologies – Patterns – Framework – Unified approach – UML – UML diagrams – UML dynamic modeling – UML extensibility – UML meta-model.

UNIT III OBJECT-ORIENTED ANALYSIS

(9 hrs.)

Use case model – Object analysis classification – Approaches for identifying classes – Classes responsibilities and collaborators – Identifying object relationships, attributes and methods.

UNIT IV OBJECT ORIENTED DESIGN

(9 hrs.)

Design process and design axioms – Designing classes – Access Layer – Object storage and object Interoperability – View layer – Designing interface objects.

UNIT V SOFTWARE QUALITY

(9 hrs.)

Software quality assurance – Testing strategies – Test cases – Test plan – Myers debugging principle – System usability and measuring users satisfaction.

Max 45hrs

COURSE OUTCOMES

- CO1 - Understand the basics object model for System development.
- CO2 - Understand the object Oriented Methodologies
- CO3 - Express software design with UML diagrams
- CO4 - Understand the concept of Relationships
- CO5 - Design software applications using OO concepts.
- CO6 - Understand the various testing methodologies for OO software

TEXT/REFERENCE BOOKS:

1. Ali Bahrami, "Object oriented systems development using the unified modeling language", 1st Edition, McGraw- Hill, 1998.
2. Grady Booch, James Rumbaugh, and Ivar Jacobson, "The Unified Modeling Language User Guide", 3rd Edition Addison Wesley, 2007.
3. John Deacon, "Object Oriented Analysis and Design", 1st Edition, Addison Wesley, 2005.
4. Bernd Oestereich, "Developing Software with UML, Object-Oriented Analysis and Design in Practice", Addison- Wesley.

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SBSA1403	OBJECTORIENTEDANALYSIS AND DESIGN	L	T	P	Credits	TotalMarks
		3	0	0	3	100

COURSEOBJECTIVES:

- To Understand the fundamentals of Object Oriented System Development
- To understand the object oriented methodologies.
- To use UML in requirements elicitation and designing.
- To understand concepts of relationships and aggregations.
- To understand the design patterns in Object Oriented designing

UNIT I INTRODUCTION

(9 hrs.)

Overview of object oriented language systems development– Object basics hierarchy – Object and identity –Static and dynamic binding – Object oriented SDLC.

UNIT II OBJECT ORIENTED METHODOLOGIES

(9 hrs.)

Rumbaugh etal.'s technique–Booch, Jacobson Methodologies–Patterns– Framework– Unified approach–UML– UML diagrams–UML dynamic modeling–UML extensibility–UMLmeta-model.

UNIT III OBJECT-ORIENTED ANALYSIS

(9 hrs.)

Use case model–Object analysis classification–Approaches for identifying classes–Classes responsibilities and collaborators – Identifying object relationships, attributes and methods.

UNIT IV OBJECT ORIENTED DESIGN

(9 hrs.)

Design process and design axioms – Designing classes – Access Layer – Object storage and object Interoperability – Viewlayer – Designing interface objects.

UNIT V DESIGN PATTERNS

(9 hrs.)

GRASP: Designing objects with responsibilities — Creator — Information expert — Low Coupling — High Cohesion — Controller Design Patterns — creational — factory method — structural — Bridge — Adapter — behavioural — Strategy — observer –Applying GoF design patterns — Mapping design to code

Max 45hrs

COURSEOUTCOMES

- CO1 - Understand the basics object model for System development.
- CO2-UnderstandtheobjectOrientedMethodologies
- CO3 - Express software design with UML diagrams
- CO4-Understand the concept of Relationships
- CO5- Designs of software applications using OO concepts.
- CO6-Understand the various testing methodologies for OO software

TEXT/REFERENCEBOOKS:

1. Ali Bahrami, "Object oriented systems development using the unified modeling language", 1st Edition, McGraw- Hill, 1998.
2. GradyBooch,JamesRumbaugh,andIvarJacobson,"TheUnifiedModelingLanguageUserGuide",3rdEditionAddisonWesley,2007.
3. JohnDeacon,"ObjectOrientedAnalysisandDesign",1stEdition,AddisonWesly,2005.
4. Bernd Oestereich,"DevelopingSoftwarewith UML,Object-OrientedAnalysis andDesigninPractice",Addison- Wesley.

Added Content

SCHOOL OF SCIENCE AND HUMANITIES
DEPARTMENT OF COMPUTER SCIENCE

Minutes of meeting

Date: 8.12.2022

Time: 10:00AM

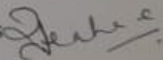
Venue: COMPUTER SCIENCE LAB

Agenda:

- Newly added courses for the following courses for B.Sc CS Specialization in AI:
 - Introduction to Robotics- SBSA1404
 - Society 5.0- SCSEA3091
 - Fog and Cloud Computing - SBSA1405
 - Robotics Lab - SBSA2402
- Updating the course contents for the following courses for M.Sc CS:
 - Design Thinking - SBSA5201
- Updating the course contents for the following courses for B.Sc CS :
 - Web Technology - SBSA1503

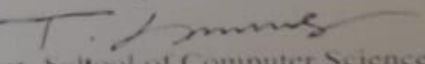
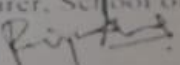
Minutes:

- In order to improve 'problem-solving, analytical, and spatial thinking abilities of the students, the Design Thinking theory course will be converted into a practical course.
- Web Technology course is updated to make it more aligned towards full stack web development course.
- All the external members appreciated the updates made in the above course

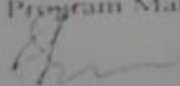
Convener: Dr. Rekha Chakravarthi, Dean of Science and Humanities 

External Members:

Academic Expert

- Dr. T. G. Sambanthan, Professor & Head, Department of Computer Science & Engineering NITTR, Chennai. 
- Dr. Riyaz Ahamed, Senior lecturer, School of Computer Science and Engineering, Taylor's University, Malaysia. 

Industry Experts

- Dr. V. Sankaran, Program Manager, Engineering and R&D Services, HCL Technologies 

- Mr. Aray Kumar, CTO, Cognibot Robotics, Chennai. *Aray Kumar*

Alumni

- Mr. Johnson S, Project Test Manager, TCS, Chennai. *Johnson S*
- Mr. Ashish Chopra, Senior BDE, Freshworks, Chennai. *Ashish Chopra*

Internal Members:

- Dr. L. Lakshmanan, HoD, Department of CSE. *Lakshmanan*
- Dr. S. Vigneswari, HoD of CSE. *S. Vigneswari*
- Dr. U. Laxmuthalvi, Associate Professor, Department of CSE. *U. Laxmuthalvi*
- Dr. S. Marugan, Professor, Department of CSE. *S. Marugan*
- Dr. Prem Jacob, Associate Professor, Department of CSE. *Prem Jacob*
- Dr. Usha Nandini, Associate Professor, Department of CSE. *Usha Nandini*
- Dr. Ramya Franklin, Asst. Professor, Department of CSE. *Ramya Franklin*

Dr. REKHA CHAKRAVARTHI, B.E., Ph.D.
 DEAN, ARTS AND SCIENCES
SATHYABAMA
 INSTITUTE OF SCIENCE AND TECHNOLOGY
 (DEEMED TO BE UNIVERSITY)
 Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Rekha Chakravarti
 Dean

SBSA1401	DATABASE MANAGEMENT SYSTEM	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To gain knowledge in fundamentals of data models using ER diagram.
- 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 understand database security and performance issues

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 hours

COURSE OUTCOMES

- 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 & Johannes Gehrke, Database Management Systems, 3rd Edition, Tata McGraw Hill, 2002.
4. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", 4th Edition, 2002.
5. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 3rd Edition, Elsevier, 2012
6. Jan L. Harrington, "Object oriented database design", Harcourt India private limited 2000.

New Course

SBSA1404	INTRODUCTION TO ROBOTICS	L	T	P	Credits	TotalMarks
		3	0	0	4	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.
- To provide the student with some knowledge and skills associated with robot control.
- To understand the mechanical movements of the robots and its applications.

UNIT 1

12 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 12 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 12 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 12 Hrs.

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

UNIT 5 12 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. 60 Hours

COURSE OUTCOMES

On completion of the course the 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.

New Course

SBSA3091	SOCIETY 5.0	L	T	P	Credits	TotalMarks
		3	0	0	4	100

COURSEOBJECTIVE

- To understand the society5.0,Cyberspace and Physical Space to solve
- To Provide knowledge and overview about big data, IoT and Artificial Intelligence for Society5.0.
- Discuss To understand Augmented Reality and Virtual Reality, Next Generation Sensors
- To discuss about Challenges and Technologies towards Society5.0, Security of Cyber Physical Systems
- Discuss to apply society 5.0 Innovation with Future Trends with Applications

UNIT I INTRODUCTION TO SOCIETY 5.0

(9hrs)

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.

UNITII EMERGING TECHNOLOGIES WITH SOCIETY5.0

(9hrs)

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.

UNITIII INTRODUCTION TO INDUSTRY4.0

(9hrs)

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.

UNITIV CHALLENGES AND TECHNOLOGIES TOWARDS SOCIETY5.0 (9hrs)

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 counter-measures, security protocols- Social Issues in Society 5.0 - human-centered society (Society 5.0)- Sustainable Development Goals-Economic Advancement- Resolution to Social Problems..

UNITV INNOVATION WITH FUTURE TRENDS WITH APPLICATIONS (9hrs)

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

Max45hrs

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-Utoko Laboratory, Springer, 2020.
2. Society 5.0 Industry 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. McKerrrow P.J. "Introduction to Robotics", Addison Wesley, USA, 1991.

 New Course

SBSA1405	FOG AND CLOUD COMPUTING	L	T	P	Credits	TotalMarks
		3	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.
- To understand the basic concepts of Fog computing.
- To gain knowledge of cloud and to Fog, IoT and its security

UNIT 1 UNDERSTANDING CLOUD COMPUTING

9 Hrs.

Basic Concepts and Terminology - 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 .

UNIT 2 CLOUD SERVICE MODELS

9 Hrs.

Software as a Service (SaaS) - Infrastructure as a Service (IaaS)- Platform as a Service (PaaS)- Web services - Service Oriented Architecture (SoA) - Elastic Computing - On Demand Computing- Service Management in Cloud Computing - Multitenancy computing , architecture.

UNIT 3 CLOUD DEPLOYMENT MODELS AND VIRTUALIZATION

9 Hrs.

Deployment models: Public cloud – Private Cloud –Hybrid cloud – Community cloud - Need for virtualization – Types of Virtualization – VMware – Process VM - Virtual Machine Monitor – Properties - Xen, Hyper V, Virtual Box, Eucalyptus .

UNIT 4 UNDERSTANDING FOG COMPUTING

9 Hrs.

Fog Computing: The Next Evolution of Cloud 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.

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 Hours

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, Cloud Resource Management and collaboration services.
- CO4 - Create combinatorial auctions for cloud resources and services for computing clouds Develop and make cloud services as commercial.
- CO5 - Assess cloud and cloud to Fog with IoT.
- CO6 - Ability to, understand fog computing architecture.

TEXT/REFERENCEBOOKS

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.

 New Course

SBS2401	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	Credits	TotalMarks
		0	0	4	2	100

LIST OF EXPERIMENTS

1. Data Definition Language(DDL).
2. Data Manipulation Language(DML)
3. Data Control Language(DCL)
4. Constraints and Built-in functions.
5. Joins and Group-by functions.
6. PL/SQL programs using functions
7. PL/SQL programs using procedures
8. PL/SQL programs using triggers
9. Developing GUI applications using PHP.
10. Student Information System.
11. Inventory Management.
12. Payroll Processing

 New Course

SBSA2402	ROBOTICS LAB	L	T	P	Credits	TotalMarks
		0	0	4	2	100

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.

New Course

SBSA5201	DESIGN THINKING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the principles of Design Thinking, a creative solution-based approach to problem solving.
- To understand about Agile methodology as a practice to promote continuous iteration of development and testing throughout SDLC.
- To understand the basics about development cycles, IT Operations & faster innovation.
- To understand the practice of design thinking for Strategic Innovation
- To understand DevOps the advanced process of software engineering for faster problem resolution & team collaboration.

UNIT 1 INTRODUCTION TO DESIGN THINKING 9 Hrs.

Introduction to Design Thinking – Importance of Design Thinking – History of Design Thinking- Design Thinking Framework - Design Thinking Methods - Empathise – Define – Ideate – Prototype – Test- Software Development Methodology – Waterfall model – V –model -Customer Example.

UNIT 2 INTRODUCTION TO AGILE 9 Hrs.

History of Agile – Agile principles – Agile Vs Waterfall – Agile Methodology Overview- Agile frameworks – Extreme programming- Rational Unified Process (RUP) - Test Driven Development (TDD) – Feature Drive Development (FDD)- Scrum - Kanban Methodology – Agile and Devops.

UNIT 3 AGILE SOFTWARE DEVELOPMENT 9 Hrs.

Software Development- using Extreme Programming – Roles & Rules - Software Development using Scrum Framework – Scrum team – Sprints – Sprints planning – Metrics – Scrum tools - Case Studies.

UNIT 4 DESIGN THINKING FOR STRATEGIC INNOVATION 9 Hrs.

Innovation Management- Changing Management Paradigms- Design Thinking related to Science and art- Design Thinking in Business- Linking Design Thinking Solution to Business Challenges

UNIT 5 DEVOPS 9 Hrs.

Introduction to DevOps – DevOps vs Agile – DevOps Principles and Life Cycle – Introduction to CI / CD & DevOps Tools – Version Control – Build Automation – Configuration Management – Containerization – Continuous Deployment – Continuous Integration – Continuous Testing – Continuous Monitoring.

Max.45 Hours

COURSE OUTCOMES

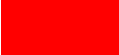
On completion of the course, student will be able to

- CO1 : Apply design thinking concepts to give solution for the problems identified
- CO2 : Implement Agile software methodology for faster development of quality software
- CO3 : Describe how to improve collaboration between development and operations.
- CO4 : Design innovative products
- CO5 : Implement Automated Installations and Deployments
- CO6 : Unresolve different transformations of a product or a service through brainstorming and incremental approach, etc.

TEXT/REFERENCE BOOKS

1. Maurício Vianna, Ysmar Vianna, Brenda Lucena and Beatriz Russo, "Design thinking : Business innovation", MJV, Technologies and innovation press, 2011
2. Design Thinking: Integrating Innovation, Customer Experience, and Brand Value by Thomas Lockwood (Editor) Published February 16th 2010 by Allworth Press

3. KalloriVikram, —Introduction to DevOps, 1 st Edition, KalloriVikram Publication, 2016.
4. Jaokim Verona, —Practical DevOps, 2 nd Edition, Packt. Publication, 2018.
5. Stephen Fleming, Pravin, —DevOps Handbook: Introduction of DevOps Resource Management—,1st Edition, Createspace Independent Pub. , 2010.
6. Len Bass, Ingo Weber, Liming Zhu, G., —DevOps: A Software Architect’s Perspective, 1st Edition, Addison-Wesley Professional, 2015.
7. Alistair Cockburn, “Agile Software Development”, 2nd ed, Pearson Education, 2007.

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S734ADPROJ	DESIGN THINKING AND INNOVATIONS	L	T	P	EL	Credits	TotaMarks
		0	0	4	0	2	100

COURSE OBJECTIVES

- To apply knowledge in Real time problem solving.
- To foster innovation in design of products, processes or systems.
- To develop creative thinking in finding viable solutions to Engineering /Non Engineering problems.

Activity 1

Design thinking introduction

- Phases of design thinking- a study approach.
- Group Discussion on Ideation- Users perspective.
- Formation of team – Thinking skills- Brain storming.

Activity 2

Problem identification (phase I)

- Selecting user requirements.
- Survey on various user's applications.
- Specific Problem selection to proceed with the work – Team presentation on identified problems and various possible solutions.

Activity 3

Problem identification (Phase II)

- Study of an application and its importance to end user.
- Various models of an applications.
- Finalize the identified problem.

Activity 4

Design ideation and various stages

- Sketch design diagram.
- Architecture or full diagrammatic study.

Activity 5

Review and upgradation

- Review of the ideation (one to one interaction).
- Feedback.

•Upgradation plan.

Activity 6**Implementation (Phase I)**

- Build the prototype using available resources.
- Record Module diagrams.

Activity 7**Implementation(Phase II)**

- Display and review of the prototype.
- Record its functionality and its Usage-Technical manual.



New Course

Activity 8

Testing

- To test the product design with real time environment.
- Record Process-user manual.

Activity 9

IPR-Activity I

- To study various IPR activities.
- To prepare for IPR Process.
- To file an IPR.

Activity 10

Start-ups Formation

- To exhibit the product to public: feedback approach.
- To prepare full documentation.
- Start-ups registration/apply patent/publish paper/submit model/prototype/Apply for seed/submit as research proposal.

COURSE OUTCOMES

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

- CO1** - Solve real world problems by applying knowledge across domains.
- CO2** - Develop various design products, processes or technologies for sustainable and socially relevant applications.
- CO3** - Demonstrate knowledge of resource utilization/budgets to Implement appropriate methodologies.
- CO4** - Execute tasks by application of engineering standards/ requirements/ design criteria, within timelines.
- CO5** - Conduct extended investigation that results in the translation of idea to product / production of a research thesis/ developing a proof of concept.
- CO6** - Communicate well organized technical and scientific findings effectively in written and oral forms, following ethical and professional norms.

TEXT / REFERENCE BOOKS

1. Mueller-Roterberg, Christian. "Handbook of Design Thinking." Hochschule Ruhr West (2018).
2. Design Kit by IDEO.org. "The field guide to human centered design." (2015), ISBN: 978-0-9914063-1-9.
3. <https://www.interaction-design.org/literature/article/design-thinking-getting-started-with-empathy>.
4. <https://www.interaction-design.org/literature/article/stage-4-in-the-design-thinking-process-prototype>.
5. <https://www.interaction-design.org/literature/article/test-your-prototypes-how-to-gather-feedback-and-maximise-learning>.
6. <https://uxplanet.org/what-are-insights-aa1f2d1b3b9c>.
7. <https://labs.sogeti.com/using-design-thinking-to-design-business-models/>.
8. <https://www.northeastern.edu/graduate/blog/implementing-business-model-innovation/>.

COURSE ASSESSMENT METHODS

Direct Methods	Design innovation Reviews Report Submission IPR Registration
Indirect Methods	Course Exit Survey

Assessment Method	Rubrics	Marks allotted	Assessment Type
Review1	1	30	CAE
InternaGuide	2	10	CAE
IPR Process and Registration	5	10	ESE
Total- Internal		50	
FinaReview	3	30	ESE
Report Submission	4	20	ESE
Total-Externa		50	

SBSA1503	WEB TECHNOLOGY	L	T	P	Credits	TotalMarks
		3	0	0	4	100

COURSE OBJECTIVES

- To effectively design with a range of technologies.
- To develop static websites & dynamic web applications.
- To learn new emerging web technologies.
- To gain knowledge and skills required for web development careers.
- To develop skills in the use and application of specific methods in user experience design.

UNIT 1

(9 Hrs.)

Introduction To HTML- DHTML , XML – Structuring XML document using DTD – Schemas – XML parsers – DOM – SAX presentation technologies – XSL – XFORMS – XHTML – Transformations – XSLT – XLINK – XPATH – XQuery. Responsive Web Design-Intro-Fluid Grid-Viewport-Media Queries-Images.Introduction To CSS-Syntax,Selectors-Types of style sheets.

UNIT 2

(9 Hrs.)

Java Script – Advantages – Data types – Variables – Operators – Control statements – Functions – Objects and arrays – Windows and frames – Forms.AJAX – XMLHttpRequest (XHR) – Create Object – Request – Response – Ready state.

UNIT 3

(9 Hrs.)

Introduction To PHP – Data Types – Control Structures – Arrays - Function – Html Form with PHP –Form Handling & Validation- File Handling – Cookies – Sessions – Filters – Exception Handling - Database Connectivity With MySQL.

UNIT4

(9 Hrs.)

Angular JS Expression – Modules – Directives – Data Binding – Controllers – Scopes – Filters – Services – Tables – Events– Form – Validation.Query Syntax – Selects – Events – jQuery Effects – jQuery – jQuery HTML – jQuery Traversing.

UNIT 5

(9 Hrs.)

UX Introduction -Elements of UX Design- UX Design Process- Research Methods and Tools-Understanding User Needs and Goals. UX Design Process: Visual Design Principles-Information Design and Visualization-Interaction Design-Prototyping Tools-Usability Test.UI Introduction-User Interface Components -Tools and Processes.

Max.45Hrs.

COURSE OUTCOMES

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

CO1 - Able to work with XML technologies.

CO2 - Design web page to perform form validation using client-side scripting language.

CO3 - Implement new technologies such as Angular JS and JQuery.

CO4 - Develop web applications using server-side scripting language.

CO5 - Understand the differences between usability and user experience.

CO6 - Effectively select and utilize design thinking processes and UX/UI tools.

TEXT /REFERENCE BOOKS

1. Jeffrey C. Jackson, WebTechnologies: A Computer Science Perspective, Pearson Education, 2009.
2. Kogent Learning Solutions Inc., Web Technologies Black Book, Dreamtech Press, 2009.
3. Ken Williamson, Learning AngularJS: A Guide to AngularJS Development, O'Reilly, 2015.
4. Jon Duckett, JavaScript and JQuery: Interactive Front-End Web Development, John Wiley and Sons Inc., 2014.
5. CallumMacrae, Learning from JQuery, O'Reilly, 2013.

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SBSA1503	WEB TECHNOLOGY	L	T	P	Credits	TotalMarks
		3	0	0	4	100

COURSE OBJECTIVES

- To effectively design with a range of technologies.
- To develop static websites & dynamic web applications.
- To learn new emerging web technologies.
- To gain knowledge and skills required for web development careers.
- To develop skills in the use and application of specific methods in user experience design.

UNIT I

9 Hrs.

Introduction To HTML- DHTML , XML – Structuring XML document using DTD – Schemas – XML parsers – DOM – SAX presentation technologies – XSL – XFORMS – XHTML – Transformations – XSLT – XLINK – XPATH – XQuery.Responsive Web Design-Intro-Fluid Grid-Viewport-Media Queries-Images.Introduction To CSS-Syntax,Selectors-Types of style sheets.

Unit II

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

Unit III

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

Unit IV

9 Hrs.

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

Unit V

9 Hrs.

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

Max.45Hrs.

COURSE OUTCOMES

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

- CO1 - Able to work with XML technologies.
- CO2 - Design web page to perform form validation using client-side scripting language.
- CO3 - Implement new technologies such as Angular JS and JQuery.
- CO4 - Develop web applications using server-side scripting language.
- CO5 - Understand the differences between usability and user experience.
- CO6 - Effectively select and utilize design thinking processes and UX/UI tools.

TEXT /REFERENCE BOOKS

1. Jeffrey C. Jackson, WebTechnologies: A Computer Science Perspective, Pearson Education, 2009.
2. Kogent Learning Solutions Inc., Web Technologies Black Book, Dreamtech Press, 2009.
3. Ken Williamson, Learning AngularJS: A Guide to AngularJS Development, O'Reilly, 2015.
4. Jon Duckett, JavaScript and JQuery: Interactive Front-End Web Development, John Wiley and Sons Inc., 2014.
5. CallumMacrae, Learning from JQuery, O'Reilly, 2013.

Added Content



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited A++ Grade by NAAC | 12B Status by UGC | Approved by AICTE

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School of Science & Humanities

Department of Computer Science

1.2.2, Number of Programmes in which Choice Based Credit System (CBCS)/elective coursesystem has been implemented during the 2023-2024

S. No.	Course Code	Course Name	Page No.
1	SBSB3001	CYBER LAW	2
2	SBSB3002	NETWORK SECURITY	4
3	SBSB3003	AUGMENTED REALITYAND VIRTUAL REALITY	6
4	SBSB3004	INTRODUCTIONTO IOT	8
5	SBSB3005	SOFTWARE TESTING	10
6	SBSB3006	DESIGN AND ANALYSIS OF ALGORITHMS	12
7	SBSB3007	SOFTWARE ARCHITECTURE	14
8	SBSB3008	SOFTWARE QUALITY MANAGEMENT	16
9	SBSB3009	KNOWLEDGE MANAGEMENT SYSTEMS	18

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

COURSE OBJECTIVES

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

UNIT 1

9 Hrs.

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

UNIT 2

9 Hrs.

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

UNIT 3

9 Hrs.

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

UNIT 4

9 Hrs.

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

UNIT 5

9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

- C01** - To know all the aspects of Cyber law as per Indian/IT act
- C02** - It also covers overview of Intellectual Property Right and Trademark Related laws with respect to Cyber Space.
- C03** - To understand the concept of data and recovery evidence for different platforms.
- C04** - To designed Forensics Investigation and laws.
- C05** - To understand the concepts of cyber security and legal systems of information technology.
- C06** - 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 particular 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- Cryptanalysis Monoalphabetic 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

- C01** - Implement various symmetric encryption techniques for given applications
- C02** - Illustrate various public key encryption techniques
- C03** - Understand various key encryption mechanisms and key management strategies that can be applied for real time transactions.
- C04** - Evaluate authentication and hash algorithms.
- C05** - Summarize the basic network security mechanisms
- C06** - 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 Mark

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, MultiGen, Virtoolsetc.

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

- C01** - Design and implement the VR system.
- C02** - Implement the Augmented Reality software.
- C03** - Analyse and design the framework in VR using various software development tools in VR.
- C04** - Design the multi modal user interface.
- C05** - Describe the principles and features of VR and AR.
- C06** - Recognize the technologies used to manage the large-scale VR environment in real time.

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

TEXT / REFERENCE BOOKS

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

COURSE OBJECTIVES

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

UNIT 1

9 Hrs.

Introduction to IoT, Current technological trends and future prospects, - Evolution of IoT, BusinessScope, Relation with embedded system, - Basic Architecture of an IoT, Introduction of M2M-M2M vsIoT.

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 andCreatingcloudservice, cloud basedIoT platforms-IBMWatson-Googlecloud.

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.

COURSE OUTCOMES

On completion of the course, student will be able to

Max. 45 Hrs.

C01 - To learn and understand the technology and current trends in Internet of things.

C02 - To understand the various elements of IoT system and hardware devices.

C03 - To learn the programming languages and platforms for building IoT applications.

C04 - To understand the cloud computing and its relevance for developing IoT applications.

C05 - To design and implement IoT applications that manages big data with data analytics and visualization tools.

C06 - 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 Cook book, Pack Publications. Author(s): Marco Schwatz
4. Internet of Things and Data Analytics, Wiley Publications.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

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

20 Marks

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

80 Marks

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

COURSE OBJECTIVES

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

UNIT 1

9 Hrs.

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

UNIT 2

9 Hrs.

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

UNIT 3

9 Hrs.

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

UNIT 4

9 Hrs.

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

UNIT 5

9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

- C01** - Finding defects which may get created by the programmer while developing the software
- C02** - To understand the Software Testing Concepts
- C03** - To implement the Software Quality and Control Concepts
- C04** - To Design the Test cases and to get familiarity over Automated Testing tools
- C05** - To understand the significance of testing
- C06** - 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		

COURSE OBJECTIVES

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

UNIT 1 INTRODUCTION

9 Hrs.

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

UNIT 2 MATHEMATICAL FOUNDATIONS

9 Hrs.

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

UNIT 3 BRUTE FORCE AND DIVIDE-AND-CONQUER

9 Hrs.

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

UNIT 4 GREEDY APPROACH AND DYNAMIC PROGRAMMING

9 Hrs.

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

UNIT 5 BACKTRACKING AND BRANCH AND BOUND

9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- C01** - Determine the Suitable Algorithmic Design Technique for A Given Problem.
- C02** - Identify the Limitations of Algorithms in Problem Solving
- C03** - Analyse the Efficiency of The Algorithm Based on Time and Space Complexity.
- C04** - Implement Asymptotic Notations to Analyse Worst-Case and Average Case Running Times Of Algorithms.
- C05** - Interpret the Fundamental Needs of Algorithms in Problem Solving.
- C06** - 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. AnanyLevitin, "introduction to the design and analysis of algorithms", third edition, Pearson education, 2012.
4. Ellis Horowitz, SartajSahni and Sangu ThevarRajasekaran, 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

- C01** - Analyse software process and process modelling.
- C02** - Ability to draw UML diagrams for a given problem statement.
- C03** - Understand various design patterns.
- C04** - Evaluate the applicability of an architectural style for a product.
- C05** - Build web application architecture using ADL tools.
- C06** - Compare and contrast formal languages and description languages

TEXT / REFERENCE BOOKS

1. Len Bass, Paul Clements, Rick Kazman, Software Architecture in practice, second edition.
2. Eric J. Braude, Software Design From programming to architecture, Boston Univ ISBN:0-47120459- 5, 2004
3. Dale Rogerson, InsideCom Microsoft Programming series
4. James L. Weaver, Kevin Mukhar, James p. Crume(Publisher) Beginneing 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, 2011
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

SBSA3008	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.

COURSE OUTCOMES

Max.45 Hrs.

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

- C01** - Understand the concept of knowledge and its types
- C02** - Analyse the challenges in building Knowledge Management systems
- C03** - Develop knowledge management capturing techniques
- C04** - Test the coding tools for knowledge management systems.
- C05** - Understand the architecture and development of knowledge systems
- C06** - 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. 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. 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**



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

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School of Science & Humanities

Department of Computer Science

1.2.2, Number of Programmes in which Choice Based Credit System (CBCS)/elective coursesystem has been implemented during the 2023-2024

S. No.	Course Code	Course Name	Page No.
1	SBSB3001	CYBER LAW	2
2	SBSB3002	NETWORK SECURITY	4
3	SBSB3003	AUGMENTED REALITYAND VIRTUAL REALITY	6
4	SBSB3004	INTRODUCTIONTO IOT	8
5	SBSB3005	SOFTWARE TESTING	10
6	SBSB3006	DESIGN AND ANALYSIS OF ALGORITHMS	12
7	SBSB3007	SOFTWARE ARCHITECTURE	14
8	SBSB3008	SOFTWARE QUALITY MANAGEMENT	16
9	SBSB3009	KNOWLEDGE MANAGEMENT SYSTEMS	18

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 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, webjacking, phishing etc., Cyber terrorism, Bandwidth theft, Convention on cybercrime.

Max. 45 Hrs.

COURSE OUTCOMES

- C01** - To know all the aspects of Cyber law as per Indian/IT act
- C02** - It also covers overview of Intellectual Property Right and Trademark Related laws with respect to Cyber Space.
- C03** - To understand the concept of data and recovery evidence for different platforms.
- C04** - To designed Forensics Investigation and laws.
- C05** - To understand the concepts of cyber security and legal systems of information technology.
- C06** - 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 particular 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- Cryptanalysis Monoalphabetic 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

- C01** - Implement various symmetric encryption techniques for given applications
- C02** - Illustrate various public key encryption techniques
- C03** - Understand various key encryption mechanisms and key management strategies that can be applied for real time transactions.
- C04** - Evaluate authentication and hash algorithms.
- C05** - Summarize the basic network security mechanisms
- C06** - 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 Mark

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, MultiGen, Virtoolsetc.

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

- C01** - Design and implement the VR system.
- C02** - Implement the Augmented Reality software.
- C03** - Analyse and design the framework in VR using various software development tools in VR.
- C04** - Design the multi modal user interface.
- C05** - Describe the principles and features of VR and AR.
- C06** - Recognize the technologies used to manage the large-scale VR environment in real time.

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

TEXT / REFERENCE BOOKS

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

COURSE OBJECTIVES

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

UNIT 1

9 Hrs.

Introduction to IoT, Current technological trends and future prospects, - Evolution of IoT, BusinessScope, Relation with embedded system, - Basic Architecture of an IoT, Introduction of M2M-M2M vsIoT.

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 andCreatingcloudservice, cloud basedIoT platforms-IBMWatson-Googlecloud.

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.

COURSE OUTCOMES

On completion of the course, student will be able to

Max. 45 Hrs.

C01 - To learn and understand the technology and current trends in Internet of things.

C02 - To understand the various elements of IoT system and hardware devices.

C03 - To learn the programming languages and platforms for building IoT applications.

C04 - To understand the cloud computing and its relevance for developing IoT applications.

C05 - To design and implement IoT applications that manages big data with data analytics and visualization tools.

C06 - 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 Cook book, Pack Publications. Author(s): Marco Schwatz
4. Internet of Things and Data Analytics, Wiley Publications.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

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

20 Marks

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

80 Marks

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

COURSE OBJECTIVES

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

UNIT 1

9 Hrs.

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

UNIT 2

9 Hrs.

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

UNIT 3

9 Hrs.

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

UNIT 4

9 Hrs.

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

UNIT 5

9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

- C01** - Finding defects which may get created by the programmer while developing the software
- C02** - To understand the Software Testing Concepts
- C03** - To implement the Software Quality and Control Concepts
- C04** - To Design the Test cases and to get familiarity over Automated Testing tools
- C05** - To understand the significance of testing
- C06** - 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		

COURSE OBJECTIVES

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

UNIT 1 INTRODUCTION

9 Hrs.

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

UNIT 2 MATHEMATICAL FOUNDATIONS

9 Hrs.

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

UNIT 3 BRUTE FORCE AND DIVIDE-AND-CONQUER

9 Hrs.

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

UNIT 4 GREEDY APPROACH AND DYNAMIC PROGRAMMING

9 Hrs.

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

UNIT 5 BACKTRACKING AND BRANCH AND BOUND

9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- C01** - Determine the Suitable Algorithmic Design Technique for A Given Problem.
- C02** - Identify the Limitations of Algorithms in Problem Solving
- C03** - Analyse the Efficiency of The Algorithm Based on Time and Space Complexity.
- C04** - Implement Asymptotic Notations to Analyse Worst-Case and Average Case Running Times Of Algorithms.
- C05** - Interpret the Fundamental Needs of Algorithms in Problem Solving.
- C06** - 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. AnanyLevitin, "introduction to the design and analysis of algorithms", third edition, Pearson education, 2012.
4. Ellis Horowitz, SartajSahni and Sangu ThevarRajasekaran, 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

- C01** - Analyse software process and process modelling.
- C02** - Ability to draw UML diagrams for a given problem statement.
- C03** - Understand various design patterns.
- C04** - Evaluate the applicability of an architectural style for a product.
- C05** - Build web application architecture using ADL tools.
- C06** - Compare and contrast formal languages and description languages

TEXT / REFERENCE BOOKS

1. Len Bass, Paul Clements, Rick Kazman, Software Architecture in practice, second edition.
2. Eric J. Braude, Software Design From programming to architecture, Boston Univ ISBN:0-47120459- 5, 2004
3. Dale Rogerson, InsideCom Microsoft Programming series
4. James L. Weaver, Kevin Mukhar, James p. Crume(Publisher) Beginneing 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, 2011
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

SBSA3008	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.

COURSE OUTCOMES

Max.45 Hrs.

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

- C01** - Understand the concept of knowledge and its types
- C02** - Analyse the challenges in building Knowledge Management systems
- C03** - Develop knowledge management capturing techniques
- C04** - Test the coding tools for knowledge management systems.
- C05** - Understand the architecture and development of knowledge systems
- C06** - 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. 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. 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**

Board of Studies
Minutes of the Meeting

Date: 25.05.2024

Time: 9:30am

Attendees:

1. Mr. Suraj K Sebastian, Head of e-Learning & Lecturer Information Technology & AI, Gulf Medical University, Ajman, United Arab Emirates.
2. Mr. Hariharan, Director and CEO of Space Zee Tech (Industrial Person)
3. Dr. Rekha Chakravarthi, Dean of Arts and Sciences
4. Dr. R. Aroul canessane, M.E., Ph.D., Professor and Head, Department of Computer Applications, Internal member

Agenda of the Meeting: Syllabus Revision and Implementation for B.Sc Cs, B.Sc with AI, B.Sc IT, B.Sc DS, B.C.A & MCA in the 2024 – 2025 Regulation

Agenda Item 1:

Updating content for the following courses in Semester I - B.Sc CS, B.Sc with AI, B.Sc IT, B.Sc DS & B.C.A:

- Ancillary Mathematics I for Computer Science - SMTB1112
- Problem Solving Techniques with C – SBSB1103

Updating content for the following courses in Semester II - B.Sc CS, B.Sc with AI, B.Sc IT, B.Sc DS & B.C.A:

- Ancillary Mathematics II for Computer Science – SMTB1210
- Database Management Systems – SBSB1204

Adding Multi-Disciplinary Electives for the following courses - B.Sc CS, B.Sc with AI, B.Sc IT, B.Sc DS & B.C.A:

- Operating System – SBSB1303
- Fog and Cloud Computing – SBSB1402
- Quantum Computing – SBSB1406

- Linux & Shell Programming – SBSB1407
- Computer Communication – SBSB1504
- Society 5.0 – SBSB1602

Including one Design Thinking for the following courses - B.Sc CS, B.Sc with AI, B.Sc IT, B.Sc DS & B.C.A:

- Design Thinking – S29LHPROJ

Including one Value Added Course for the following courses - B.Sc CS, B.Sc with AI, B.Sc IT, B.Sc DS & B.C.A:

- Digital Computer Fundamentals (Old Subject Code: SBSB1202 → New Subject Code: SBSB1203)

Changing Credits for Few Subjects in the following courses - B.Sc CS, B.Sc with AI, B.Sc IT, B.Sc DS & B.C.A:

- Advanced Java Programming – SBSB1310 in Semester III
- Python Programming – SBSB1410 in Semester IV
- Fundamentals of Microprocessor – SBSB1509 in Semester V

Minutes:

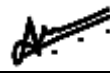
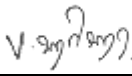
- Problem Solving Techniques with C and Database Management System updated with content for B.Sc CS, B.Sc with AI, B.Sc IT, B.Sc DS & B.C.A students to enrich their knowledge in Case Study.
- Ancillary Mathematics: Based on feedback from Board of Studies (BoS) members, credits of courses in the list above have been changed from 3 to 4 credits, considering higher weightage for UG students.
- Additional Electives were included based on feedback from staff and students.
- As per the suggestion from the Board of Studies(BoS) member, we have added syllabus for Design Thinking.
- The updates and new courses were well-received by all external members as beneficial for the students.
- MCA Syllabus has been discussed and updated.

Agenda Item 2:

Modification proposed for 2024 batch of Bachelor of Computer Science (B.Sc CS, B.Sc with AI, B.Sc IT, B.Sc DS & B.C.A) students in various courses.

Resolution: The BoS members reviewed and recommended the modifications for approval. The approved syllabus is in annexure II.

Based on suggestions from the members, the BoS resolved to recommend the minutes to the Academic Council for further approval.

Name of the Members	Designation	Signature
Mr. Suraj K Sebastian	Head of e-Learning & Lecturer	
Mr. Hariharan	CEO of Space Zee Tech	 
Dr. Rekha Chakravarthi	Dean, Arts and Sciences	
Dr. R. Aroul Canessane	Professor and Head	

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 summarize 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 - Analyze critical thinking skills by framing questions related to elements of reasoning

CO5 - Evaluate written pieces to self-correct in the topic areas of verbs, reported speech, and punctuation

CO6 - Equip the students with the required Professional Skills

TEXT / REFERENCE BOOKS

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

SMTB1112	ANCILLARY MATHEMATICS I FOR COMPUTER SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVE

- 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.

Elementary transformation – Row reduced echelon form a matrix – Rank of a matrix using Row echelon form - Characteristic Equation of a square matrix - Cayley Hamilton Theorem (without proof) Verification - Finding inverse and power of a matrix.

UNIT 2 DIFFERENTIAL CALCULUS

9 Hrs.

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

UNIT 3 INTEGRAL CALCULUS

9 Hrs.

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

UNIT 4 CORRELATION AND REGRESSION

9 Hrs.

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

UNIT 5 PROBABILITY CONCEPTS

9 Hrs.

Definitions, Sample Space, Events, Addition Law of Probability – Conditional Probability - Multiplication law of Probability - Bayes' 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 portability to solve the given problem
- CO6** - Evaluate conditional probability using Bayes theorem

TEXT / REFERENCE BOOKS

1. T.K.Manickavachagam Pillai, Matrices, S.Viswanathan Printers & Publishers, 2012.
2. DipakChatterjee, IntegralCalculus and Differentialequations,TATAMcGrawS 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 |

SBSB1103	PROBLEM SOLVING TECHNIQUES WITH C	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	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

12 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

12 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

12 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

12 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

12 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- Case-Study: Inventory Management System with Low Stock Alerts.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students 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. YashavantKanetkar, 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**

SBSB2101	PROBLEM SOLVING	L	T	P	EL	Credits	Total Marks
	TECHNIQUES LAB	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	C	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 et al. (2015) Communication and Language Skills. Foundation books. Chennai
2. Strunk Jr., William, and E.B. White. The Elements of Style. Allyn and Bacon, 2000.
3. Murphy, Raymond. English Grammar in Use. Cambridge University Press, 2019.
4. Thomson, A.J., and A.V. Martinet. A Practical English Grammar. Oxford University Press, 2013.
5. Straus, Jane. The Blue Book of Grammar and Punctuation. John Wiley & Sons, 2014.
6. Swan, Michael. Practical English Usage. Oxford University Press, 2016

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

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

**20
Marks**

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

**80
Marks**

SMTB1210	ANCILLARY MATHEMATICS II FOR COMPUTER SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVE

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

UNIT 1 LOGIC**9 Hrs.**

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

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

Basic concepts of Set theory - Laws of Set theory - Partition of set, Relations -Types of Relations: Equivalence relation, Partial ordering relation - Graphs of relation - Hasse diagram.

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

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

UNIT 4 NUMERICAL INTERPOLATION**9 Hrs.**

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

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

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

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**

SBSB1204	DATABASE MANAGEMENT SYSTEMS	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

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

UNIT 1

12 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

12 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

12 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

12 Hrs.

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

UNIT 5

12 Hrs.

Transaction processing concepts – Concurrency control techniques – Database recovery techniques – Database security and Authorization. Introduction to Emerging Database Technologies and Application - Case Study: Library Management System - University Management System

Max. 60 Hrs.

COURSE OUTCOMES

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

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

TEXT / REFERENCE BOOKS

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

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each uniformly distributed – No choice	20 Marks
PART B : 2 Questions from each unit of internal choice, each carrying 16 marks	80 Marks

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

SBSB1316	WEB DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- Students will gain the theoretical skills and practical experience required for entry into web design and development careers.
- Students will be able to use a variety of latest technologies to create responsive websites.
- Students will learn to develop, host and maintain a responsive website

UNIT 1

12 Hrs.

Brief History of Internet- WWW- Why create a Website- Web Standards- Basic Principles involved in developing a website- Planning Process- Five Golden rules for website designing-Design Concept.

UNIT 2

12 Hrs.

Structure of an HTML document - Basic Tags -Working with Text, List, Tables and Frames -Linking document, Image and Multimedia - Forms and Controls.

UNIT 3

12 Hrs.

Introduction Creating Style Sheet CSS Properties - CSS Styling: Background, Text Format, Controlling Fonts - Working with block elements and Objects - Working with Lists and Tables -CSSID and Class - Box Model: Border, Padding & Margin Properties - CSS Advanced: Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo Class, Navigation Bar, Image Sprites, Attribute Selector - CSS Color Creating Page Layout and Design.

UNIT 4

12 Hrs.

Introduction to JavaScript - Advantage of JavaScript, JavaScript Syntax - Data type - Variable Array- Operator and Expression - Looping Constructor - Function-Dialog box.

UNIT 5

12 Hrs.

Document object - Browser Object - Form Object - Navigator object Screen object - Build in Object - User defined object-Cookies. Site Planning-Site navigation- Responsive Web Designing-Validating a Website.

Max. 60 Hrs.

COURSE OBJECTIVES

On completion of the course, student will be able to

CO1 - Implement an appropriate planning strategy for developing websites.

CO2 - Describes the strengths and weaknesses of the client-server internet approaches to web design and implementation of the same.

CO3- Create and manipulate web media objects using HTML5 and CSS.

CO4 - Create a web page and use scripting languages to transfer data and add inter active components to other web pages.

CO5 - A web page and modify the web structure using the DOM model and utilize graphic design to enhance web pages.

CO6 - Develop a responsive website that works in the cross-platform environment and also a host and maintain that website in the real-time environment.

TEXT / REFERENCEBOOKS

1. Josh Hill, HTML5 and CSS3 in Simple Steps, 2011, Pearson.
2. David Flanagan, JavaScript: The definitive Guide, 2011, 6th Edition, Oreilly Media.
3. Joel Sklar, Principle of Web Design, 2014, 5th Edition, Cengage Learning.

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**

SBSB1311	COMPUTER ARCHITECTURE	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	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**12 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**12 Hrs.**

Combinational Logic: Adders-Half Adders-Full Adders – Subtractors-Half Subtractor- Full Subtractor - Decoders - Encoders - Multiplexer – Demultiplexer

UNIT 3**12 Hrs.**

Sequential logic: RS, JK, D and T Flip flops - Registers -Shift Registers –Serial In Serial Out, Serial In Parallel Out, Parallel In Serial Out, Parallel In Parallel Out , Counters – Synchronous Counters- Asynchronous Counters

UNIT 4**12 Hrs.**

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

UNIT 5**12 Hrs.**

Introduction to Microprocessors, opcode, operand –Pin Configuration, Architecture and its Operation – Addressing Modes: Register Addressing Mode, Direct Addressing Mode, Indirect Addressing Mode, Immediate Addressing mode and Implicit Addressing Mode.

Max. 60 Hrs.

COURSE OUTCOME

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. 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**

SBSB1317	FINANCIAL ACCOUNTING	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To familiarize students with the mechanics of preparation of financial statements,
- To understand corporate financial statements, their analysis and interpretation
- To know the role of IFRS in accounting discipline, and the concept of management quality analysis and wealth creation

UNIT 1

12 Hrs.

Meaning and scope of Accounting - Basic Accounting concepts and conversions
Objectives of Accounting- Accounting transactions Double entry book keeping Journal, Ledger, preparation of Trial Balance Preparation of Cash Book. Course outline.

UNIT 2

12 Hrs.

Preparation of Final accounts of sole trading Concerns Adjustments to final accounts.

UNIT 3

12 Hrs.

Departmental Accounts: Basis for allocation of expenses - Inter departmental transfer at cost or selling price -Treatment of expenses which cannot be allocated.

UNIT 4

12 Hrs.

Depreciation Meaning, causes, types problems based on straight line and diminishing Balance methods.

UNIT 5

12 Hrs.

Meaning, features, defects, Statement of Affairs method and conversion method.
(Problems on Statement of Affairs method only).

Max. 45 Hrs.

COURSE OUTCOME

On completion of the course, student will be able to

CO1 To Understand the process of recording and classifying the business transactions and events

CO2 To Understand the financial statements, viz., Profit and Loss Account, Balance Sheet, and cash flow statement of a sole proprietor.

CO3 To Understand the role of IFRS/Ind-AS in accounting discipline.

CO4 To Understand and Analyse the financial statements from the perspective of different stakeholders using ratio analysis.

CO5 To Understanding of financial distress or bankruptcy prediction

CO6 To analyse management quality means the concept of beyond balance sheet.

TEXT / REFERENCE BOOKS

1. Gupta R.L, Advanced Accountancy, S.Chand, Delhi.
2. Agarwala A.N, Higher Science of Accountancy, Kitab Mahal, Allahabad.
3. S.P. Jain and K.L. Narang, Financial Accounting
4. M.C.Shukla and T.S.Grawel, Advanced Accounts (Vol. 1)
5. Gillespie Accounting system, Procedure & methods, Prentice Hall India Ltd, 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**

SBSB2303	WEB DEVELOPMENT LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

LIST OF EXPERIMENTS

1. Write a program outputs the squares, roots, cubes and complements of integers between 1 and 100.
2. Create a calculator.
3. Write a script to Sort numbers and strings
4. Create a program to generate a hit counter
5. Create a program to verify whether mail address provided by user is valid or invalid.
6. Write a program to scroll the text on status bar.
7. The form consists of two multiple choice list and one single choice list. The first multiple choice list display the major dishes available.
 - a) These cond multiple choice list display the stocks available.
 - b) he single choice list display the miscellaneous (Milk shakes, soft drinks, softy available etc.)
8. Write a script to create a digital clock.
9. Create A web page using two image file which switch black and white one another as the mouse pointer moves over the image. Use the On Mouse over and On Mouse event, on Dbl click handler
- 10.10. Build a WWW page with an image and 3 buttons. Pick three favorite graphics, Label the buttons and make each ones wap in the graphic you have chosen
11. Create a frameset that has two frames, side by side. Make the left-hand frame contain a form with 3 radio buttons
12. The buttons should be forth research engines:
 - a)Yahoo(<http://www.yahoo.com>)
 - b)Altavista(<http://www.altavista.com>)
 - c)Infoseek(<http://www.infoseek.com>)
 - d)When the user clicks on of the option buttons, the frame on the right and sides Should be loaded with the right search engine. Write a program to implement Employee database with all validation

SBSB1410	PYTHON PROGRAMMING	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	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

12 Hrs.

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

UNIT 2

12 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

12 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

12 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

12 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. 60 Hrs.

COURSE OUTCOME

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 programs.

CO3 - To learn how to use lists, tuples, and dictionaries in Python

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**

SBSB1415	NUMERICAL AND STATISTICAL METHODS	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To understand the numerical solution of algebraic, transcendental and system of linear
- To apply the concept of interpolation and extrapolation for the given data sets.
- To understand the concept of solving integration and differential equations numerically for various real-world problems.

UNIT 1

12 Hrs.

Introduction Mathematical Preliminaries- Errors Computations, Formula - Errorsina Series Approximation- Roots of Equations- Linear Equations: Bisection, False Position Methods- Newton- Raphson Method- Secant Method- Muller's Method - Lin - Bairstow's Method - Simultaneous Linear Equations: Matrix Inversion Method - Gauss Elimination, Gauss-Jordan, LUD ecomposition Methods- Gauss-Seidel Method.

UNIT 2

12 Hrs.

Numerical Differentiation-Error In Numerical Differentiation-Cubic Spline Method- Numerical Integration- Trapezoidal Rule- Simpson's 1/3 and 3/8 Rules- Romberg Integration-Ordinary Differential Equations- Taylor's Series Method- Euler's Method- Runge- Kutta 2nd and 4th Order Methods - Predictor-Corrector Methods.

UNIT 3

12 Hrs.

Sampling - Frequency Distribution - Cumulative Frequency Function - Grouped Sample - Measures of Central Tendency: Mean, Median and Mode - Geometric Mean - Harmonic Mean-Dispersion: Range, Mean Deviation, Variance and Standard Deviation - Moments - Computation of Moments.

UNIT 4

12 Hrs.

Probability- Characteristics: Addition, Multiplication and Conditional Probability Laws-Discrete Distributions: Random Variable - Density and Distribution Functions - Binomial Distribution - Poisson Distribution - Hypergeometric Distribution - Mathematical Expectation.

UNIT 5

12 Hrs.

Correlation and Regression Analysis: Linear Least Squares Fit - Nonlinear Fit- Fitting a Polynomial Function Coefficient of Correlation - Properties - Multiple Correlation - Partial Correlation-Rank Correlation-Tests of Significance-Chi Square Test-Goodness of Fit, Algorithm and Analysis of Contingency Tables- t-Test and F-Test.

Max. 45 Hrs.

COURSE OUTCOME

On completion of the course, student will be able to

CO1 - Understand the various approaches dealing the data using theory of probability.

CO2 - Analyze the different samples of data at different level of significance using various hypothesis testing.

CO3- Develop a framework for estimating and predicting the different sample of data for handling the uncertainties.

CO4 Understand error, source of error and its effect on any numerical computation and also analyze the efficiency of any numerical algorithm.

CO5 Learn how to obtain numerical solution of nonlinear equations using Bisection, Newton - Raphson and fixed-point iteration methods

CO6 Solve system of linear equations numerically using direct and iterative methods.

TEXT / REFERENCE BOOKS

- i) S.S.Sastry, 2005, Introductory Methods of Numerical Analysis, 4th Edition, Prentice-Hall of India
- ii) E.Balagurusamy, 2000, Computer Oriented Statistical and Numerical Methods- Macmillan India Pvt. Ltd..
- iii) Rajaraman, 2005, Computer Oriented Numerical Methods, 3rd Edition, Prentice-Hall of India Pvt. Ltd..
- iv) K. S. Trivedi 2005, Probability and Statistics with Reliability, Queuing and Computer S Applications, Prentice-Hall of India Pvt. Ltd.
- v) E. Balagurusamy, 1999, Numerical Methods, Tata McGraw-Hill Publishing Co.Ltd. P. Niyogi, 2003, Numerical Analysis and Algorithms, Tata McGraw-Hill Publishing Co. L

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

SBSB1416	LINUX\UNIX PROGRAMMING	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To understand and make effective use of Linux utilities and Shell scripting language (bash) to solve problems.
- To write Shell programming to automate the shell commands.
- To develop the skills necessary to write systems programs related to file systems and managing process creation.

UNIT 1

12 Hrs.

The operating system, The UNIX operating system, knowing your system, The UNIX Architecture, features of UNIX, locating commands, internal and external commands, command structure, understanding the man documentation.

UNIT 2

12 Hrs

Cal, date, echo, printf, bc, script, Email basics, mailx, passwd, who, uname, ty, sty. The process: Process basics, ps: Process status, mechanism of process creation, internal and external commands, running jobs in background, process states and Zombies, nice, killing processes with signals, job control, cron, time.

UNIT 3

12 Hrs.

Listing file attributes, directory attributes, file ownership, file permissions, directory permissions, changing file ownership, file system and Inodes, hard links, symbolic links, locating files, modification and access time.

UNIT 4

12 Hrs.

VI Basics, Input mode - Entering and Replacing text, Saving and Quitting- The exmode, Navigation, Editing text, Undoing Last Editing Instructions, Repeating the last command, searching text in the editor, Substitution-search and replace.

UNIT 5

12 Hrs.

The sample database, Paginating Files, head, tail, cut, paste, sort, uniq, tr, grep, Basic regular expressions, Extended Regular expressions, Stream editor, Line addressing, Using multiple instructions.

Max. 60 Hrs.

COURSE OUTCOME

On completion of the course, student will be able to

C01 Develop deeper understanding of operating systems, their functions and services.

C02 Understanding the basic set of commands and utilities in Linux/UNIX systems.

C03- Learn the Linux/UNIX library functions and system calls.

C04- Understand the effective uses of UNIX utilities, and scripting languages.

C05 Effectively uses Texted it or for shell programs and Shell Scripts.

C06 - Developing projects using C and C++ in the Linux/Unix environment.

TEXT / REFERENCE BOOKS

1. Sumitabha Das, Your UNIX/LINUX: The Ultimate Guide, Edition 2012, Tata McGraw Hill. Paul Love, Joe Merlino, Craig Zimmerman, Jeremy C. Reed, Paul Weinstein Beginning Unix, 2015, Wiley Publisher.
2. Andrew Mallet-Mastering Linux Shell Scripting, 2015, PACKT Publisher
- 3.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each uniformly distributed – No choice	20 Marks
PART B : 2 Questions from each unit of internal choice, each carrying 16 marks	80 Marks

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

LIST OF EXPERIMENTS

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

SBSBLH51	FULLSTACK 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

12 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

12 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

12 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**12 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**12 Hrs.**

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

Create a program using PHP and MySQL

- A) Student Information System Payroll System
- B) Inventory Management System

COURSE OUTCOME

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

CO1 - Understand and develop HTML applications**CO2** - Design and style webpage using CSS**CO3** - Design web page to perform form validation using client-side scripting language**CO4** - Implement new technologies such as Angular JS**CO5** - Develop web applications using server-side scripting language..**CO6** - Understand the differences between usability and user experience.**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**80Marks**

SBSB1513	COST AND MANAGEMENT ACCOUNTING	L	T	P	EL	Credits	Total Marks
		4	0	0	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

12 Hrs.

Cost Accounting: Definition, Meaning and objectives - Distinction between Cost and Financial Accounting. Management Accounting - Definition and objectives- Distinction between management and financial accounting.

UNIT 2

12 Hrs.

Stores Records- Inventory Control - ABC Analysis-Economic Ordering Quantity Maximum, Minimum and Reordering levels - Methods of Pricing Issued. Labour: Importance of Labour Cost Control-Various Methods of Wage Payment.

UNIT 3

12 Hrs.

Overheads: Factory, Administration, Selling and Distribution of overheads - Classification - Allocation and Apportionment - Redistribution (Secondary Distribution)-Absorption of Overheads including Machine Hour Rate.

UNIT 4

12 Hrs.

Funds Flow and Cash Flow Analysis: Preparation of Statement'-Ratio Analysis

:Utility and limitations of Accounting Ratios-calculation of Accounting Ratios - Ratio Analysis for Liquidity, Solvency, Profitability and Leverage.

UNIT 5

12 Hrs.

Marginal Costing: The Concept- Break Even Analysis - Break - Even Chart-Importance and assumptions -Application of Profit Volumes Ratio -

Different types of problems (with special emphasis on decision making problems). Budget and Budgetary Control: Procedure and Utility- Preparation of different types of Budget including Flexible Budget.

Max.60 Hrs.

COURSE OUTCOME

On completion of the course, student will be able to

CO1 To describe the three fundamental purposes of cost and management accounting.

CO2 To appreciate the use of different costs for different purposes..

CO3 To Explain traditional and contemporary approaches to cost allocation.

CO4 To Describe different product costing scenarios in job-order and process environments.

CO5 To Identify relevant information for decision making purposes in order to produce financial

CO6 To Use standard costs to prepare budgets for planning and control purposes. analyses for a range of decisions such as product-mix, pricing, outsourcing and special orders.

TEXT / REFERENCE BOOKS

- 1) Wheldon A.J., Cost Accounting and Costing Methods.
- 2) Iyengar S.P., Cost Accounting: Principles and Practice.
- 3) Bhar B.K., Cost Accounting: Methods and problems.
- 4) Bigg W.W., Cost Accounts.
- 5) Prasad N.K, Cost Accounting: Principles and Problems.
- 6) Jain S.P. and Narang K.L., Advanced Cost Accounting. Agarwal M., Theory and Practices of Cost Accounting
- 7) Robert Anthony: Management Accounting: Text and cases.
- 8) Maheswari S.N., Principles of Management Accounting.

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

SBSB1514	R PROGRAMMING	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- Understand how to link data, statistical methods, and actionable questions
- Use R for statistical programming, computation, graphics, and modeling.
- Fit some basic types of statistical models.

UNIT 1 INTRODUCTION TO R

12 Hrs.

History and fundamentals of R, Installation and use of R/R Studio / R Shiny, Installing R packages, R - Nuts and Bolts -Getting Data In and Out -Objects in R -Arrays, Data Frame and List -Control Structures and Functions- Loop Functions-Data Manipulation-String Operations-Matrix Operations.

UNIT 2 R DATA INTERFACES

12 Hrs.

R Data interfaces - CSV Files, XSL files, XML files, Web Data- Data Preprocessing: Missing Values, Outliers, Principle Component Analysis - Data Visualization - Charts & Graphs-Pie Chart, Bar Chart, Box plot, Histogram, Line graph, Scatter Plot.

UNIT 3 STATISTICAL MODELING IN R

12 Hrs.

Statistical Modeling in R-Descriptive statistics-R Packages: Regression (MASS package)-Distribution (STATS package) -ANOVA - Time Series Analysis.

UNIT 4 MACHINE LEARNING IN R

12 Hrs.

Machine learning in R-classification: Decisions Trees, Random Forest, SVM- Clustering: K-Means, Fuzzy - Association Rule Mining - Outlier Detection

UNIT 5 BUILDING R SHINY APPLICATION

12 Hrs.

Building R shiny Application: User Interface, Control Widgets, Dynamic Output - R Hadoop Installation of R Hadoop-rhdfs-rmr2-Data Analysis with RHadoop- Case Study.

Max. 60 Hrs.

COURSE OUTCOME

On completion of the course, student will be able to

CO1 List motivation for learning R programming language

CO2 Access online resources for R and import new function packages into the R workspace

CO3- Import, review, manipulate and summarize data-sets in R

CO4 - Explore data-sets to create testable hypotheses and identify appropriate statistical tests

CO5 Perform appropriate statistical tests using R

CO6 Create and edit visualizations with R

TEXT / REFERENCE BOOKS

- 1) Hands-On Programming with R: Write Your Own Functions and Simulations By Garrett Golemund, O'Reilly Media, Inc., 2014.
- 2) R for Data Science, Hadley Wickham, Garrett Golemund, "O'Reilly Media, Inc.2016.
- 3) Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016
- 4) The R Software-Fundamentals of Programming and Statistical Analysis-Pierre Lafaye de Micheaux, Rémy Drouilhet, BenoitLiquet, Springer 2013
- 5) A Beginner's Guide to R (Use R) By Alain F. Zuur, Elena N. Ieno, Erik H.W.G.Meesters, Springer2009

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**

SBSB2402	R PROGRAMMING LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

LIST OF EXPERIMENTS

- 1) Implement the built in functions in R
- 2) Using vectors and matrices
- 3) Using data frames
- 4) Using lists
- 5) Using looping constructs.
- 6) Creating custom functions.
- 7) Plotting Data (Dot plots, Histogram, Box plots, 3D plots, Scatter plots)
- 8) Fit Statistical Models using R
- 9) Implementing machine learning algorithms in R
- 10) Building R shiny applications.HOIT

SBSB1609	SOFTWARE TESTING AND DEBUGGING	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategy and methods
- To discuss various software testing issues and solutions in software unit test, integration, regression, and system testing.
- To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, and generate a testing report.

UNIT 1

12 Hrs.

Introduction: Purpose - Productivity and Quality in Software Testing Vs Debugging-Model for testing -Bugs-Types of Bugs-Testing and Design Style.

UNIT 2

12 Hrs.

Flowgraphs and Path Testing - Achievable paths - Path instrumentation -Application-Transaction Flow Testing Techniques

UNIT 3

12 Hrs.

Data Flow Testing Strategies - Domain Testing: Domains and Paths - Domains and Interface Testing.

UNIT 4

12 Hrs.

Linguistic-Metrics - Structural Metric - Path Products and Path Expressions. SyntaxTesting - Formats-Test Cases.

UNIT 5

12 Hrs.

Logic Based Testing - Decision Tables - Transition Testing - States, State Graph, State Testing.

Max. 60 Hrs.

COURSE OUTCOMES

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

C01-To apply software testing knowledge and engineering methods.

C02 - To design and conduct a software test process for a software testing project.

C03-To identify the needs of software test automation, and define and develop a test tool to support test automation.

C04-To understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

C05 To use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.

C06-To understand the knowledge of contemporary issues in software testing, such as component- based software testing problems

TEXT / REFERENCE BOOKS

- 1) B. Beizer, 2003, Software Testing Techniques, II Edn., DreamTech India, New Delhi.
- 2) KV.KK. Prasad, 2005, Software Testing Tools, DreamTech. India, 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

DISCIPLINE SPECIFIC ELECTIVES

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

COURSE OBJECTIVES

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

UNIT 1**9 Hrs.**

Cyber space -Meaning and characteristics - Need for regulation of cyber space - Cyber-libertarianism,

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

UNIT 2**9 Hrs.**

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

UNIT 3**9 Hrs.**

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

UNIT 4**9 Hrs.**

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

UNIT 5**9 Hrs.**

Computer misuse - identity theft, grooming and harassment, Hacking, Viruses, criminal damage and mail bombing, Denial of service attack, Obscenity, child abuse, Stalking. Morphing, webjacking, 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 I Property Right and Trademark Related laws with respect to Cyber Space.

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

CO4 - To designed Forensics Investigation and laws.

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

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

TEXT / REFERENCE BOOKS

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

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3

Hrs.

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

**20
Marks**

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

**80
Marks**

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

COURSE OBJECTIVES

- To identify some of the factors driving the need for network security
- To identify and classify particular 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- Cryptanalysis Monoalphabetic 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" Wiley publications, 2003
3. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.
4. Joey Holland, "Cryptography: Principles and Practice" Larsen and Keller, 2017.
5. Sahadeo 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	Toal 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, MultiGen, Virtoolsetc.

UNIT 4 INTRODUCTION OF AUGMENTED REALITY

9 Hrs.

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

UNIT 5 APPLICATION OF VR IN DIGITAL ENTERTAINMENT

9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

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

CO1 - Design and implement the VR system.

CO2 - Implement the Augmented Reality software.

CO3 - Analyse and design the framework in VR using various software development tools in VR.

CO4 - Design the multi modal user interface.

CO5 - Describe the principles and features of VR and AR.

CO6 - Recognize the technologies used to manage the large-scale VR environment in real time.

TEXT / REFERENCE BOOKS

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
Hrs.

Exam Duration : 3

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

20
Marks

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

80
Marks

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

COURSE OBJECTIVES

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

UNIT 1

9 Hrs.

Introduction to IoT, Current technological trends and future prospects, - Evolution of IoT, BusinessScope, Relation with embedded system, - Basic Architecture of an IoT, Introduction of M2M- M2M vsIoT.

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 andCreatingcloudservice, cloud basedIoT platforms- IBMWatson-Googlecloud.

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 Cook book, Pack Publications. Author(s): Marco Schwatz
4. Internet of Things and Data Analytics, Wiley Publications.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3

Hrs.

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

**20
Marks**

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

**80
Marks**

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

COURSE OBJECTIVES

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

UNIT 1

9 Hrs.

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

UNIT 2

9 Hrs.

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

UNIT 3

9 Hrs.

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

UNIT 4

9 Hrs.

Acceptance and operational testing: Defining the acceptance criteria-Developing an Acceptance 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 ,the 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 ,the student will be able to

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

CO2 - Identify the Limitations of Algorithms in Problem Solving

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

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

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

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

TEXT / REFERENCE BOOKS

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

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100
Hrs.

Exam Duration : 3

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 ,the student will be able to

- CO1** - Analyse 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, BostonUniv ISBN:047120459- 5, 2004
3. Dale Rogerson, InsideCom Microsoft Programming series
4. James L. Weaver, Kevin Mukhar, James p. Crume(Publisher) Begineeing J2EE1.4 from Novice to Professional (Apress Beginner series)
5. Lenn Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Third Edition, Addison- Wesley Publication, 2011
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

SBSA3008	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 ,the 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. 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. 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**

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
Hrs.

Exam Duration : 3

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
Hrs.

Exam Duration : 3

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

SBSB1406	QUANTUM COMPUTING	L	T	P	EL	C	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce the basics of Quantum Computing
- To understand Quantum state transformation and classical computation versions
- To know various Quantum Computation Algorithms.

UNIT 1 QUANTUM BUILDING BLOCKS-I 9 Hrs.

Introduction - Single Qubit Quantum Systems - Multiple Qubit Systems.

UNIT 2 QUANTUM BUILDING BLOCKS-2 9 Hrs.

Measurement of multiple Qubit Systems-Quantum State Transformations-Quantum versions of Classical Computations.

UNIT 3 BASIC ALGEBRA FOR QUANTUM ALGORITHMS 9 Hrs.

Introduction-Numbers and Strings-Basic linear algebra-Boolean Functions, Quantum, Bits and Feasibility, Special Matrices, Tricks.

UNIT 4 QUANTUM ALGORITHMS 9 Hrs.

Phil's algorithm, Deutsch's algorithm, Jozsa Algorithms, Simon's Algorithm, Shor's Algorithms, Grover's Algorithms.

UNIT 5 ENTANGLED SUBSYSTEMS AND ROBUST QUANTUM COMPUTATIONS**9 Hrs.**

Quantum subsystems and properties of entangled states-Quantum error correction-Fault tolerance and Robust.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - An ability to identify, analyse Quantum Building Blocks.

CO2 - Know Quantum state transformations.

CO3 - Identify the advantages and limitations of some Quantum Computation Algorithms

CO4 - Apply advanced quantum computation algorithms

CO5 - Proficiency on the concepts of robust computation and error correction

CO6 - Analyze error correction mechanisms

TEXT / REFERENCE BOOKS

1. Quantum Computing A Gentle Introduction, Eleanor Rieffel and Wolfgang Polak, The MIT Press Cambridge, Massachusetts London.
2. Quantum Algorithms Via Linear Algebra, Richard J. Lipton, Kenneth W. Regan, The MIT Press Cambridge, Massachusetts London, England, 2014.
3. Quantum Computing Devices: Principles, Designs And Analysis, Goong Chen, David A. Church , Berthold-Georg Englert, Carsten Henkel, Bernd Rohwedder , Marlan O. Scully, M. Suhail Zubairy, Hapman and Hall/CRC.

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

SBSB1407	LINUX AND SHELL PROGRAMMING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Student will be able to write simple shell programming using Linux utilities, pipes and filters.
- To understand file system, process management and memory management
- To learn various commands used by Linux shell which makes the users to interact with each other.

UNIT 1**9 Hrs.**

Introduction to LINUX Operating System: Introduction - The LINUX Operating System - Managing Files and Directories: Introduction – Directory Commands in LINUX – File Commands in LINUX.

UNIT 2**9 Hrs.**

Creating files using the vi editor: Text editors – The vi editor. Managing Documents: Locating files in LINUX – Standard files – Redirection – Filters – Pipes.

UNIT 3**9 Hrs.**

Securing files in LINUX: File access permissions – viewing File access permissions – Changing File access permissions. Automating Tasks using Shell Scripts: Introduction – Variables- Local and Global Shell variables – Command Substitution.

UNIT 4**9 Hrs.**

Using Conditional Execution in Shell Scripts: Conditional Execution – The case... esac Construct. Managing repetitive tasks using Shell Scripts: Using Iteration in Shell Scripts – The while construct – until construct – for construct – break and continue commands – Simple Programs using Shell Scripts.

UNIT 5**9 Hrs.**

Pipe, process pipes, the pipe call, parent and child processes, and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget, msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, ipc status commands. Sockets- Socket, socket connections - socket attributes, socket addresses, socket, connect, bind, listen, accept, socket communications.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Describe the architecture and features of Linux Operating System and distinguish it from another Operating System
- CO2** - Develop Linux utilities to perform File processing, Directory handling, User Management and display system configuration
- CO3** - Develop utilities to perform User Management and Display system configuration
- CO4** - Develop shell scripts using pipes, redirection, filters and Pipes
- CO5** - Apply and change the ownership and file permissions using advance Unix commands
- CO6** - Build Regular expression to perform pattern matching using utilities and implement shell scripts for real time applications.

TEXT / REFERENCE BOOKS

1. Operating System LINUX, NIIT, PHI, 2006, Eastern Economy Edition.
2. N.B. Venkateswarlu , Introduction to Linux: Installation and Programming, BS Publications, 2008, 1st 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

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

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 Industry 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