SHSB1101	TECHNICAL ENGLISH	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand specialized subject areas and skills included or theirstudy.
- To comprehend and react in oral andwritten forms to the specialized texts.
- To respond to listening, reading and writing tasks byusing digital tools.
- To enhance communication, collaboration and critical thinking skills.
- To explore creativity through blended learning contexts.

UNIT 1 **9 Hrs.**

Listening : Listening to choose the correct answer from the options given (MCQ).
Speaking : SelfIntroduction,Talking about likes and dislikes.
Reading : Comprehending a passage-Skimming, scanning, detailed reading.
Writing : Letter of Job Application, Resume, Letter to the Editor (problems and solutions).
Vocabulary : Kinds of Sentences, Affixes**,** Collocations, Sequence words, contextual guessing of words.
LanguageFocus : PartsofSpeech, Tense and itstypes,Voice- Impersonal Passive.
LanguageLabwork : Focus Digitalliteracy: students join zoom platform/ using online tools.

UNIT 2 **9 Hrs.**

Listening : Listening to advertisements about a product, say true or false.
Speaking : JAM on current topics, mini presentations.
Reading : Identifying topic sentences by reading content.
Writing : Writing compare/ contrast paragraphs, process description, E-Mail Writing.
Vocabulary : Verbalphrases, Prepositions and Prepositional phrases, Concord, Discourse Markers.
LanguageFocus : Clauses, Conjunctions, SentenceTypes - Simple, Compound & Complex.
LanguageLab : Digitalliteracy: Responding to quiz using Kahoot application.

UNIT 3 **9 Hrs.**

Listening : Listening to summarize the information, debates/ discussions.
Speaking : Group discussion on a given topic.
Reading : To find specific information and to prepare notes using the format.
Writing : Framing openended questions -SurveyReport-Arranging the sentences in the right order.
Vocabulary : Paired expressions, Adjectives/ adverbs, Technical definitions, Compound Nouns.
Language Focus : Punctuation, Editing, Same words used as different parts of speech.
Language Lab : Digital literacy: Power point tools -Slide share to make presentation on the survey report.

UNIT 4 **9 Hrs.**

Listening : Listening to differentiate instructions and recommendations.
Speaking : Debate on current issues.
Reading : Reading to understand and classify the information.
Writing : Instructions, Recommendations, Preparation of User Manual.
Vocabulary : Classification of words, Abbreviations, Acronyms.
Language Focus : Reported Speech, Causatives, Basic Sentence Patterns
Language Lab : Digital literacy: Using online discussion forum

UNIT 5 **9 Hrs.**

Listening and summarizing : Listening to identify the structure of sentences, small talks, TED talks.
Speaking : Giving impromptu talks, Speech Writing .
Reading : Read argumentative essays and paragraphs.
Writing : Essay writing, Checklist preparation, Note making .
Vocabulary : Homophones/Homonyms, Idioms and Phrases.
Language Focus : Negatives, Tag questions, Similes and Metaphors.
Language Lab : Digital literacy: Creating own Blogs and interactive exercises and quizzes online.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Classify technical words to use them in sentences framing, compose problem solving paragraphs.
CO2 - Categorize information based on the understanding of reading materials to prepare notes.
CO3 - Prepare and document to report, identify elements of editing.
CO4 - Interpret technical definitions related to the text and design a user manual using instructions.
CO5 - Summarize reading materials and outline an essay on any topic given.
CO6 - Demonstrate their language learning activities in the classroom/ online group environment

TEXT/ REFERENCES BOOKS

1. Technical English [2019], Department of English, Sathyabama Institute of Science & Technology.
2. Beer, David F., and David McMurrey. A Guide to Writing as an Engineer. 4th ed., Wiley, 2013
3. Alred, Gerald J., et al. Handbook of Technical Writing. 11th ed., Bedford/St. Martin's, 2019.
4. Pearsall, Thomas Edward. Technical Writing: A Practical Guide for Engineers, Scientists, and Nontechnical Professionals.McGraw-Hill Education, 2017.
5. Straus, Jane. The Blue Book of Grammar and Punctuation. John Wiley & Sons, 2014.
6. O'Conner, Patricia T. Woe is I: The Grammarphobe's Guide to Better English in Plain English. Riverhead Books, 2019.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

SMTB1101	MATRICES AND CALCULUS	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVE

- The Objective of this Course is to identify, reflect upon, evaluate and achieve conceptual understanding and knowledge of traditional Calculus to form independent judgements.
- The purpose of this course is for Modeling the Engineering problems and obtaining its solutions mathematically.
- This helps in understanding Science, Engineering and Computer Science analytically and logical thinking is attained.

UNIT 1 MATRICES 9 Hrs.

Characteristic equation of a square matrix - Eigen values and Eigen vectors of a real matrix - Properties of eigen values and eigen Vectors - Cayley-Hamilton theorem (without proof) - verification, finding inverse and power of a matrix - Diagonalisation of a matrix using orthogonal transformation - Quadratic forms - Nature of quadratic forms - Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT 2 GEOMETRICAL APPLICATIONS OF DIFFERENTIAL 9 Hrs.

Definitions - Derivative of standard functions (Results only) - Differentiation of function of function - Logarithmic differentiation - Derivatives of implicit function- Curvature - Centre, Radius and Circle of Curvature in Cartesian co-ordinates - Evolutes.

UNIT 3 FUNCTIONS OF SEVERAL VARIABLES 9 Hrs.

Partial derivatives (Definition) - Total derivative - Jacobian-Taylor's expansion - Maxima and minima of functions of two variables - Constrained maxima and minima using Lagrange's multiplier method.

UNIT 4 INTEGRAL CALCULUS I 9 Hrs.

Beta and Gamma integrals - Relation between them - Properties of Beta and Gamma integrals with proofs - Evaluation of definite integrals in terms of Beta and Gamma function.

UNIT 5 INTEGRAL CALCULUS II 9 Hrs.

Double integrals in Cartesian and Polar co-ordinates - Change of order of integration - Change of variables from Cartesian to Polar coordinates - Area of plane curves using double integrals. Triple integrals - Volume using triple integrals in Cartesian co-ordinates (Simple Applications**).**

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 -Convert the quadratic form to canonical form by orthogonal transformation
CO2 -Construct the circle of curvature and evolutes of any curve.
CO3 -Examine the maxima and minima of functions of several variables.
CO4 -Analyze the relationship between Beta and Gamma functions and its applications
CO5 -Evaluate double integrals in various coordinate systems
CO6 -Apply the concept of triple integrals in engineering problems

TEXT / REFERENCE BOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, Singapore, 2012.
2. Grewal B.S., Higher Engineering Mathematics, 41th Edition, Khanna Publications, Delhi, 2011.
3. Veerarajan T., Engineering Mathematics for First Year, II Edition, Tata McGraw Hill Publishers, New Delhi, 2008.
4. Kandaswamy P & Co., Engineering Mathematics for First Year, IX revised edition, S.Chand& Co Pub., 2010.
5. Venkataraman M.K., Engineering Mathematics - First Year (2nd edition), National Publishing Co., 2000.
6. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill, New Delhi, 11th Reprint, 2010.
7. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi publications, Reprint 2008

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

SCYB1101	CHEMISTRY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basic concepts of quantum chemistry from bonds to bands
- To learn the principles and applications of energy levels in molecules
- To know the importance of electrochemistry in batteries.
- To explore the concept of corrosion mechanism and design principles.
- To study the various synthetic approaches in nanochemistry.

UNIT 1 ATOMIC AND MOLECULAR STRUCTURE 9 Hrs.

Introduction to quantum chemistry - Motion of a quantum mechanical particle in one dimension (time-independent) - Physical meaning of wave function - Schrodinger equation for Hydrogen atom (No derivation.Only wave function). Angular and radial wave functions and probability densities - Quantum numbers - Principal, azimuthal, spin and magnetic quantum numbers - Wave functions and orbital shapes -s,p,d,f - LCAO-MO of H_2 - Band theory of solids: Conductors, semi-conductors- Role of As and Ga doping on band structures.

UNIT 2 MOLECULAR SPECTROSCOPY 9 Hrs.

Electromagnetic spectrum - Interaction of radiation with matter - Energy levels in molecules - Microwave spectroscopy - Principle - Classification of molecules based on moment of Inertia - Rotational energy expression (J levels) - Calculation of J for CO molecule - Vibrational spectroscopy - Normal modes of vibrations - Vibrations of polyatomic molecules (CO_2 and H_2O) - Determination of Force constant - Electronic transitions in organic molecules - Mathematical derivation of Beer-Lambert's law.

UNIT 3 ELECTRO CHEMISTRY 9 Hrs.

Electrochemistry: Galvanic cell - Electrochemical cell representation - EMF series and its significance. Batteries: Terminology - Mechanism of Lead-acid accumulator - Mechanism of Nickel-cadmium batteries. Mechanism of Lithium batteries: Li/$SOCl_2$ cell - Li/I_2 cell - Lithium ion batteries. Mechanism of Fuel Cells: Hydrogen-oxygen fuel cells - Solid oxide fuel cell (SOFC).

UNIT 4 CORROSION SCIENCE 9 Hrs.

Introduction: Definition. Types: Dry corrosion: Mechanism - Pilling-Bedworth rule - Wet Corrosion: Mechanism. Types: Galvanic corrosion and differential aeration cell corrosion. Galvanic series and its significance.Factors influencing corrosion. Corrosion prevention: Material selection and design - Cathodic protection - Sacrificial anodic method and Impressed current method - Inhibitors - Anodic and Cathodic inhibitors.

UNIT 5 CHEMISTRY OF MATERIAL SCIENCES 9 Hrs.

Phase equilibria: Gibbs phase rule - Terms involved in Phase rule - Phase diagram of water system - Thermal method of analysis - Construction of simple eutectic system (Lead-Silver alloy system).
Fuels- Classification of fuels - Determination of calorific values of solid fuels by bomb calorimeter- Manufacture of synthetic petrol by Fischer-Tropsch method - Knocking in IC engines - Chemical structure - Octane and cetane rating of fuels. **Nanomaterials:** Size dependent properties of nanomaterials - Synthesis of gold and silver nanoparticles by Chemical reduction method-Applications of nanoparticles in medicine.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Apply the principles of quantum chemistry for energy level quantisation in molecules.
CO2 - Analyse the molecular transitions by interaction of EMR with matter.
CO3 - Assess the reaction mechanism in electrochemical storage device.
CO4 - Comprehend the corrosion mechanism for environmental sustainability. Examine the mechanism of corrosion for mitigation.
CO5 - Interpret the role of phase diagram/ fuels/ nanoparticles in chemical/ material science.
CO6 - Apply the concept of chemical science in real world applications.

TEXT / REFERENCE BOOKS

1. A.K.Chandra, Introductory Quantum Chemistry, Tata McGraw-Hill, 4th edition, 2019.
2. Ira N. Levine, Physical chemistry, 6th Edition, 2018.
3. Ira N. Levine, Quantum chemistry, 7th Edition, 2013.
4. David W. Ball and Thomas Baer, Physical Chemistry, Wadsworth Cengage Learning, 2nd Edition, 2014.
5. Mars G Fontana, Corrosion Engineering, 3rd Edition, Tata McGraw Hill, 2018.
6. Douglas A. Skoog and Donald M.West, Principles of Instrumental Analysis, Cengage, 6th Edition, 2014.
7. P.C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai Publication, 2018.
8. David Linden, Thomas B Reddy, Handbook of Batteries, 4th Edition, McGraw-Hill, 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice	**20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks	**80 Marks**

SEEB1101	ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSEOBJECTIVES

- To understand the fundamental concepts of electrical wiring and its components
- To analyze DC and AC circuit behaviour
- To impart Knowledge on electronic devices and their applications.
- To gain Knowledge on operation of UPS and SMPS power supplies.

UNIT1 INTRODUCTION TO ELECTRICAL SYSTEMS 9 Hrs.

Basic Element Resistors, inductors and capacitors - Domestic Wiring -Wiring Materials and Accessories -Staircase Wiring - Fluorescent Tubes-Earthing-Types & Benefits.

UNIT2 DC CIRCUITS 9 Hrs.

Electrical Quantities - Ohm's law - Kirchoff's laws -Resistance in series and parallel combinations - Current and Voltage division rules - Mesh analysis and Nodal analysis.

UNIT3 AC CIRCUITS 9 Hrs.

Sinusoidal functions - R.M.S and Average values for Sinusoidal waveform - Phasor representation - Sinusoidal excitation applied to purely resistive, inductive and capacitive circuits - RL , RC and RLC series circuits - power and power factor.

UNIT4 SEMI CONDUCTOR DEVICES 9 Hrs.

VI Characteristics of PN-junction diodes and Zener diodes, BJT and its configurations - input/output Characteristics, Junction Field Effect Transistor - Drain and Transfer Characteristics - Silicon Controlled Rectifiers.

UNIT5 POWER SUPPLY 9 Hrs.

Introduction to Power Supplies- Regulated power supplies- Single and Dual regulated power supply- Design using regulator IC-Switched Mode Power Supplyc(SMPS) - Design used in Computer Systems- Introduction to Uninterrupted power supplies(UPS), online UPS, offline UPS, high frequency online UPS.

Max. 45Hrs.

COURSEOUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamental electrical concepts.
CO2 - Analyze simple DC circuits using appropriate techniques
CO3 - Apply phasor analysis techniques to solve AC circuits.
CO4 - Demonstratethecharacteristicsofvarioussemi-conductordevices
CO5 - Analyzecharacteristics of Switched Mode Power Supply
CO6 - Designpower supply unit using regulator IC.

TEXT / REFERENCE BOOKS

1. Dr. Ramana Pilla, Dr. M Surya Kalavathi and Dr. G T Chandra Sekhar, ¯Basic Electrical Engineering‖, S.Chand and Co.,2022.
2. Dr.Sanjay Sharma, ‖Electronic Devices and Circuits‖, 2nd edition,S.K.Kataria and Sons,2012.
3. B.N.Mittle and Aravind Mittle, ¯Basic Electrical Engineering‖, 2nd edition,Tata McGraw Hill,2011.
4. Smarajit Ghosh, ¯Fundamentals of Electrical and Electronics Engineering‖, 2nd edition,PHI Learning PrivateLtd,2010.
5. B.L.Theraja, ¯Fundamentals of Electrical Engineering and Electronics‖,1st edition,S.Chand andCo.,2009.
6. G.K.Mithal, ¯Basic Electronic Devices and Circuits‖, 2nd Edition,G.K.Publishers Pvt,2008.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

S11BLH11	PROGRAMMING IN C	L	T	P	EL	Credits	Total Marks
		2	0	4	0	4	100

COURSE OBJECTIVES

- To understand the concepts of variables, operators, control structures and arrays.
- To gain knowledge on Functions, Structures and Union in C.
- To explore the concepts of pointers and files to create real world applications using CDevise programs using Loops, Control structures and Array in C.

UNIT 1 BITS AND BYTES IN COMPUTING 12 Hrs.

Computers: Hardware - Software - Processor - Memory - I/O devices - Interface - Programming Languages - Evolution from COBOL, FORTRAN to C, Python - Need

Algorithms: Role in problem solving - Analysis - Design - Flowcharts: Role in problem solving - Symbols - Design - Pseudocode: Role in problem solving - Design - Program: Role in problem solving – Design

Practice:

1. Describe a simple real world problem in your domain of interest and describe it in the form of problem statement, input, output and provide its solution in terms of algorithm, flowchart, pseudo code and program.

UNIT 2 C: MATH BEHIND CODING 12 Hrs.

C: Structure of program - Character set - Tokens - Keywords - Identifiers - Constants - Variables - Datatypes - Strings - Operators and its types - Functions - Header Files

Algorithmic Strategies: Iteration and Recursion - Efficiency - Role of Time and Space consumption while building an algorithm – Complexities

Practice:

1. Describe a simple real world problem in your domain of interest and provide a computing and non-computing solution for the same. Calculate the time and space consumed in both solutions. Compare and contrast the pros and cons in both solutions.
2. Write an algorithm, flowchart, pseudo code followed by a simple C code to do find the Factorial and Fibonacci series using both iteration and recursion.
3. Get the number of days taken to cultivate both rice and wheat in turns in an agricultural land from the user. Write a C program to convert the days and display as years, months and days using simple operators.
4. You have a circular plot for building playground and a rectangular plot for building an apartment. Get the input from the user for both plots and write a C program to calculate the area and perimeter of both plots.

UNIT 3 C: MAGIC BEHIND INSTANT OUTPUTS 12 Hrs.

Advanced Coding Concepts: Decision Making using Branching Statements and its types - Decision Making using Looping Statements and its types - Switch Statements - Break - Continue - Goto - Jump Statements

Case Study: Fun with Code - Printing Alphabets / Flags of Countries / Flying Alphabet Screensaver

Practice:

1. Describe a problem statement in your domain of interest whose solution involves repetition of same steps and provide code as solution involving for, while and do while loops.
2. Describe a problem statement in your domain of interest whose solution involves decision making and provide code as solution involving if-else, nested if-else and ladder if-else.
3. Develop a simple scientific calculator using Switch case statement.

4. A Cartesian co-ordinate system has four quadrants. Write a C program to find the quadrant of the co-ordinate points given by the user using both if-else if-else and nested if-else control structure.
5. Given a rose flower to you, dismantle the petals of the flower from inside, if you notice - it follows the sequence of Fibonacci. Now, try to arrange the word "PIZZA" in several ways without repeating and calculate number of ways it can be done using factorial concept. Write a C program to find both Fibonacci and factorial by getting the mentioned input.
6. Product of two large prime numbers is used as encryption key in encryption algorithms. Write a C program to display all the prime numbers between 1 to 100 and give the first two largest numbers as the output.

UNIT 4 STORING GROUP OF HOMOGENOUS ELEMENTS: ARRAYS 12 Hrs.

Diving into Arrays: Definition - Syntax - Types - Representation: Row & Colum Order - Dynamic Arrays

Idea behind Functions: Declaration - Definition - Types - Calling - Arguments - Prototypes - Call by Value - Call by Reference - Pointers - Amalgamation of Pointers: with Arrays & Strings

Case Study: Fun with Code - Simple Game Development using Arrays and Functions

Practice:

1. Describe a problem statement in your domain of interest where you need to work with group of same type of data. Provide a solution in terms of C program to store and manage the data effectively.
2. You're playing UNO cards, suddenly a person is getting rev card. Write a C program to reverse the round by storing the number of players in array.
3. Write a C program for Vehicle Regulation System where odd number ending vehicles can use the road on odd days and even number ending vehicles can use the road on even days using two separate arrays to store and display the odd and even numbers.
4. Write a C program to do the following applications in array:
   (i). Get set of +ve and -ve integers from user, replace -ve integers by 0 in the array.
   (ii). Reverse the floating point numbers stored in the array.
   (iii). Return the smallest value and largest value position in the array.
   (iv). Search the number '5' in array and replace it with '10'
5. Write C program to do the following string handling applications.
   (i). Get favourite actor and actress name, concatenate it and display
   (ii). Display your name in uppercase, lowercase and as fname and lname.
   (iii). Count the frequency of "the" in any sentence and delete it from sentence.
   (iv). Check whether the given string is a palindrome or not.
6. Write C program to do the following string handling applications.
   (i). Get favourite actor and actress name, concatenate it and display
   (ii). Display your name in uppercase, lowercase and as fname and lname.
   (iii). Count the frequency of "the" in any sentence and delete it from sentence.
   (iv). Check whether the given string is a palindrome or not.
7. Write a C program for counting the total number of duplicate elements in an array, print all the unique elements in the same array as two different functions.
8. Write a C program to sort the elements in an array in both ascending and descending order using two different functions.
9. Write a C program to find the largest and smallest number in an array using recursion and to convert the output into a binary number.
10. Write a C program to swap two numbers using two functions, one using pointers and the other one without using pointers.

UNIT 5 STORING GROUP OF HETROGENOUS ELEMENTS: STRUCTURE 12 Hrs.

Outset of Structure and Union: Structure Definition & Declaration - Structures Fusion with: Arrays - Pointers – Functions - Union Initiation, Definition & Declaration - Memory Allocation: Static and Dynamic
Working with Files: File Handling Functions - Read - Write - Other Operations - Different File Types
Case Study: Report on using File Functions to create Score Board for any game, importing it to program
Practice:

1. Describe a problem statement in your domain of interest where you need to work with group of different type of data. Provide a solution in terms of C program to store and manage the data effectively.
2. Write a C program to get the details of the student (roll no, name, date of birth, state, 10th percentage and 12th percentage) using Structure. Calculate the age of the student and display the eligibility status for his admission.
   Eligibility criteria: more than 60 percent in 10th and 12th, age>=17, state==TN.
3. Write a menu driven C program for library management system with ten entries:
   (i). Add Book (ii). Add Author (iii). Add Category (iv). Book Cos
   (v). Display - Book by Author, Book by Category, Book under cost
4. Write a C program to create an employee Union with employee details (id, name, salary) Accept the details of 'n' employees, rearrange the data in ascending order of employee name, id and salary as three different functions and display it.

Complex Practice Problems

1. Design a C program by creating your own header file for any function of your choice and display the output by calling the header file.
2. Create TIC-TAC-TOE game using C Language.
3. Given a situation, you are going to ATM to withdraw money. Write a C program, get the money requested from the user as input and display the number of possible bank notes for the requested money. Note: Give input as number ending in 0's or 5's.
4. Develop a C program for managing Car Rental process with various modules for registration as new user, login, get id proof, keep track of cars available and cars given for rental.
5. Create SUDOKU game using C Language.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Interpret the difference between components of problem solving such as algorithm, flowchart, pseudo code and source code.

CO2 - Build simple solution for any given problem statement using various components of problem solving techniques and measure its efficiency in terms of time and space.

CO3 - Infer and examine the roots and foundation of C programming‘s key concepts like Datatypes, Operators.

CO4 - Devise and correlate the use of different core concepts such as Arrays and Functions in C language.

CO5 - Formulate real time solutions through programs using Structure and Union in C language.

CO6 - Design and Develop various Application Oriented Program for solving real time societal problems.

TEXT / REFERENCE BOOKS

1. Yashavant Kanetkar, ¯Let us C‖, BPB Publications, Fourteenth Edition, 2019.
2. R.G.Dromey, ¯How to Solve it by Computer‖, Pearson Education, 2008..
3. Balagurusamy, ¯Programming in ANSI C‖, McGrawHill Publications, Eighth Edition, 2019.
4. Greg Perry, Dean Miller ¯C Programming Absolute Beginner‘s Guide‖, Third Edition, 2013.

SCYB2101	CHEMISTRY LAB	L	T	P	EL	Credits	Total Marks
		0	0	2	0	1	50

COURSE OBJECTIVES

- To understand the basic principle involved in volumetric and instrumental analysis.
- To acquire practical knowledge in pHmetry, potentiometry and conductometry.
- To develop the skill in water analysis.

SUGGESTED LIST OF EXPERIMENTS

1. Estimation of mixture of acids by conductometry.
2. Estimation of ferrous ion by potentiometry.
3. Determination of pKa value of glycine by pHmetry.
4. Estimation of hardness of water by EDTA method.
5. Determination of alkalinity of water
6. Estimation of Iron by photocolorimetry.
7. Estimation of copper in brass
8. Determination of high molecular weight polymer using Ostwald viscometer.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Estimate the ionic conductance of mixture of acids.
CO2 - Construct a redox cell for the emf measurement.
CO3 - Interpret the concept of Zwitter ion in amino acids
CO4 - Predict the quality of water sample for domestic and industrial applications.
CO5 - Demonstrate the validity of Beer-Lambert's law.
CO6 - Apply Poiseuille's law for molar mass measurement.

TEXT / REFERENCE BOOKS

1. G,H. Jeffery, Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition. Persons Education 2004.
2. S. S. Dara, Experiments and Calculations in Engineering Chemistry, S. Chand and Co. 2010.

SMTB1201	ADVANCED CALCULUS AND STATISTICS	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVE

- The Objective of this Course is to identify, reflect upon, evaluate and achieve conceptual understanding and knowledge of traditional Calculus to form independent judgements.
- The purpose of this course is for modeling the Engineering problems and obtaining its solutions mathematically.
- This helps in understanding Science, Engineering and Computer Science analytically and logical thinking is attained.

UNIT 1 DIFFERENTIAL EQUATIONS 9 Hrs.

Higher order linear differential equations with constant coefficients - Particular Integral for e^{ax}, sinax or cosax, x^n, $x^n e^{ax}$, xsinax, xcosax, e^{ax}sinbx or e^{ax}cosbx - Method of Variation of Parameters - Homogeneous equation of Euler's and Legendre's type.

UNIT 2 VECTOR CALCULUS 9 Hrs.

Vector Differentiation - Gradient, divergence and curl - Directional derivative - Irrotational and Solenoidal vector fields-Vector Integration - Simple problems on line, surface and volume Integrals - Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (without proofs)- Simple applications involving cubes and rectangular parallelopipeds.

UNIT 3 LAPLACE TRANSORMATION 9 Hrs.

Laplace transform - Transforms of standard functions - properties - Transforms of derivatives and integrals - Transforms of the type $e^{at}f(t)$, tf(t), f(t)/t - Transform of periodic functions - Transform of unit step function and impulse function - Inverse Laplace transforms - Convolution theorem - Initial and final value theorems - Applications - Linear ordinary differential equation with constant coefficients.

UNIT 4 BASIC CONCEPTS OF PROBABILITY AND STATISTICS 9 Hrs.

Measures of central tendency: Mean, Median, Mode - Measures of dispersion: Standard deviation for discrete and grouped data. Definitions: Sample Space, Events - Addition Law of probability - Multiplication law of probability - Conditional probability - Baye's theorem (without proof).

UNIT 5 THEORY OF SAMPLING AND TESTING OF HYPOTHESIS 9 Hrs.

Test of Hypothesis - Large samples - Z test - Single proportion - Difference of proportions - Single mean - Difference of means - Small samples - Student_s t test - Single mean - Difference of means - Test of variance - Fisher's test - Chi square test: Goodness of fit, Independence of attributes.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Solve any higher order linear differential equations.
CO2 - Apply concepts of calculus on vector and scalar valued functions.
CO3 - Use Laplace Transform for transformation of functions.
CO4 - Evaluate problems on conditional probability using Baye's theorem.
CO5 - Analyze the concept of testing of hypothesis in small, large samples.
CO6 - Construct the Chi-Square test for goodness of fit and independence of attributes of real data.

TEXT / REFERENCE BOOKS

1. L., Ross, Differential Equations, 3rd Edition, Wiley India, 2009.
2. Bali N.P and Manish Goyal, A Text book of Engineering Mathematics, Eigth Edition, Laxmi Publications Pvt Ltd., 2011.
3. Veerarajan T, Engineering Mathematics for First Year, II Edition, Tata McGraw Hill Publishers, 2008.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, Singapore, 2012.
5. Grewal B.S., Higher Engineering Mathematics, 41th Edition, Khanna Publications, Delhi, 2011.
6. Venkataraman M.K., Engineering Mathematics - First Year, 2nd Edition, National Publishing Co., 2000.
7. Veerarajan T, Probability, Statistics and Random Process, 4th Edition, Tata McGraw Hill, 2014

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

SPHB1101	PHYSICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the concept of crystal structures and symmetry, the physics of scattering and diffraction theory, experimental diffraction from single crystals, instrumentation and powder diffraction.
- Students will be able to understand theIdentify and describe properties of matter, including: flexibility, strength and transparency.
- The objective of this course is to develop a working knowledge of the laws and methods of thermodynamics and elementary statistical mechanics and to use this knowledge to explore various applications.
- Differentiate between various acoustic terms and understand how these apply to different materials and acoustic design solutions.
- To give knowledge about semiconductor physics and discus working and applications of basic devices, including p-n junctions, BJTs and FETs

UNIT 1 QUANTUM MECHANICS 9 Hrs.

Introduction to Quantum mechanics-Energy distribution function, Wave - particle duality-de Broglie matter waves - Concept of wave function and its physical significance - Heisenberg's Uncertainty Principle - Schrodinger's wave equation - Time independent and Time dependent equations - Particle in a one dimensional rigid box - tunnelling (Qualitative) - Scanning Tunnelling Microscope (STM).

UNIT 2 PROPERTIES OF MATTER 9 Hrs.

Introduction- Elasticity- Hooke's law - Torsional stress & deformations - Twisting couple - Torsion pendulum - theory and experiment-bending of beams - bending moment-cantilever:-Theory and experiment-uniform and non-uniform bending: theory and experiment- Magnetism - Basic definitions - Magnetic permeability, susceptibility, relation between permeability and susceptibility - Bohr magneton. Classification of magnetic materials-Hysteresis

UNIT 3 CRYSTAL PHYSICS 9 Hrs.

Single crystalline, polycrystalline and amorphous materials - single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices - inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP.- crystal imperfections: point defects, line defects - growth of single crystals: solution and melt growth techniques.

UNIT 4 SEMICONDUCTOR PHYSICS 9 Hrs.

Classification of materials-Theory of semiconductors: Intrinsic and extrinsic semiconductors, band structure of semiconductors - Fermi level in intrinsic and extrinsic semiconductors. Theory of p-n junctions - diode and transistor: p-n junction under thermal equilibrium, forward bias, reverse bias, carrier density, V-I characteristics, junction capacitance and voltage breakdown. Zener diode and its characterisation- Avalanche breakdown- JEFT- I-V characteristics- amplifying and switching.

UNIT 5 LASER AND ITS APPLICATIONS 9 Hrs.

Absorption and Emission of Radiation by atoms, ions and molecules.Laser medium Phenomenon of population inversion. Laser cavity (fiber laser, and other cavities), generation of coherent beam, Q-switching, short pulse generation, power amplification. Basic Laser Principles: Theory of Laser, Properties of Laser, Fundamental Optical properties, Modified Optical properties, Laser output - its characteristics.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Solve the time independent Schrodinger wave equation for a particle in a box to obtain the Eigen values and Eigen functions.

CO2 - Understand the dual nature of radiation and matter

CO3 - Estimate the atomic packing factor for SC, BCC & FCC structures.

CO4 - Recognize sound level descriptors and how they are used in architectural acoustics andanalyse acoustic properties of typically used materials for design consideration.

CO5 - Understanding the working, design considerations and applications of various semiconducting devices including p-n junctions, BJTs and FETs

CO6 - Demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.

TEXT / REFERENCE BOOKS

1. Pillai S.O., Solid state Physics, New age International Publishers, 7th Edition.
2. Arthur Beiser, Concepts of Modern Physics, Tata McGraw Hill Publications.
3. M.N.Avadhanulu&P.G.Kshirasagar. A text book of Engineering Physics, S. Ch.Publishing.
4. B. B.Laud,Lasers and nonlinear optics, New age International Publishers, II-Edition.
5. R. Murugesan, Modern Physics, S. Chand Publishing, 15th Edition (2015).
6. D. S. Mathur, Elements of Properties of Matter, S. Chand Publishing (2014).
7. A. K. Bandyopadhyay, Nanomaterials, New age International Publishers,
8. K. K. Chattopadhyay, Introduction to nano science and nano technology, PHI publisher,
9. Sulabha Kulkarni, Introduction to Nanoscience and Nanotechnology 2nd Edition
10. David Griffiths, Introduction to electrodynamics, Addison-Wesley publishing 3rd Edition

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice	**20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks	**80 Marks**

SCSB1201	DATA STRUCTURES	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVES

- To understand concepts about linked list, searching and sorting techniques.
- To implement basic concepts about stacks and queues.
- To develop the ability to solve problems by choosing and applying the right data structures.

UNIT 1 INTRODUCTION 9 Hrs.

Introduction to Data Structures - Need - Classification-Arrays - Singly linked list - Representation of a linked list in memory - Operations on a singly linked list - Merging two singly linked lists into one list - Reversing a singly linked list -Advantages and disadvantages of singly linked list - Circular linked list - Doubly linked list.

UNIT 2 STACK AND QUEUE 9 Hrs.

Basic Stack Operations - Representation of a Stack using Arrays - Algorithm for Stack Operations - Infix to postfix Transformation - Evaluating Arithmetic Expressions.

Basic Queue Operations - Representation of a Queue using array - Enqueue - Dequeue - Circular Queues - Priority Queues.

UNIT 3 TREES 9 Hrs.

Trees- Binary Trees-Properties of Binary trees, Implementation using Array and Linked list - Recursive and Non-Recursive Binary Tree traversals - Binary Search Tree - Insertion and Deletion

UNIT 4 GRAPHS 9 Hrs.

Graph- Representation using Array and Linked List - Types of graphs - Graph traversals - BFS and DFS -Minimum Spanning Tree - Kruskal‘s, Prim‘s Algorithm - Shortest path using Dijkstra‘s, Bellman Ford and Floyd Warshall Algorithm.

UNIT 5 SEARCHING AND SORTING TECHNIQUES 9 Hrs.

Basic concepts - List Searches using Linear Search - Binary Search - Fibonacci Search - Sorting Techniques - Insertion sort - Heap sort - Bubble sort - Quick sort - Merge sort - Analysis of sorting techniques.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Interpret the concepts of data structures and choose the appropriate data structure to the problem definition.

CO2 - Design and implement the applications of linear data structures.

CO3 - Apply Algorithm for solving problems like sorting, searching.

CO4 - Design and implement the various non-linear data structures and perform the intended operations.

CO5 - Demonstrate the representation and traversal techniques of graphs and their applications

CO6 - Ability to apply and implement learned algorithm, data structures to solve problems.

TEXT / REFERENCE BOOKS

1. Jean-Paul Tremblay, Paul G. Sorenson,'An Introduction to Data Structures with Application', TMH, 2017.
2. Richard F, Gilberg, Forouzan, ¯Data Structures‖, Cengage, 2004, 2nd Edition.
3. Larry R. Nyhoff, ADTs, Data Structures, and Problem Solving with C++, Pearson Education, 2009.
4. Thomas H. Cormen, Charles E. Leiserson, ¯Introduction to Algorithms‖, MIT Press, 4th Edition, 2022.
5. Goodrich MT, Tamassia R, Goldwasser MH. Data structures and Algorithms in Python.John Wiley & Sons Ltd; 2013.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

S11BLH21	PROGRAMMING IN PYTHON	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To learn about data structures lists, tuples, and dictionaries in Python.
- To build packages with Python modules for reusability and handle user/custom exceptions.
- To create real world GUI applications, establish Database connectivity and Networking.

UNIT 1 INTRODUCTION TO PYTHON 12 Hrs.

History of Python- Introduction to the IDLE interpreter (shell) - Data Types - Built-in function - Conditional statements - Iterative statements- Input/output functions - Python Database Communication - data analysis and visualization using python

Practice:

- Implement built-in functions and trace the type of data items.
- Implement concepts of Conditional and Iterative Statements.
- Use the built-in csv module to read and write from a CSV file in Python.
- Perform data analysis and visualization on a given dataset using Python libraries like pandas, numpy, matplotlib and display charts, graphs, and plots.

UNIT 2 OBJECT ORIENTED CONCEPTS 12 Hrs.

Class - Objects - Constructors - Polymorphism - Encapsulation -Inheritance -Data Abstraction-Method Overloading-Method Overriding-Database Access-Data Hiding-Import Class.

Practice:

- Execute concepts on Polymorphism, Encapsulation.
- Implement Data Abstraction and Inheritance.
- Differentiate Method Overloading and Overriding.
- Create a class called "Person" with attributes "name" and "age." Make the "age" attribute private and implement a getter method to access it.
- Create a module called "math_operations.py" with a class called "Calculator." Import the "Calculator" class into another script and use its methods to perform mathematical operations.

UNIT 3 FILES AND EXCEPTIONS HANDLING, MODULES, PACKAGES 12 Hrs.

File Operations -Iterators - Exception handling - Regular Expressions- Functions and modules-Import Statement Introduction to PIP-Installing Packages via PIP-Using Python Packages.

Practice:

- Create a text file called "numbers.txt" and write the numbers from 1 to 10 in words, each on a separate line.
- Implement a custom iterator that generates a sequence of Fibonacci numbers and print the first 10 numbers.
- Create a try-except block to catch a FileNotFoundError and print a message when a file is not found.
- Write a Python program that handles a ZeroDivisionError and prints a custom error message to the console.
- Create a module called "greetings.py" with a function called "hello" that prints "Hello, World!" Import the module into another script and use the "hello" function.
- Install the "numpy" package using PIP.Import the package and create a NumPy array with random values.

UNIT 4 GUI PROGRAMMING 12 Hrs.

GUI Programming in Python - Introduction to GUI library - Layout management - Events and bindings - Fonts - Colors - Canvas - Widgets (frame, label, button, check box, entry, list box, message, radio button, text, spin box).

Practice:

- Design a GUI form with a vertical box layout that includes labels and entry fields for user registration information.
- Create a GUI window with a grid layout that contains buttons representing a 3x3 game board.
- Create a canvas in your GUI program and draw simple shapes such as rectangles, circles, and lines.
- Create a GUI form program that includes various widgets and implement event handling Concepts also add Create a drop-down menu that allows users to select different font styles for text display.

UNIT 5 DATABASE AND NETWORK 12 Hrs.

Database (using NoSQL): Connector Module -Cursor - Statements - Exceptions in database. Network connectivity: Socket module - Client - Server -Email - URL Access.

Practice:

- Connect to the NoSQL database using a Python connector module, such as "pymongo" for MongoDB or "cassandra-driver" for Cassandra.
- Use a cursor to iterate over the records in a collection/table and print specific fields/attributes.
- Implement error handling for specific scenarios, such as duplicate key violation or record not found, in the NoSQL database.
- Implement either a TCP/IP or UDP client-server application using the socket module for sending and receiving messages.
- Write a program using the smtplib module to send an email from a specified email address to another recipient.

Max. 60 Hrs.

COURSE OUTCOMES

On Completion of the course the student will able to

CO1 - Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.
CO2 - Do the decision making and write functions in Python.
CO3 - ExplainhowtodesignGUIApplicationsinPythonandevaluatedifferentdatabaseoperations.
CO4 - Design and develop Client Server network applications using Python.
CO5 - Ability to design real life situational problems and think creatively about solutions of them.
CO6 - Apply the best features of mathematics, engineering and natural sciences to program real life problems.

TEXT / REFERENCE BOOKS

1. R. Nageswara Rao , ¯Core Python Programming‖, Dreamtech Press, Third Edition, 2021
2. Y. Daniel Liang, ¯Introduction to Programming Using Python‖, Pearson,2013.
3. Python Notes for Professionals by Stack Overflow Documentation (https://books.goalkicker.com/PythonBook/).
4. Dr. Charles R. Severance, ¯Python for Everybody- Exploring Data Using Python 3‖, 2016.
5. Paul Gries, Jennifer Campbell, Jason Montojo, ¯Practical Programming: An Introduction to Computer Science using Python 3‖, Pragmatic Bookshelf, 2nd Edition,2014.

SMEB2102	ENGINEERING DRAWING AND DESIGN	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

COURSE OBJECTIVES

The main learning objective of this course is

- To understand the concept of graphic communication, develop the drawing skills for communicating concepts, ideas and designs of engineering products and to expose them to existing national standards related to technical drawings.
- To make the student to visualize and read the drawings.
- To make the student to understand the importance of sectioning and development of surfaces.
- To learn about the orthographic and pictorial projections.

CONCEPTS AND CONVENTIONS

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

- **PLANE CURVES**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction ofellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – Drawing of tangents and normal to the above curves.

- **PROJECTION OF POINTS AND LINES**

Projection - Types of projection - Projection of points lying in four quadrants - Projection of lines (First angle projection only) -Projection of lines parallel and inclined to one or both the planes

- **PROJECTION OF SOLIDS**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis isinclined to one of the principal planes and parallel to the other by rotating object method.
Practicing three-dimensional modeling of simple objects by CAD Software **(**Not for examination**)**

- **SECTION OF SOLIDS**

Purpose of sectioning - Sectional views - Hatching - Section plane perpendicular to one plane and parallel to other plane -Section plane inclined to HP-True shape of the section.
Practicing three-dimensional modeling of simple objects by CAD Software **(**Not for examination**)**

- **DEVELOPMENT OF SURFACESAND FREEHAND SKETCHING**

Need for development of surfaces - Types of development of surfaces - Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.

Orthographic Projection-: Visualizationconcepts and Free Hand sketching: Visualization principles – Representation of Three Dimensionalobjects – Layout of views- Freehand sketching of multiple views from pictorial views of objects.
Practicing three-dimensional modeling of simple objects by CAD Software (Not for examination)

COURSE OUTCOMES

On completion of the course, students will be able to

CO1 - Identify the national standards related to the Engineering drawing based on BIS and construct conic sections and polygons.

CO2 - Solve practical problems involving projection of lines.

CO3 - Draw orthographic projections of solids.

CO4 - Draw orthographic section of solids and improve the students visualization skill to develop New products .

CO5 - Draw the Development of surfaces and its applications in manufacturing industry

CO6 - Draw the orthographic view of solids and learn to convert pictorial into orthographic projection.

TEXT / REFERENCE BOOKS

1. Bhatt N.D. and Panchal V.M., ¯Engineering Drawing‖, Charotar Publishing House,53rd Edition, 2019.
2. Natrajan K.V., ¯A Text Book of Engineering Graphics‖, Dhanalakshmi Publishers, Chennai, 2018.
3. Venugopal K. and Prabhu Raja V., ¯Engineering Graphics", New Age International (P) Limited,2018.
4. Engineering drawing practice for schools and colleges, SP 46 - 1988 (http:// web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf).

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 –2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

(Note: Only after submission of all drawing sheets prescribed by staff member, the students will be allowed for End Semester practical examination.)

SPHB2101	PHYSICS LAB	L	T	P	EL	Credits	Total Marks
		0	0	2	0	1	50

LIST OF EXPERIMENTS

1. Determine the Rigidity modulus of a given wire by Torsional pendulum
2. To determine the angle of Minimum Deviation by I - D curve method.
3. Determine V-I characteristics of a photodiode
4. To determine the Numerical aperture of an optical fiber
5. To find the Energy gap of a semiconductor
6. Determination of Young's modulus- Non-uniform bending
7. Determination of Young's modulus- Uniform bending
8. Determination of the wave length of the laser using grating- Laser.
9. Determination of thickness of a thin sheet/wire- Air wedge.
10. Determination of Numerical Aperture and acceptance angle- Optical fibre.
11. Photoelectric effect
12. Michelson Interferometer.
13. V-I characterisation of solar cell
14. CRO- FUNCTIONS

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Measure the rigidity modulus of a given wire by oscillations.
CO2 - Measure the angle of minium deviation by spectrometer.
CO3 - Analyse the I-V characteristics of the given photo diode.
CO4 - Measure the band gap of the given semiconductor.
CO5 - Measure the young's modulus of bar by uniform bending method.
CO6 - Determine the wavelength of the given laser light source.

SCSB2201	DATA STRUCTURES LAB	L	T	P	EL	Credits	Total marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. In a marketplace, there are multiple places that sell pineapple at different size and cost. Implement a program to find the place that sells quality pineapple with largest size and minimum cost by getting the size and cost in array.
2. To use undo operation in a Microsoft Word, the machine needs to remember the list of states and operations made. To implement this in real time write a detailed program with set of insertion and deletion operation functions.
3. Spotify app uses playlist where the song can be changed in both directions to play the next and previous songs in the list. To implement this concept in real time write a detailed program with set of insertion and deletion operation functions.
4. Implement the problem of Towers of Hanoi - a critically acclaimed mathematical implementation with the use of Stack data structure. Implement all of its operation.
5. To manage the queuing system of ticket counter in SKY cinemas implement the queue data structure with all of its corresponding operations.
6. To organize a traffic light management system based on number of vehicles on each side, implement a circular queue data structure algorithm along with its respective operations.
7. Get a complex expression from the user in human‘s understandable BODMAS format and convert the same expression into machine readable form.
8. To sort the contact names in your phone in ascending order based on the first name using insertion sort algorithm.
9. To sort the students in the class according to their heights for group photo in descending using quick sort algorithm.
10. To sort the chocolates in the supermarket based on its cost and size in ascending order using merge sort algorithm.
11. Implement the Linear Search and Binary Search methods in two programmes to discover any given element inside the provided range of numbers, and compare the results to determine which algorithm is faster and/or uses less space.
12. Write a programme to visit every restaurant along the route when travelling from Chennai to Pondicherry through creating a binary tree for the purpose.
13. Write a program
    a. To find the nearest restaurants from your location by implementing Breadth First Search traversal algorithm.
    b. Implement the Depth First Search traversal algorithm to find the cycles in any given graph.
14. By applying the minimal spanning tree technique, you can implement an intercom system to connect all the departments in your college with the least amount of wiring.
15. Implement any shortest path algorithm to discover the shortest route between Chennai and Hyderabad.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Implement programs using array and linked list data structures by mapping it to daily pursuits.

CO2 - Formulate programs for algorithms based on stack and queue data structure and its application.

CO3 - Demonstrate the process of sorting that happens in daily activity by implementing various sorting algorithms.

CO4 - Compare and Contrast the difference in time and space complexity for Linear and Binary search algorithm.

CO5 - Develop graph and tree traversal algorithms for real time application.

CO6 - Design shortest path finding algorithms for real time societal problems.

SMTB1302	DISCERETE MATHEMATICS AND NUMERICAL METHODS	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVE

- The Objective of this Course is to identify, reflect upon, evaluate and achieve conceptual understanding and knowledge of traditional Calculus to form independent judgements.
- The purpose of this course is for modeling the Engineering problems and obtaining its solutions mathematically.
- This helps in understanding Science, Engineering and Computer Science analytically and logical thinking is attained.

UNIT 1 LOGIC 9 Hrs.

Statements-Truth tables-Connectives-Equivalent Propositions- Tautological Implications-Normal forms- Predicate Calculus, Inference theory for Propositional Calculus and Predicate Calculus.

UNIT 2 SET THEORY AND GROUP THEORY 9 Hrs.

Basic concepts of Set theory- Laws of Set theory- Partition of set, Relations- Types of Relations: Equivalence relation, Partial order in relation-Graphs of relation- Hass diagram, Groups-Properties of groups-Semi group and Monoid (definition and examples only) -Subgroups, Cosets - Lagrange theorem.

UNIT 3 GRAPH THEORY 9 Hrs.

Introduction to graphs - Graph terminology - representation of graphs - Graph isomorphism - Connectivity - Euler & Hamilton paths - Tree - Binary tree - Expression tree.

UNIT 4 NUMERICAL METHODS FOR SOLVING EQUATIONS 9 Hrs.

Solution of algebraic equation and transcendental equation: Regula Falsi Method, Newton Raphson Method - Solution of simultaneous linear algebraic equations: Gauss Elimination Method, Gauss Jacobi & Gauss Seidel Method.

UNIT 5 NUMERICAL INTERPOLATION, DIFFERENTATION AND INTEGRATION 9 Hrs.

Interpolation: Newton forward and backward interpolation formula, Lagrange‘s formula for unequal intervals - Numerical differentiation: Newton‘s forward and backward differences to compute first and second order derivatives - Numerical integration: Trapezoidal rule, Simpson‘s 1/3rd rule and Simpson‘s 3/8th 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 Inference theory for propositional calculus and predicatecalculus. Distinguish PCNF and PDNF

CO2 - Explain the concept of set theory and group theory

CO3 - Develop Euler, Hamiltonian paths. Identify graph isomorphism.

CO4 - Formulate numerical solution of algebraic, transcendental and simultaneous linear equations.

CO5 - Appraise various numerical methods for Interpolation.

CO6 - Develop the solutions for Numerical differentiation and integration

TEXT / REFERENCE BOOKS

1. Kenneth H.Rosen, Discrete Mathematics and its applications, 6th Edition, McGraw- Hill, 2007.
2. Veerarajan T., Discrete Mathematics with Graph Theory and Combinatorics, Tata Mcgraw Hill Publishing Co., New Delhi, 2006.
3. Narasingh Deo, Graph Theory with application to Engineering and Computer Science, Prentice Hall India, 2010.
4. Steven C .Chapra, Raymond P. Canale, Numerical Methods for Engineers, Tata McGraw Hill Publishing Co., New Delhi, 2003.
5. Kandasamy P., Thilagavathy K., and Gunavathy K., Applied Numerical Methods, S. Chand & Co., New Delhi, 2003.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

SCSB1301	COMPUTER ARCHITECTURE AND ORGANIZATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSEOBJECTIVES

- ToimpartknowledgeonALU and its operations.
- To understand the types of memory organizations, interface and communication in I/O devices.
- To analyse the characteristics, structure, communication and synchronization of multiprocessors.

UNIT 1 GENERAL REGISTERS 9 Hrs.

Introduction - General Register Organization - Stack organization - Basic computer Organization - Instruction codes - Computer Registers - Computer Instructions - Instruction Cycle.

UNIT 2 ARITHMETIC LOGIC UNIT AND COMPUTER ARITHMETIC 10 Hrs.

Introduction to ALU - Arithmetic - Logic - Shift Micro operations - Arithmetic Logic Shift unit - Example Architectures: MIPS - RISC - CISC - Addition - Subtraction - Multiplication and Division algorithms - Floating Point Arithmetic operations - Micro programmed Control- Design of Control unit.

UNIT 3 MEMORY ORGANIZATION 8 Hrs.

MemoryHierarchy-Mainmemory- AuxiliaryMemory-AssociativeMemory-CacheMemory-Virtualmemory

UNIT 4 INPUT - OUTPUT ORGANIZATION 9 Hrs.

PeripheralDevices - I/OInterface - Modesoftransfer - PriorityInterrupt - DMA - IOP - SerialCommunication.

UNIT 5 CHARACTERISTICS OF MULTIPROCESSORS 9 Hrs.

Interconnection Structures - Interprocessor Arbitration - Interprocessor Communication and Synchronization - Cache coherence.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Classify the various types of registers, micro instructions and addressing modes.
CO2 - Explain Arithmetic Logic Unitand computer arithmetic operations.
CO3 - Explain the usage of Memory Organization.
CO4 - Describe about the I/O devices and organization.
CO5 - Explain the interconnection structures and interprocessor communication
CO6 - Describe the characteristics and synchronization of multiprocessors.

TEXT / REFERENCE BOOKS

1. M.Morris Mano, ¯Computer system Architecture‖, 3rd Edition, Prentice-Hall Publishers, 2017.
2. Mark Burrell, ¯Fundamentals of Computer Architecture‖, Mcmillan Higher Education, 2003.
3. John D. Carpinelli, ¯Computer Systems Organization and Architecture‖, Pearson Education, 2001.
4. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, ¯Computer Organization‖, 5th Edition, McGraw - Hill, 2002.
5. William Stallings, ¯Computer Organization and Architecture - Designing for Performance‖, 9th Edition, Prentice Hall, 2013.
6. John P Hayes, Computer Architecture Organization, McGraw Hill Edition 4, 2003.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

SISB4301	UNIVERSAL HUMAN VALUES	L	T	P	EL	Credits	Total Marks
		2	0	0	3	3	100

COURSE OBJECTIVES

- To develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence
- To understand (or developing clarity) the harmony in the human being, family, society and nature/existence
- To strengthen self-reflection, develop commitment and courage to act.

MODULE 1 COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration-what is it? - Its content and process; ‗Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

MODULE 2 UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF!

7. Understanding human being as a co-existence of the sentient ‗I' and the material ‗Body'
8. Understanding the needs of Self (‗I') and ‗Body' - happiness and physical facility
9. Understanding the Body as an instrument of ‗I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‗I' and harmony in ‗I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health.Practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

MODULE 3 UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN-HUMAN RELATIONSHIP

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
    Practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

MODULE 4 UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.
    Practice sessions to discuss human being as cause of imbalance in nature (film ¯Home‖ can be used), pollution, depletion of resources and role of technology etc.

MODULE 5 IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up.Practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Total: 28 Lectures And 14 Practice Sessions

COURSE OUTCOMES

On completion of the course, the student are expected

CO1 - To become more aware of themselves, and their surroundings (family, society, nature)

CO2 - They would become more responsible in life, and in handling problems with sustainable solutions, while keeping

CO3 - human relationships and human nature in mind

CO4 - To have better critical ability

CO5 - To become sensitive to their commitment towards what they have understood (human values, human relationship andhuman society)

CO6 - To apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction

TEXT / REFERENCE BOOKS

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. The Story of Stuff (Book).
5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
6. Small is Beautiful - E. F Schumacher.
7. Slow is Beautiful - Cecile Andrews
8. Economy of Permanence - J C Kumarappa
9. Bharat Mein Angreji Raj - PanditSunderlal
10. Rediscovering India - by Dharampal
11. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
12. India Wins Freedom - Maulana Abdul Kalam Azad
13. Vivekananda - Romain Rolland (English)
14. Gandhi - Romain Rolland (English)

ASSESSMENT

Assessment by faculty mentor	: 10 marks
Self-assessment	:10 marks
Assessment by peers	: 10 marks
Socially relevant project/Group Activities/Assignments	: 20 marks
Semester End Examination	: 50 marks

SCSB1303	THEORY OF COMPUTATION	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVES

- To introduce Automata Theory, Regular Languages, Context Free languages and recognizers for different languages.
- To design Turing Machines for various languages.
- To gain knowledge on undecidable problems.

UNIT 1 FINITE AUTOMATA AND REGULAR LANGUAGES 9 Hrs.

Finite automata and regular languages - Regular languages and regular expressions - Finite automata - Non-determinism and Kleene's theorem - Non-deterministic finite automata and NFA with null transition.

UNIT 2 CONTEXT-FREE LANGUAGES AND NORMAL FORMS 9 Hrs.

Context-free grammars - Definition - More examples - Union, concatenations, and *'s of CFLs - Derivation trees and ambiguity - Unambiguous CFG for algebraic expressions - Normal Forms - CNF - GNF.

UNIT 3 PUSH DOWN AUTOMATA 9 Hrs.

Pushdown automata - Introduction - Definition - Deterministic pushdown automata - PDA corresponding to a given context-free grammar - Context-free Grammar corresponding to PDA. Pumping Lemma for CFG.

UNIT 4 TURING MACHINES 9 Hrs.

Turing machines - Models of computation and the Turing thesis - Definition of TM and TM as language acceptor - Non-deterministic TM and Deterministic TM - Universal TM.

UNIT 5 RECURSIVE LANGUAGES AND UNDECIDABILITY 9 Hrs.

Recursively enumerable and recursive languages - Properties of Recursively enumerable and recursive languages - Enumerating a language.Introduction to Undecidability- Halting problem- Undecidability of Post correspondence problem (PCP)-Modified PCP -Rice Theorem.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Build solutions for acceptance, rejections problems using Finite State Machine.
CO2 - Perform operations on Context free Languages using context free grammars.
CO3 - Solve problems on Context Free Languages using Push Down Automata.
CO4 - Design a solution for given problems using Turing Machine.
CO5 - Distinguish Recursively Enumerable Languages and Recursive languages.
CO6 - Hypothesize solutions to unsolvable problems.

TEXT / REFERENCE BOOKS

1. John. C. Martin, Introduction to Languages and the Theory of Computation, , Tata McGraw-Hill, 4th Edition, 2010.
2. Hopcroft, Motwaniand Ullman, Introduction to Automata Theory, Languages and Computation, Pearson Publishers, Third Edition, 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

S13BLH21	DIGITAL LOGIC CIRCUITS	L	T	P	EL	Credits	Total Marks
		2	0	4	0	4	100

COURSE OBJECTIVES

- To design a binary logic circuit for an arithmetic expression.
- To understand the usage of registers and counters used in various digital circuits.
- To get an exposure about the electronics behind design of Basic digital logical elements.

UNIT 1 NUMBER SYSTEMS, LOGIC FUNCTIONS AND BOOLEAN ALGEBRA 12 Hrs.

Number systems - Number systems conversions - Binary arithmetic - Binary codes - Logic functions- Universal gate functions - Boolean algebra - Functionally complete operation sets, Reduction of switching equations using Boolean algebra, Realization of switching function, Experimental verification of Logic gates and Boolean function.

UNIT 2 DESIGN OF COMBINATIONAL LOGIC 12 Hrs.

Design procedure of Combinational Logic - Design of two level gate networks - Sum of Products (SOP) - Product of Sums(POS) - Canonical SOP - Canonical POS - Karnaugh Map - Simplifications of Boolean functions using Karnaugh Map and implementation using Logic function - Advantages and limitations of K-Map - Tabulation method - Simplifications of Boolean functions using Tabulation method.

UNIT 3 COMBINATIONAL CIRCUITS 12 Hrs.

Introduction to Combinational circuits - Half Adder, Full Adder - Half Subtractor, Full Subtractor- Parallel binary Adder, Parallel binary Subtractor - Carry look ahead Adder- BCD Adder- Decoders- Encoders - Priority Encoder- Multiplexers- MUX as universal combinational modules- Demultiplexers- Code convertors- Magnitude Comparator, Design and experimental verification of Adders, Substractors, Encoders, Decoders, Multiplexers, Demultiplexers and Code convertors

UNIT 4 SEQUENTIAL CIRCUITS 12 Hrs.

Introduction to Sequential circuits - Flip flops - SR, JK, D and T flip flops, Master Slave flip flop, Characteristic and excitation table - Realization of one flip flop with other flip flops - Regisrers - Shift registers - Counters - Synchronous and Asynchronous counters - Modulus counters - Ring Counter - Johnson Counter - State diagram, State table, State minimization - Hazards, Design and experimental verification of Flip flops, Sift registers and Counters.

UNIT 5 DIGITAL LOGIC FAMILIES, MEMORIES AND PROGRAMMABLE DEVICES 12 Hrs.

Classification and characteristics of logic family - Bipolar logic family - Saturated logic family - Non saturated family - Unipolar family - MOS, CMOS logic families. Classification and Organization of memories - Programmable Logic Devices - Programmable Logic Array(PLA) - Programmable Array Logic (PAL) - Field Programmable Gate Arrays (FPGA)

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Classify various types of Digital Number systems and Boolean algebra.
CO2 - Illustrate Combinational logic.
CO3 - Design and implement the digital circuit using combinational logic
CO4 - Design and implement the digital circuit using sequential logic.
CO5 - Illustrate the digital logic families
CO6 - Solve the arithmetic expressions using memories and programable logic devices and implement memory units with Programmable logic devices.

TEXT / REFERENCE BOOKS

1. Morris Mano, ¯Digital design‖, 3rd Edition, Prentice Hall of India, 2008.
2. Milos Ercegovac, Jomas Lang, ¯Introduction to Digital Systems‖, Wiley publications, 1998.
3. John M. Yarbrough, ¯Digital logic: Applications and Design‖, Thomas - Vikas Publishing House, 2002.
4. R.P.Jain, ¯Modern digital Electronics‖,3rd Edition, TMH, 2003.
5. William H. Gothmann, ¯Digital Electronics‖, Prentice Hall, 2001.

S12BLH31	PROGRAMMING IN JAVA	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To introduce object oriented concepts, Packages, Interfaces and Multithreading in Java.
- To understand Input and Output Operations, GUI Programming and Database Connectivity.
- To impart knowledge on the concepts of Server Side Programs.

UNIT 1 JAVA BASICS 12 Hrs.

Features of Java Language - JVM - Byte code -Data Types-Java Tokens-Access Modifiers-Operators-Arrays one dimensional and multi-dimensional - Control Structures- String Handling - String class - String buffer class

Practical:Implementation of Matrix Operations using Arrays,String Operations,Looping Control Statements,Conditional Control Statements.

UNIT 2 OBJECT ORIENTED PROGRAMMING 12 Hrs.

Object Oriented Concepts-Classes and Objects -Constructors -. Method Overloading-Inheritance - Types - Using Super - Method Overriding - Abstract Classes - Using final with inheritance- Garbage Collection

Practical: Implementation of Constructors, Inheritance, Static and dynamic Polymoryphism, Abstract Class.

UNIT 3 PACKAGES, INTERFACES AND THREADS 12 Hrs.

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

Practical: Creating custom Packges, Interfaces. Handling predefined and User Defined Exceptions,Implementation Single and Multi Threading.

UNIT 4 FILE STREAMS AND COLLECTIONS FRAMEWORK 12 Hrs.

IO Package - Introduction - Input Stream and Output Stream classes - Data Output Stream and Data Input Stream classes -FileInput Stream - File Output Stream. - Reader and Writer Classes - File Reader and File Writer-Collections Framework-List, Set, Map.

Practical: Reading Contents From file and Writing Contents to File, Implementation of Collectoions Framesworks.

UNIT 5 GUI PROGRAMMING, DATA BASE CONNECTIVITY, SERVER SIDE PROGRAMMING 12 Hrs.

GUI Programming using Java FX-Explore Events-Accessing Database using JDBC- Introduction to servlet - Servlet life cycle - Developing and Deploying Servlets - JSP TAGS-Expressions-Applications using Servelt and JSP.

Practical: Creation of Graphicl user Interface for different Applications.Cretion of Server side Programs using Servlet and JSP.

Max.60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Develop applications using java object oriented concepts.
CO2 - Create User defined Packages and Interfaces.
CO3 - Bui;d Software using the concepts of Files and Collection Framework
CO4 - Design GUI using Java FX.
CO5 - Implement Java Applications web using Data base Connectivity
CO6 - Design Web Applications using Servlet and JSP

TEXT / REFERENCE BOOKS

1. Herbert Schildt ,‖The Complete Reference JAVA2‖, Fifth Edition, Tata Mcgraw Hill, 2017.
2. Bruce Eckel , ‖Thinking in Java‖, Pearson Education, Fourth Edition 2006.
3. Core Java Volume-I Fundamentals, 9th Edition, Cay Horstman and Grazy Cornell, Prentice Hall, 2013.
4. Y. Daniel Liang, Introduction to Java programming-comprehensive version,Tenth Edition, Pearson ltd, 2015.
5. https://docs.oracle.com/javase/tutorial/.
6. https://www.tutorialspoint.com/java/.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

S12BLH32	SOFTWARE ENGINEERING DESIGN	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To understand fundamental concepts of requirements engineering and Analysis Modelling.
- To understand the major considerations for enterprise integration and deployment.
- To learn various testing and maintenance measures.

UNIT 1 SOFTWARE LIFE CYCLE MODELS 12 Hrs.

Process: Definition, Benefits of well defined process- Generic phases- Verify and validate -Software life cycle models: Waterfall model- Prototyping model- RAD model-Spiral model- Agile methodologies.
Practical: Prepare problem statement for Course Registration System- Online Examination System and Payroll Management System.

UNIT 2 REQUIREMENTS ENGINEERING 12 Hrs.

Understanding requirements: Functional and Non-Functional, Other classifications -Modelling requirements: Data Flow Diagram, Entity Relation Diagram, Data Dictionary, State Transition Diagram - Software Requirements Document - Requirement Engineering Process: Feasibility studies, Requirements elicitation and analysis- Requirements validation,-Requirements management.
Practical: Prepare problem statement and SRS document for ATM System and Passport Automation System.

UNIT 3 SOFTWARE DESIGNS 12 Hrs.

Design process and concepts - Popular design methods: Modular Decomposition, Event oriented, Object-oriented design - Transition from Analysis to Design -Architectural Design: Pipes & filters, Call and return systems, Object-oriented systems, Layered Systems, Data Centered systems - Structured Design: principles- strategies for converting DFD into Structure chart - How to measure the goodness of the design: coupling- cohesion-types.
Practical: Prepare problem statement- SRS document and UML diagrams for Hotel Management System and Hospital Management System.

UNIT 4 TESTING 12 Hrs.

Software testing fundamentals - Testing approaches - Black Box Testing: Equivalence partitioning, Boundary Value Analysis - White box testing: basis path testing - Test coverage criteria based on Data flow mechanisms - Regression Testing - Levels of Testing: Unit Testing-Integration Testing- System Testing- Acceptance Testing.
Practical: Prepare problem statement- SRS document and UML diagrams for Library Management System and Foreign Trading System.

UNIT 5 UMBRELLA ACTIVITIES &PROJECT MANAGEMENT AND ESTIMATION 12 Hrs.

Risk Management - Identification- Projection- RMMM - Software Configuration Management: Definitions and terminology-processes and activities- Configuration audit -Software Quality Assurance: Quality Definition, Quality of Conformance- Cost and benefits of quality- Quality control and Quality assurance.Software cost estimation - COCOMO model - Software maintenance - SCM - Need for SCM -Version control - Introduction to SCM process Software reengineering -Reverse engineering - Restructuring - Forward engineering.
Practical: Prepare problem statement, SRS document and UML diagrams for Recruitment System and e-Ticketing.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify the key phases in process models.
CO2 - Compare different process models.
CO3 - Apply the concepts of requirements engineering and Analysis modelling.
CO4 - Apply systematic procedure for software design and deployment.
CO5 - Compare and contrast various testing and maintenance.
CO6 - Design and implement the applications using software-oriented life cycle models.

TEXT / REFERENCE BOOKS

1. Roger S. Pressman, Software Engineering - A practitioner's Approach, Seventh Edition, McGraw-Hill International Edition, 2010.
2. Ian Sommerville, Software Engineering, 9th Edition, Pearson Education Asia, 2011.
3. Rajib Mall, Fundamentals of Software Engineering, Third Edition, PHI Learning PrivateLimited, 2009
4. Kelkar S.A., ¯Software Engineering‖, Prentice Hall of India Pvt Ltd, 2007
5. Pankaj Jalote, Software Engineering, A Precise Approach, Wiley India, 2010.
6. Ghezzi, Fundamentals of Software Engineering, Second Edition, Pearson Education India, 2015.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

SMTB1402	PROBABILITY AND STATISTICS	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVES

- The Objective of this Course is to identify, reflect upon, evaluate and achieve conceptual understanding and knowledge of traditional Calculus to form independent judgements.
- The purpose of this course is for modeling the Engineering problems and obtaining its solutions mathematically.
- This helps in understanding Science, Engineering and Computer Science analytically and logical thinking is attained.

UNIT 1 BASIC CONCEPTS OF PROBABILITY 9 Hrs.

Probability Space - Events - Axiomatic approach to Probability - Conditional Probability - Independent Events - Baye's Theorem.-Random Variables-Functions of Random Variables and their Probability Distribution.

UNIT 2 PROBABILITY DISTRIBUTION 9 Hrs.

Discrete Distributions: Binomial, Poisson and Geometric - Continuous Distributions: Uniform, Exponential and Normal - Applications only (no derivation).

UNIT 3 TWO DIMENSIONAL RANDOM VARIABLES 9 Hrs.

Joint Probability distributions- Marginal and Conditional Distributions-Transformation of Random Variables.

UNIT 4 CORRELATION AND REGRESSION 9 Hrs.

Correlation-Linear regression-Ranks-Spearman rank Correlation - Repeated Ranks- Multiple and Partial Correlation-Curve Fitting-Method of Least Squares- Fitting of the Curve of the form $y = a+bx$, $y = a+bx+cx^2$, $z = ax+by+c$.

UNIT 5 ANALYSIS OF VARIANCE AND STATISTICAL QUALITY CONTROL 9 Hrs.

Review of F-test- Design of experiments: Completely Randomized Design, Randomized Block Design and Latin Square Design-Statistical Quality Control: Mean, Range, p, np, c-charts.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand probability concepts and Baye's theorem problems. Explain functions of random variables and theirprobability distributions.
CO2 - Analyze discrete and continuous probability distributions.
CO3 - Estimate the distributions and transformations of two dimensional random variables
CO4 - Distinguish correlation and regression. Construct curve fitting by the method of leastsquares.
CO5 - Evaluate problems on design of experiments using analysis of variances.
CO6 - Sketch the control charts and point out the results based on the charts.

TEXT / REFERENCE BOOKS

1. Hong R.V, Tanis E.A and Zimmerman D L, Probability and Statistical Inference, Pearson Education Limited, Nineth Edition, 2015.
2. Miller I.and Freund J.E, Probability and Statistics for Engineers, Pearson Publishers, Nineth Edition, 2017.
3. Gupta S C and Kapoor V K, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, Tenth Edition, 2002.
4. VeerarajanT., Probability, Statistics and Random Processes, Tata McGraw-Hill, New Delhi, Fourth Edition, 2014.
5. Sivaramakrishna Das P, VijayaKumari C., Probability and Random Processes, Pearson Education, Sixth Edition,2014.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

SCSB1401	OPERATING SYSTEMS AND UNIX	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To have an overview of different types of operating systems and process management.
- To understand the concepts of storage management, I/O and file systems.
- To learn the basics of Unix Programming

UNIT 1 INTRODUCTION 8 Hrs.

Introduction - Operating system structures - System components - OS services - System calls - System structure - Resources Processes - Threads - Objects - Device management - Different approaches - Buffering device drivers

UNIT2 PROCESS MANAGEMENT 9 Hrs.

Processes - Process concepts - Process scheduling - Operations on processes - Cooperating processes - CPU scheduling - Basic concepts - Scheduling criteria - Scheduling algorithms - Preemptive strategies - Non-preemptive strategies.

UNIT3 SYNCHRONIZATION AND DEADLOCKS 9 Hrs.

The critical section problem - Semaphores - Classic problems of synchronization - Critical regions - Monitors-Dead locks - Deadlock characterization - Prevention - Avoidance - Detection - Recovery.

UNIT4 MEMORY MANAGEMENT AND I/O MANAGEMENT 10 Hrs.

Storage Management Strategies - Contiguous Vs. Non-Contiguous Storage Allocation - Fixed and Variable Partition Multiprogramming - Paging - Segmentation - Paging/Segmentation Systems - Page Replacement Strategies - Demand & Anticipatory Paging, File Management: Access Methods - Directory Structure, Allocation Methods, Disk Management: Disk Structure- Disk Scheduling.

UNIT 5 UNIX 9 Hrs.

Unix Components, Internal and External commands, File and directory related commands, File permission and manipulation, Standard I/O, configuring vi environment, Regular expression, Process related commands, Shell programming-Branching control structures- if, case etc., Loop control structures- while, until, for, etc., Jumping control structures - break, continue, exit, etc., Integer and Real arithmetic in shell programs

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the 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 in process management.
CO3 - Analyse synchronization and deadlocks in real computing problems.
CO4 - Demonstrate the different memory and I/O management techniques used in Operating Systems.
CO5 - Have practical exposure in disk scheduling
CO6 - Ability to write shell scripts in vi environment

TEXT / REFERENCE BOOKS

1. Abraham Silberschatz, Peter Galvin and Gagne, ¯Operating System Concepts‖, 10th Edition, Addison Wesley, 2018.
2. Harvey M.Deitel, ‖Operating System‖, 3rd Edition, Addison Wesley, 2004
3. Gary Nutt, ‖Operating System, A modern perspective‖, 3rd Edition, Addison Wesley, 2004.
4. Andrew S. Tanenbaum, ¯Modern Operating Systems‖.4th edition 2015.
   Art of UNIX Programming, The 1st Edition, by Eric S. Raymond,2003.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**

. **PART B :** 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

S11BLH41	DATABASE MANAGEMENT SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To understand the concept of DBMS and ER Modelling.
- To familiarize with normalization, Query optimization and relational algebra.
- To apply concurrency control, recovery, security and indexing for the real time data.

UNIT 1 DATABASE SYSTEMS CONCEPTS AND ARCHITECTURE 12 Hrs.

History and motivation for database systems - characteristics of database approach - Actors on the scene - Workers behind the scene - Advantages of using DBMS approach - Data Models, Schema, and Instances - Three-Schema Architecture and Data Independence - The Database System Environment - Centralized and Client/Server Architectures for DBMS - Classification of DBMS.

Practical: Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.

UNIT 2 DATA MODELING 12 Hrs.

Entity Relationship Model: Types of Attributes, Relationship, Structural Constraints - Relational Model, Relational model Constraints - Mapping ER model to a relational schema - Integrity Constraints

Practical: Create a set of tables, add foreign key constraints and incorporate referential integrity.

UNIT 3 SCHEMA REFINEMENT 12 Hrs.

Guidelines for Relational Schema - Functional dependency - Normalization, Boyce Codd Normal Form, Multi-valued dependency and Fourth Normal form - Join dependency and Fifth Normal form.

Practical: Query the database tables using different ‗where' clause conditions and also implement aggregate functions. Query the database tables and explore sub queries and simple join operations.

UNIT 4 QUERY PROCESSING AND TRANSACTION PROCESSING 12 Hrs.

SQL fundamentals -Translating SQL Queries into Relational Algebra - heuristic query optimization - Introduction to Transaction Processing - Transaction and System concepts - Desirable properties of Transactions - Characterizing schedules based on recoverability - Characterizing schedules based on serializability

Practical: Execute complex transactions and realize DCL and TCL commands.

UNIT 5 CONCURRENCY CONTROL, RECOVERY TECHNIQUES AND NOSQL DBMS 12 Hrs.

Two-Phase Locking Techniques for Concurrency Control - Concurrency Control based on timestamp - Recovery Concepts - Recovery based on deferred update - Recovery techniques based on immediate update -Shadow Paging - Introduction, Need of NoSQL - different NoSQL data models: Key-value stores - Column families - Document databases - Graph databases.

Practical: Create Document, column and graph-based data using NOSQL database tools.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Demonstrate the basic concept and role of DBMS in an organization.
CO2 - Illustrate the design principles for database design, ER model.
CO3 - Discuss normalization techniques with simple examples.
CO4 - Demonstrate the basics of query evaluation and heuristic query optimization techniques.
CO5 - Apply Concurrency control and recovery mechanisms for the desirable database problem.
CO6 - Design and implement the database system with the fundamental concepts of DBMS.

TEXT / REFERENCE BOOKS

1. Silberschatz, A., Korth, H. F., and Sudarshan, S. Database System Concepts, McGraw-Hill, 7th Edition. 2019.
2. Elmasri, R., & Navathe, S. B. Fundamentals of database systems, 4th Edition, Addison Wesley Publishing Edition, 2017.
3. Majumdar, A. K., and Bhattacharyya, P. Database Management Systems. McGraw-Hill, 2017.
4. Pramod J. Sadalage and Marin Fowler, NoSQL Distilled: A brief guide to merging world of Polyglot persistence, Addison Wesley, 2012.
5. Shashank Tiwari, Professional NoSql,Wiley ,2011

SCSB2401	OPERATING SYSTEMS LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

SUGGESTED LIST OF EXPERIMENTS

1. Working with Shell in Ubuntu/ Fedora.
2. Working with Text Files in Ubuntu

a. Editing Files with Vim and Vi

b. Starting With Vi

3. Managing Running Processes: Monitoring Process Activity

a. Fedora OS Installation on Virtual Machine.

b. Post-Installation Configuration on Fedora OS.

c. Configuring Basic Tools in Fedora OS.

4. Implementation of Process Scheduling mechanism - Priority Scheduling, Round Robin Scheduling, FCFS, SJF.
5. Producer Consumer Problem using Semaphores.
6. Inter-Process Communication using Shared Memory.
7. Bankers Algorithm for Deadlock Avoidance.
8. Memory Allocation Methods for Fixed Partition: First Fit, Worst Fit and Best Fit allocation.
9. Simulate Paging Technique of Memory Management.
10. Page Replacement Algorithms: FIFO, LRU, LFU.
11. File Organization Technique: Single Level Directory, Two Level Directory Organization.
12. Simulate File Allocation Strategies: Sequential, Linked and Indexed.
13. Reader - Writer Problem.
14. Diner's Philosopher Problem.
15. Threading & Synchronization Applications.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Learn the basic services and functionalities of the operating system using System Calls in Linux.

CO2 - Model CPU Scheduling such as FCFS, SJF, Priority and Round Robin.

CO3 - Describe and solve Synchronization Problems.

CO4 - Simulate Memory Management Techniques.

CO5 - Perform Paging Techniques and Page Replacement Algorithms.

CO6 - Design and Solve Synchronization Problems.

SCSBDPROJ	DESIGN THINKING AND INNOVATIONS	L	T	P	EL	Credits	Total Marks
		1	0	2	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

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 successful 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
Review 1	1	30	CAE
Internal Guide	2	10	CAE
IPR Process and Registration	5	10	ESE
Total – Internal		**50**	
Final Review	3	30	ESE
Report Submission	4	20	ESE
Total –External		**50**	

Note: The design thinking guidelines is suggestive and the procedures can customize the rubrics based on their domain requirements

SCSB1501	DATA COMMUNICATION AND COMPUTER NETWORKS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Classify different network architectures, transmission methods and switching techniques.
- Evaluate network errors, examine methods to detect and remove them.
- Articulate the functioning behind the data transfer through different transmission mode in a network.

UNIT 1 INTRODUCTION 9 Hrs.

Data communication process - Components of communication media - Modes of Communication - IEEE protocol and Standards - Network Classifications - Rudiments of Networks topologies - Client Server and Peer to Peer Network Architecture

UNIT 2 TRANSMISSION MEDIA AND SWITCHING 9 Hrs.

Communication Media - Guided transmission, Unguided and Line of Sight (LOS) - Network Connecting Devices - Multiplexing Techniques - Switching Techniques - Packet Switching Techniques - Analog and digital signals - Encoding and modulation - Parallel and serial transmission

UNIT 3 ERROR DETECTION, CORRECTION AND COMMUNICATION 9 Hrs.

Types of Network Errors - Error Detection - Error Correction Methods - Flow control - Error control - IEEE 802.3 - IEEE 802.5 - IEEE 802.11 - IEEE 802.15.1 (Piconet and Scatternet)

UNIT 4 ISDN AND ATM 9 Hrs.

Access to ISDN - ISDN layers - Broadband ISDN - Packet layer protocol - ATM - ATM architecture - ATM layers - Congestion control - Leaky bucket algorithm.

UNIT 5 REFERENCE MODELS AND PROTOCOLS 9 Hrs.

OSI Reference models - Routing algorithms - TCP/IP Layered Architecture - Transport and application layers of TCP/IP - Network Protocols - DHCP - NAT - DNS - SMTP - HTTP - WWW.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Infer and interpret the foundations of communication, network and transmission along with its devices, types, topologies & protocols.

CO2 - Compare and construct different network architectures, transmission methods and switching techniques.

CO3 - Classify various types of network errors, examine methods to detect them and evaluate various correction algorithms to remove it.

CO4 - Apprehend and perceive the working of advanced switching network, its protocol and architecture.

CO5 - Deduce and master the functioning behind the data transfer through different transmission mode in a network.

CO6 - Categorize the classification of layers built in a network and discern the data flow between the layers through diverse range of algorithm.

TEXT / REFERENCE BOOKS

1. Behrouz and Forouzan, ¯Data Communications and Networking‖, 6th Edition, 2022.
2. Andrew.S.Tenenbaum, Nick Feamster, David Wetherall, ‖Computer Networks‖ , 6th Edition, Pearson, 2021
3. WilliamStallings,‖ Data and Computer Communication ¯, 6th Edition, Pearson Education, 2000

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

SCSB1502	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVES

- To analyse the performance of algorithms under various scenarios.
- To learn mathematical background for algorithm analysis & solving the recurrence equations.
- To understand and apply the design strategies to real world problems.

UNIT 1 INTRODUCTION 9 Hrs.

Fundamentals of Algorithmic Problem Solving - Time Complexity - Space complexity with examples - Growth of Functions - Asymptotic Notations and its properties - Complexity Analysis Examples - Performance measurement - Instance Size, Test Data, Experimental setup.

UNIT 2 MATHEMATICAL FOUNDATION 9 Hrs.

Solving Recurrence Equations - Substitution Method - Recursion Tree Method - Master Method - Sorting in Linear Time - Lower bounds for Sorting: - Counting Sort - Radix Sort - Bucket Sort.

UNIT 3 BRUTE FORCE AND DIVIDE-AND-CONQUER 9 Hrs.

Brute Force: Travelling Salesman Problem - Knapsack Problem - Assignment Problem - Closest Pair and Convex Hull Problems - Divide and Conquer Approach: Binary Search - Quick Sort - Merge Sort - Strassen's Matrix Multiplication.

UNIT 4 GREEDY APPROACH AND DYNAMIC PROGRAMMING 9 Hrs.

Greedy Approach: Optimal Merge Patterns- Huffman Code - Job Sequencing problem- Tree Vertex Splitting, Dynamic Programming: - Dice Throw- Optimal Binary Search Algorithms.

UNIT 5 BACKTRACKING AND BRANCH AND BOUND 9 Hrs.

Backtracking: 8 Queens - Hamiltonian Circuit Problem - Branch and Bound - Assignment Problem - Knapsack Problem: Travelling Salesman Problem - NP Complete Problems - Clique Problem - Vertex Cover Problem.

Max:45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analyze the efficiency of an algorithm based on time and space complexity.
CO2 - Apply mathematical principles for recursive analysis.
CO3 - Construct algorithms based on brute force and divide and conquer techniques and its real time applications.
CO4 - Design Solutions using dynamic and greedy approaches for real world problems.
CO5 - Design a solution by using Branch and Bound and backtracking techniques
CO6 - Develop a solution for any given problem by choosing appropriate algorithm.

TEXT / REFERENCE BOOKS

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, ¯Introduction to Algorithms‖, 4th Edition, MIT Press, 2022.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ¯Data Structures and Algorithms David E. Goldberg, ¯Genetic Algorithm In Search Optimization And Machine Learning‖ Pearson Education India, 2013.
3. Anany Levitin, ¯Introduction to the Design and Analysis of Algorithms‖, 3rd Edition, Pearson Education, 2012.
4. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, ¯Fundamentals of Computer Algorithms‖, 2nd Edition, Universities Press, 2007.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

S12BLH51	CUSTOMER INTERFACE DESIGN AND DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSEOBJECTIVES

- To develop static websites and dynamic web applications and learn new emerging web technologies.
- To gain knowledge and skills required for web development careers.
- To develop skills and application of specific methods in UI design

UNIT 1 HTML,XML,CSS 12Hrs.

Introduction To HTML-Form Handling - Form Validation - Frames -Table - DHTML -Introduction To CSS-Syntax,Selectors-Types of style sheets. XML-Structuring XMLdocument using DTD-Schemas-XMLparsers-DOM-SAXpresentation technologies - XSL - XSLT.

Practical: Design a webpage using HTML, include tables, frames, forms by adding styles with CSS.

UNIT 2 CLIENT-SIDE SCRIPTING 12Hrs.

JavaScript-Advantages-Data types-Variables-Operators-Control statements-Functions-Objects and arrays - Windows and frames-Forms.AJAX-XMLHttpRequest(XHR)-CreateObject-Request-Response-Readystate.

Practical: Write JavaScript code to perform form validation. Implement AJAX technology to create asynchronous web application.

UNIT 3 SERVER-SIDE SCRIPTING 12Hrs.

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.

Practical: Perform form handling and form validation using PHP. Create PHP database application using MySQL

UNIT 4 ANGULAR JS AND JQUERY 12Hrs.

Angular JS Expression-Modules-Directives-Data Binding-Controllers-Scopes-Filters-Services-Tables-Events-Form-Validation.QuerySyntax-Selects-Events-jQuery Effects-jQuery-jQueryHTML-jQueryTraversing.

Practical: Implement Angular JS directives, Angular JS Expressions and JQuery events and effects.

UNIT 5 REACT JS 12Hrs.

React Introduction - Installation - React Render HTML - React JSX - Class - Props - Events - Lists - Forms - Styling React Using CSS - Styling React Using Sass - NPM Basics - Nested Components and Tools - React Hooks.

Practical: Build an application and Style React JS using CSS

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, 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 - Develop web applications using server-side scripting language.
CO4 - Implement new technologies such as Angular JS and JQuery.
CO5 - Build an interactive UI and web application with React framework.
CO6 - Styling React JS using CSS.

TEXT / REFERENCE BOOKS

1. Jennifer Niederst Robbins, ¯Learning Web Design: A Beginner‘s Guide to HTML, CSS, JavaScript, and Web Graphics‖, 2018.
2. Ken Williamson, ¯Learning AngularJS: A Guide to AngularJS Development‖, O‘Reilly, 2015.
3. Jon Duckett, ¯JavaScript and JQuery: Interactive Front-End Web Development‖, John Wiley and Sons Inc., 2014.
4. Nate Murray, Felipe Coury, Ari Lerner, Carlos Taborda, ¯The Ng-book – The Complete Book on Angular‖, 2022.
5. Greg Sidelnikov, ¯React.js Book: Learning React JavaScript Library From Scratch‖, 2017.

S11BPB51	AUGUMENTED AND VIRTUAL REALITY	L	T	P	EL	Credits	Total Marks
		2	0	0	3	3	100

COURSE OBJECTIVES

- Recognize the core principles of Virtual Reality, such as presence and immersion.
- Examine the usability of AR/VR applications and their utilization of AR/VR features.
- Using the UNITY platform for business, design and prototype effective AR/VR apps.

UNIT 1 INTRODUCTION TO AUGMENTED REALITY AND VIRTUAL REALITY 9 Hrs.

A Brief History of Augmented Reality - Displays - Definition and Scope (Multimodal Displays, Spatial Display Model, and Visual Displays) - AR: Strong vs. Weak - AR Applications - AR Challenges. Scope and Definition - Types of VR - VR Characteristics - Basic VR Environments - VR Environment Limitations - Virtual Reality Hardware Requirements: Immersion vs. Presence.

UNIT 2 INTERACTION FOR AR/VR ENVIRONMENTS DESIGN 9 Hrs.

Identifying user needs is the first step in the interaction design process. - AR/VR design and analysis - Typical AR/VR Graphical Metaphors - Affordances in AR/VR - Human Data Processing - Design for Perception and cognition - User experience(UX) guidelines for AR/VR - UX obstacles for AR/VR - AR/VR prototypes - AR/VR prototype evaluation.

UNIT 3 INTRODUCTION TO UNITY 9 Hrs.

Overview of Unity: Windows, Interface, Navigation, Terminology, Game Objects, Hierarchy, Parenting Objects - Asset Store, Importing Plug-ins - Terrain Creation, Materials, Colors, and Transparency - Introduction to Monobehaviors: Awake, Start, and Update

UNIT 4 INTRODUCTION TO VUFORIA AND PHYSICS IN UNITY 9 Hrs.

Overview of Vuforia: Interface, Navigation, Terminology, Image Targeting, Custom Images - Introductory to Scripting: Definitions, Creating Objects, Accessing Components, Debugging, Lists, Loops - Overview of Physics in Unity.

UNIT 5 EXPANDING ON SCRIPTING AND INTERACTIONS 9 Hrs.

Creating Trigger Events - Manipulating Components in Scripts - Programming Interactions between Objects and Tracked Images - Designing a simple User Interface in AR - Navigating World Space for Objects and User - Introduction to colliders and their use: OnCollisionEnter, OnCollisionExit,OnCollisionStay, OnTrigger vs OnCollision - Rigidbodies and how Colliders report to them - Case Study to building a real time application using AR and VR.

Case Study

- Implement the AR for Tutor and VR for Class Room Project using Unity Software.
- Develop a VR app to virtually view the hardware lab components.
- Illustrate the Remote Desktop to control to your computer in VR.
- Develop a layout of machine shop floor in VR.
- Develop a Virtual Park for experiencing the look of environment with the help of Mixamo Animated Assets with audio.
- Design an environment for playing football and volley ball in VR.
- Develop an AR worm gear for crankshaft image video.
- Develop a layout of Computer Lab in VR environment.
- Develop satellite AR for study purpose, for launch, take off.
- Build a Planetarium set up in VR environment.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe the principles and features of VR and AR.
CO2 - Infer the design of AR and VR software.
CO3 - Design the multi model user interface using UNITY.
CO4 - Understand the Vuforia and Scripting Physics.
CO5 - Design user interfaces in AR.
CO6 - Create real time application using AR and VR.

TEXT / REFERENCE BOOKS

1. Sherman, William R. and Alan B. Craig. Understanding Virtual Reality - Interface, Application, and Design, Morgan Kaufmann, 2018.
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, 2nd Edition. Wiley-IEEE Press, 2003/2006.
5. Schmalstieg, D., & Hollerer, T. (2016). Augmented reality: principles and practice. Addison-Wesley Professional

SCSB2501	COMPUTER NETWORKS LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

LIST OF EXPERIMENTS

1. NETWORK DESIGN AND DEVICES

a. To find Network IP address of a machine, Time and Date server.
b. Working with complex network topologies
c. To monitor network traffic using Wire Shark

Case Study

d. Study of different types of Network Cables , Implement cross-wired and straight cable using clamp protocol.
e. Study of Network Devices in detail

2. NETWORKING PROTOCOL AND LAN

a. Connect the computers in LAN
b. Construction of VPN Network
c. Construction of Ethernet connection
d. To verify and configure VLAN and VLAN trunk in packet tracer

Case Study

To get the MAC or Physical Address of the system Using Address Resolution Protocol

3. NETWORK SIMULATOR TOOL

a. Configure a network topology using packet tracer software.
b. To configure simple static routing.
c. To implement Security on interconnecting devices.
d. To configure network state routing protocol

Case Study

e. Study of Network Simulator (NS) and simulation of Congestion Control algorithms using NS

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analyze the performance of network protocols in different layers.
CO2 - Implement Ethernet connection.
CO3 - Design with simulation tools.
CO4 - Analyze various LAN networks.
CO5 - Construct VPN network model.
CO6 - Understand congestion control algorithms

SCSB1601	COMPILER DESIGN	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVES

- To understand, design and implement lexical analyser and parser.
- To understand, design code generation schemes, optimization of codes and runtime environment.
- To design and develop a compiler.

UNIT 1 INTRODUCTION TO COMPILERS AND LEXCIAL ANALYSIS 9 Hrs.

Introduction to programming language translators-Structure of a Compiler-Role of Lexical Analyzer-Patterns-Lexemes-Tokens-Attributes-Specification of Tokens-Regular Expression- Regular expression to Deterministic Finite Automata-Minimized DFA- Study on LEX tool.

UNIT 2 SYNTAX ANALYSIS 9 Hrs.

Role of Parser- Context Free Grammar-Derivations and Parse Tree - Elimination of Ambiguity - Top Down Parsing - Predictive Parsing - LL(1) Grammars- Bottom Up Parsing - Shift Reduce Parsers-Operator Precedence Parsing -Types of LR Parsers SLR Parser-Error handling and Recovery in Syntax Analyzer-Study on YACC tool.

UNIT 3 SEMANTICS ANALYSIS AND INTERMEDIATE CODE GENERATION 9 Hrs.

Types of Intermediate Code - Representation of three address code - Syntax Directed Translation scheme- Intermediate code generation for Assignment statements, Boolean statements, Switch-case statement, Procedure call - Symbol Table Generation.

UNIT 4 CODE OPTIMIZATION 9 Hrs.

Principal Sources of Optimization - Loop optimizations- Basic Blocks - Optimization of Basic Blocks - The DAG Representation of Basic Blocks -Loops in Flow Graphs-Dominators-Global Data Flow Analysis.

UNIT 5 CODE GENERATION 9 Hrs.

Issues in the design of a code generator-Target Machine- Next-Use Information - Register Allocation and Assignment- Peephole Optimization- Runtime Storage Management-Activation Records-Recent Trends in Compiler Design.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Demonstrate the functioning of a Compiler and to grasp of concepts such as higher level programming, automata theory, and formal languages.
CO2 - Develop language specifications using context free grammars.
CO3 - Infer the syntactic and semantic structure in compiler design.
CO4 - Construct symbol tables and generating intermediate code
CO5 - Apply code optimization techniques to generate optimized code
CO6 - Apply the skills on devising, selecting and using tools and techniques towards compiler Design

TEXT / REFERENCE BOOKS

1. V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, ¯Compilers: Principles, techniques, & tools‖, Pearson Education, 2015.
2. K. D. Cooper and L. Torczon, ¯Engineering a Compiler‖, Morgan Kaufmann, 2nd edition, 2011.
3. V. Raghavan, ¯Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.
4. Steven S. Muchnick, ¯Advanced Compiler Design and Implementation,¯Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
5. Mogensen, Torben Ægidius., ¯Introduction to Compiler Design‖., Springer International Publishing, 2017.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

SITB1601	MOBILE APPLICATION DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	3	3	100

COURSE OBJECTIVES

- To develop applications for current and emerging mobile computing devices, performing tasks at all stages of the software development life-cycle.
- To learn how to code graphics, animation, images and video in android.
- To design, implement and deploy mobile applications for iOS and windows OS.

UNIT 1 INTRODUCTION TO ANDROID 9 Hrs.

Introduction to mobile technologies, mobile operation systems - pros and cons, Introduction to Android, Features, Architecture, UI Widgets and Events handling, Layouts, Application structure, Android Manifest file, Creating Android applications.

UNIT 2 BUILDING BLOCKS AND DATABASE 9 Hrs.

Introduction to Activities and Intents - Understanding Activity life cycle, Linking Activities, Passing Data, Toast, Displaying a Dialog Window and Notifications, Content Provider, Services, Broadcast receiver ,Introduction to SQLite database, Event Handling, Deploying and publishing application

UNIT 3 LOCATION SERVICES AND ANIMATIO 9 Hrs.

Location Services and Maps and Google Maps. Graphics and Animation Working with Graphics, Using the Drawable Object, Using the Shape Drawable object, Hardware Acceleration, Audio, Video and Camera, Use Media Player, Recording and Playing sound, Using Camera, Recording Video.

UNIT 4 INTRODUCTION TO IOS 9 Hrs.

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

UNIT 5 WINDOWS MOBILE APP DEVELOPMENT 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the technologies and business trends impacting mobile applications.
CO2 - Understand and remember the components of android, iOS and Windows mobile applications.
CO3 - Learn the programming languages and techniques for developing mobile applications.
CO4 - Develop mobile applications with compelling user interface and database connectivity for real time applications for iOS.
CO5 - Deploy mobile applications with compelling user interface and database connectivity for real time applications for Windows OS.
CO6 - Develop and deploy mobile applications using Silverlight.

TEXT / REFERENCE BOOKS

1. Dawn Griffiths,Head First Android Development: A Brain-Friendly Guide, January 2017.
2. Barry Burd,Android Application Development All-in-One For Dummies,August 2015.
3. Christian Keur,iOS Programming: The Big Nerd Ranch Guide,April 2017.
4. Bill Phillips, Android Programming: The Big Nerd Ranch Guide, December 2019.
5. Ahmad Sahar, iOS 13 Programming for Beginners, January 2020.
6. Eloquent Droid, Android Development On Android Studio, 2016.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

SCSB1603	PARALLEL AND DISTRIBUTED COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Understand parallel programming model, analyse synchronization and deadlocks in real computing problems
- Design distributed shared memory in the modern operating system.
- Understand group communication in distributed computing.

UNIT 1 INTRODUCTION TO PARALLEL COMPUTING 9 Hrs.

Motivating Parallelism- Scope of Parallel Computing- Modifications to the von Neumann Model- Parallel Hardware: SIMD systems- MIMD systems-Interconnection networks- Cache coherence - Shared memory versus distributed memory. Parallel Software: Caveats- Coordinating the processes/threads Programming hybrid systems.

UNIT 2 ARCHITECTURES AND PROGRAMMING 9 Hrs.

Parallel architectures-Trends in architectures-CMPs-GPUs and Grids-Multiprocessors-Multicomputers- Multithreading-Pipelining-VLIWs-Superscaling-Vectors-SIMDs-paradigm of shared-memory-distributed memory interconnection networks-optical computing, Models of parallelism: PRAM -CTA. Performance and Floating Point Considerations-Parallel Programming and Computational Thinking- Introduction to OPENCL.

UNIT 3 COMMUNICATION IN DISTRIBUTED COMPUTING 9 Hrs.

Introduction - Goals of Distributed computing - Design issues - Transparency - flexibility - reliability-performance - scalability - Client - Server Model - Remote procedure call - Group Communication.

UNIT 4 SYNCHRONIZATION AND PROCESS IN DISTRIBUTED SYSTEMS 9 Hrs.

Synchronization: Algorithms-Deadlocks-Threads-System Models-Workstation-model-Processor Pool Model-Hybrid Model-Scheduling in Distributed systems.

UNIT 5 DISTRIBUTED FILE SYSTEMS AND SHARED MEMORY 9 Hrs.

Distributed File System Design - Distributed File System Implementation -storage systems-performance studies, Introduction to Shared Memory - Consistency Models-Shared Variable Distributed Shared Memory - Case Study - MACH.

Max.45 Hrs.

COURSE OUTCOMES

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

CO1 - Recognize various parallel computing and parallel system's architecture.
CO2 - Describe the parallel programming model.
CO3 - Understand the group communication and distribution of the control towards the operating system.
CO4 - Apply the concepts of synchronization and deadlocks in real computing problems.
CO5 - Create, design and construct the distributed shared memory in the modern operating system.
CO6 - Understand and implement a MACH.

TEXT / REFERENCE BOOKS

1. Ananth Grama and George Karypis, ¯Introduction to parallel computing‖, Addison-Wesley 2009.
2. Peter S. Pacheco, ¯An Introduction to Parallel Programming‖, Morgan Kaufmann, 2011.
3. AnanthGramaandGeorgeKarypis,¯Introductiontoparallelcomputing‖,Addison-Wesley2009.
4. DavidCullerandJaswinderPalSingh,¯ParallelComputerArchitecture‖,MorganKaufmann,1999,
5. Andrew S. Tanenbaum & Maarten van Steen, ¯Distributed Systems: Principles and Paradigms‖, Prentice Hall, 2017.
6. PradeepKSinha,‖DistributedOperatingSystems,Concepts&Design‖,PrenticeHallofIndia,2009

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A : 10 questions of 2 marks each -No choice **20 Marks**
PART B : 2 questions from each unit of internal choice; each carrying16 marks **80 Marks**

S11BLH61	MACHINE LEARNING	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To emphasize on the logical, knowledge-based approach.
- To acquire knowledge in hyper parameter tuning which can be applied for projects and solving practical problems.
- To gain experience of doing independent study and research.

UNIT 1 INTRODUCTION TO MACHINE LEARNING 12 Hrs.

Machine Learning-Applications - Types of Machine Learning - Training, Testing, - Machine Learning process - Variance - Bias - Training Error - Testing Error - Overfitting - Underfitting - Gradient Descent - Accuracy - Precision - Recall - Confusion Matrix

Practical: Split the given dataset into 80 percentage training data and 20 percentage test data. Illustrate confusion matrix using IRIS dataset.

UNIT 2 DATA PREPROCESSING 12 Hrs.

Why Data Pre Processing - Steps of Pre Processing - Data Cleaning - Missing values, Noisy Data, Removing outliers - Data Integration - Data Transformation - Generalization, Normalization Min-max normalization, Z-Score normalization, Decimal scaling normalization, Decimal scaling normalization, Attribute Selection, Label Encoding - One Hot Encoding- Data Reduction - Dimensionality Reduction – PCA.

Practical: Apply a scaling technique for a given data set after dealing with missing values
Take a valid dataset. Reduce dimensions using PCA.

UNIT 3 SUPERVISED LEARNING 12 Hrs.

Regression - Linear Models for Regression - Classification - Logistic Regression - Classification Models - KNN Classification - Naïve Bayes Classification - Decision Tree Classification - Support Vector Machine - Ensemble Learning - Random Forest

Practical: Predict heart disease by exploiting KNN Classification Algorithm
Apply SVM and Decision Tree for classification and check their accuracy level.

UNIT 4 UNSUPERVISED LEARNING 12 Hrs.

Clustering - k-means clustering - Supervised Learning after clustering - Hierarchical clustering -Iterative distance-based clustering - Dealing with continuous, categorical values in K-Means - Constructing a hierarchical cluster - K-Medoids, k-Mode and density-based clustering - Measures of quality of clustering

Practical: Cluster the given dataset using K means
Once clusters are formed, apply appropriate supervised learning Algorithm.

UNIT 5 NEURAL NETWORK AND LOCAL MODELS 12 Hrs.

Structure of a Brain - Artificial Neural Network - Perceptron - Activation Function - Sigmoid - Relu - Tanh - Multilayer Perceptron - Feed Forward Propagation - Back propagation - Training process in Neural Network - Loss function - Gradient Descent - Tuning the network size - Learning Rate. Competitive learning - Adaptive resonance theory - Self organizing map -Radial Basis functions - Bagging- Boosting - Reinforcement Learning - Hyper Parameter Tuning

Practical: Predict the appropriate class by using ANN
Perform various Hyper parameter tuning and check the accuracy.

Max.60 Hrs

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the underlying Terminologies and the Applications of Machine Learning

CO2 - Apply relevant Preprocessing techniques and make the Data ready for applying machine learningAlgorithms

CO3 - Be capable of performing various supervised learning techniques

CO4 - Relish the beauty of unsupervised learning algorithms

CO5 - Be justified with the significance of neural network

CO6 - Understand the necessity of adaptive learning

TEXT / REFERENCE BOOKS

1. Burkov, Andriy. The Hundred-page Machine Learning Book. Germany, Andriy Burkov, 2019.
2. Theobald, Oliver. Machine Learning for Absolute Beginners: A Plain English Introduction. South Africa, Scatterplot Press, 2017.
3. Michalski, Ryszard S., et al. Machine Learning: An Artificial Intelligence Approach (Volume I) United States, Elsevier Science, 2014.
4. Maini, Vishal, and Sabri, Samer. Machine Learning For Humans: Introduction to Machine Learning with Python. Romania, Alanna Maldonado, 2023.
5. Bishop, Christopher M.. Pattern Recognition and Machine Learning. Switzerland, Springer New York, 2006

SITB2601	MOBILE APPLICATION DEVELOPMENT LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

LIST OF EXPERIMENTS

1. To implement simple calculator application.
2. To implement simple SMS application.
3. To implement authentication verification application.
4. To implement navigation application with multiple pages / activities.
5. To implement student placement registration form with database.
6. To implement a simple notification application.
7. To implement animation in application.
8. To create mobile web browser application.
9. To create mobile e-mail application to sent a mail.
10. To add Google maps to an Android application.

NOTE

1. Above applications have to be created and deployed in Android OS.
2. Environment Required: Android SDK / Android Studio.

COURSE OUTCOMES

On completion of the lab, student will be able to

CO1 - Understand how to set up Android Development Environment.
CO2 - Design various Android UI components.
CO3 - Develop Android applications using Java.
CO4 - Develop Android applications by using Eclipse with ADT / Android Studio.
CO5 - Create real time applications using Android database connectivity.
CO6 - Deploy the Android App into play store.

SCSB1701	ARTIFICIAL INTELLIGENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the different problem solving and search strategies in AI and analyze the optimization techniques.
- To understand the knowledge representation and logic in solving AI problems, planning and reasoning.
- To know about the various learning algorithms and applications of AI.

UNIT 1 AI'S FOUNDATION AND INTELLIGENT AGENTS 9 Hrs.

Introduction: What is AI - Foundations of AI - History of AI, Intelligent agent : Rationality, Performance measures - Nature of environments - Structure and types of agents, Problem solving agents : Toy problems - Real world Problems, Case study : Vacuum cleaner world.

UNIT 2 SEARCH METHODS AND OPTIMIZATION TECHNIQUES 9 Hrs.

Uninformed search : Breadth first search - Depth first search - Depth limited search - Iterative deepening DFS - Bidirectional search, Informed search : Greedy Best First Search - A* search - Heuristic functions, Optimization : Hill climbing - Simulated annealing - Local beam search - Genetic algorithm, Case study : 8 puzzle problem.

UNIT 3 BACKTRACKING AND KNOWLEDGE REPRESENTATION 9 Hrs.

Backtracking : Constraint satisfaction problems, Gaming : Adversarial search - Optimal decisions in games - Alpha Beta pruning, Case study : 8 queens problem.Knowledge based agents - Propositional logic - First order logic - Forward and backward chaining - Ontological engineering - Case study : Wumpus world problem.

UNIT 4 PLANNINGAND REASONING 9 Hrs.

Planning : Classical planning - State space search : Progression and Regression - Partial order planning - Planning and acting in real world, Reasoning : Acting under uncertainty - Bayes' rule - Probabilistic reasoning - Semantics and inference in Bayesian Networks - Decision Networks, Case study : Air cargo transport problem.

UNIT 5 LEARNING AND AI APPLICATIONS 9 Hrs.

Learning : Supervised learning - Explanation based learning - Probabilistic learning - Reinforcement learning, Applications : NLP - Speech Recognition - Object Recognition - Robotics, Case study : Word2Vec Problem.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - An ability to identify how an intelligent agent works to take actions.
CO2 - Analyze the search algorithm for solving AI problems.
CO3 - Upgrade a problem solution with optimization techniques.
CO4 - Provide the knowledge based agent to solve the problem logically.
CO5 - Apply the bayes' rule to solve the problem with uncertainty conditions.
CO6 - Design AI algorithms to work with real time applications.

TEXT / REFERENCE BOOKS

1. Stuart J.Russel, Peter Norvig, ¯Artificial Intelligence A Modern Approach‖, 3rd Edition, Pearson Education, 2009.
2. Elaine Rich, Kevin Knight, ¯Artificial Intelligence‖, 3rd Edition, Tata McGraw Hill, 2009.
3. M. Tim Jones, ¯Artificial Intelligence: A Systems Approach (Computer Science)‖, Jones and Bartlett Publishers, Inc., 1st Edition, 2008.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

S12BLH71	BIG DATA ANALYTICS	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To understand the architecture of Hadoop, including the Hadoop Distributed File System (HDFS) and the Hadoop ecosystem and apply the knowledge to work with Hadoop and Spark for data processing.
- To analyze and compare NoSQL databases like MongoDB, HBase, and Cassandra based on their architectures and data models.
- To design and build data visualizations and interactive dashboards using PowerBi and Tableau.

UNIT 1 INTRODUCTION 12 Hrs.

Introduction to Big Data - Evolution- Challenges in the traditional systems - characteristics of Big Data – Five V's of Big Data - Hadoop architecture- Hadoop Distributed File System - Hadoop Ecosystem
Practical: Installing and configuring Hadoop on a local or distributed environment - working with HDFS commands - Performing basic operations like file creation, deletion, and listing using Hadoop Distributed File System (HDFS).

UNIT 2 DATA STORAGE AND PROCESSING 12 Hrs.

Map Reduce Framework - HDFS write & Read - YARN architecture - Spark architecture, Streaming - Apache Mahout
Practical: Loading data from various sources into Hadoop, such as CSV files, JSON data, or database tables. Algorithms using map reduce - word count, matrix multiplication -Implementing the ML algorithms using Apache Spark: Linear Regression, K-means Clustering, Random Forest Classifier - Developing a Recommendation System with Apache Mahout.

UNIT 3 BIG DATA ECOSYSTEM TOOLS 12 Hrs.

Data Ingestion and Streaming: Kafka, Flume - Data Querying and Analysis: Drill, Impala - Data Processing: Hive, Pig -Data Integration and Workflow Management: Nifi, Oozie
Practical:Write Pig Latin scripts to process data stored in Hadoop.- Implementing streaming data processing using frameworks like Apache Kafka or Apache Flink.

UNIT 4 NOSQL DATABASES AND DATA EXPLORATION 12 Hrs.

Introduction to NoSQL - MongoDB:Document-oriented data model, CRUD operations, Querying and indexing, Aggregation - Hbase - Cassandra: Architecture, data Model, Data Design - Efective Data Visualization: Power BIIntroduction to Tableau
Practical:Connecting MongoDB with Power BI:Importing data from MongoDB into Power BI for visualization - Creating Basic Visualizations in Power BI:Building charts, graphs, and tables in Power BI - Customizing visualization properties and formatting options

UNIT 5 DATA VISUALIZATION AND BUSINESS INTELLIGENCE 12 Hrs.

Tableau - Apache Superset -Business use cases: Sentiment Analysis for Social Media Posts, identify fraudulent activities in financial transactions, machine learning model to predict customer behaviour, Demand Forecasting -Recommender Systems.
Practical: Connect Tableau to a dataset (e.g., CSV file, Excel spreadsheet, and database). - creating interactive dashboards and reports. basic visualizations such as bar charts, line charts, and scatter plots, Customize visualizations by adjusting colors, labels, and formatting options, Add filters - Creating Dashboards: Design and build a dashboard with multiple visualizations - Advanced Analytics and Forecasting: Apply Tableau's built-in analytics functions for data analysis, perform trend analysis,

forecasting, and statistical calculations - Embed Tableau visualizations in web pages.
Apache Superset: Open-source data exploration and visualization platform for creating charts, dashboards, and data exploration.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamental concepts and characteristics of Big Data, including its challenges and the need for specialized technologies and frameworks.

CO2 - Gain proficiency in installing, configuring, and working with Hadoop, including Hadoop Distributed File System (HDFS), MapReduce, and YARN.

CO3 - Acquire practical skills in loading and processing data using Hadoop, including working with various data formats and applying algorithms for different applications in real time.

CO4 - Explore and utilize key tools in the Big Data ecosystem, such as Kafka, Flume, Drill, Impala, Hive, Pig, Nifi, and Oozie, for data ingestion, querying, analysis, processing, and workflow management.

CO5 - Develop a strong understanding of NoSQL databases like MongoDB, HBase, and Cassandra, including data modeling, CRUD operations, querying, and aggregation.

CO6 - Learn data visualization and business intelligence techniques using tools like Tableau and Apache Superset, enabling the creation of interactive dashboards, basic visualizations, advanced analytics, and forecasting.

TEXT / REFERENCE BOOKS

1. Mayer-Schönberger, Viktor, and Kenneth Cukier. "Big Data: A Revolution That Will Transform How We Live, Work, and Think." Houghton Mifflin Harcourt, 2013.
2. White, Tom. "Hadoop: The Definitive Guide." O'Reilly Media, 2015.
3. Holmes, Alex. "Hadoop in Practice." Manning Publications, 2014.
4. Chambers, Bill, and Matei Zaharia. "Spark: The Definitive Guide." O'Reilly Media, 2018.
5. Akidau, Tyler, Slava Chernyak, and Reuven Lax. "Streaming Systems: The What, Where, When, and How of Large-Scale Data Processing." O'Reilly Media, 2018.
6. Chodorow, Kristina. "MongoDB: The Definitive Guide." O'Reilly Media, 2013.
7. George, Lars. "HBase: The Definitive Guide." O'Reilly Media, 2011.
8. Carpenter, Jeff, and Eben Hewitt. "Cassandra: The Definitive Guide." O'Reilly Media, 2010.
9. Sleeper, Ryan. "Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master." O'Reilly Media, 2018.
10. Murray, Daniel G. "Tableau Your Data!: Fast and Easy Visual Analysis with Tableau Software." Wiley, 2016.
11. Grandi, Andrea. "Learning Apache Superset: Interactive Data Visualization and Business Intelligence." Packt Publishing, 2020.

SCSB3001	INFORMATION SECURITY ANALYSIS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To explore system security related incidents and counter measures against common threat/vulnerabilities.
- To install, configure and troubleshoot information security devices and gain experience using tools and common processes in information security analysis of compromised systems.
- To gain insight on potential defences and measures the common threat/vulnerabilities

UNIT 1 INFORMATION SECURITY FUNDAMENTALS 9 Hrs.

Definitions & challenges of security, Attacks & services, Security policies, Security Controls, Access control structures, Cryptography, Deception, Ethical Hacking, Firewalls, Identify and Access Management (IdAM).

UNIT 2 SYSTEM SECURITY 9 Hrs.

System Vulnerabilities, Network Security Systems, System Security, System Security Tools, Web Security, Application Security, Intrusion Detection Systems.

UNIT 3 INFORMATION SECURITY MANAGEMENT 9 Hrs.

Monitor systems and apply controls, security assessment using automated tools, backups of security devices, Performance Analysis, Root cause analysis and Resolution, Information Security Policies, Procedures, Standards and Guidelines.

UNIT 4 INCIDENT MANAGEMENT 9 Hrs.

Security requirements, Risk Management, Risk Assessment, Security incident management, third party security management, Incident Components, Roles.

UNIT 5 INCIDENT RESPONSE 9 Hrs.

Incident Response Lifecycle, Record, classify and prioritize information security incidents using standard templates and tools, Responses to information security incidents, Vulnerability Assessment, Incident Analysis.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the basics of information security.
CO2 - Identify and analyse the responses to information security incidents.
CO3 - Install and configure information security devices.
CO4 - Performing various analysis of security management.
CO5 - Acquire the knowledge about the risk and incident management in information security analysis.
CO6 - Maintain a healthy, safe and secure working environment.

TEXT / REFERENCE BOOKS

1. William Stallings, Lawrie Brown, Computer Security: Principles and Practice, 3rd edition, 2014.
2. Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Wiley, 2017
3. Nina Godbole, SunitBelapure, Cyber Security- Understanding cyber-crimes, computer forensics and legal perspectives, Wiley Publications, 2016 Andrew VladimirovMichajlowski, Konstantin, Andrew A. Vladimirov, Konstantin V. Gavrilenko,
4. Assessing Information Security: Strategies, Tactics, Logic and Framework, IT Governance Ltd, O?Reilly, 2010
5. Lee Allen, Kevin Cardwell, Advanced Penetration Testing for Highly-Secured Environments - Second Edition, PACKT Publishers, 2016

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3002	CYBER CRIMES AND LAW	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain knowledge on the basic concepts of cybercrimes, forensics and investigation process.
- To gain insight about the Information Technology act.
- To explore various electronic records and digital signature, Legal Protection against Cyber Crimes.

UNIT 1 INTRODUCTION TO CYBER CRIME 9 Hrs.

Introduction — Understanding the ¯How‖s and ¯why‖s of cybercrime, Understanding cybercrime in digital environment- Threats: Intellectual Property - Software Attacks - Deviations in QoS - Espionage - Forces of Nature - Human Error - Information Extortion -sabotage - Theft - Hardware Failures - Software Failures Attacks: Malicious Code - Hoaxes -Crack - Brute Force - Dictionary - DoS and DDoS - Spoofing - Man-in-the-Middle - Spam - Email Bombing - Sniffers - Social Engineering - Pharming – Timing Attack.

UNIT 2 COMPUTER FORENSICS AND INVESTIGATION PROCEDURES 9 Hrs.

Introduction to computer forensics-use of computer forensics in law enforcement- computer forensics services- Benefits of Professional Forensics Methodology- Steps Taken by Computer Forensics Specialists- Who Can Use Computer Forensic Evidence?- cyber detectives- computer forensics investigative service- forensics process improvement.

UNIT 3 DEFINITIONS AND TERMINOLOGY (IT ACT, 2000) 9 Hrs.

Internet, Internet Governance, E-contract- IT Act Provisions for E-contracts in India- Features of E-contracts- Types of E-contracts- Use of Digital Signatures for E-contracts- Encryption- Data Security: Pillars of Security, Security Threats, Causes of Security Threats, Technology Solutions to Security Threats, Security Policy, Security Policy, Security Policy, Cybersecurity and Legal Framework.

UNIT 4 ELECTRONIC RECORDS 9 Hrs.

Authentication of Electronic Records, Legal Recognition of Electronic Records, Legal Recognition of Digital Signatures, Use of Electronic Records and Digital Signatures in Government and its Agencies, Retention of Electronic Records, Publications of Rules and Regulations in Electronic Gazette, Attribution, Acknowledgement and Dispatch of Electronic Record, Secure Electronic Records and Digital Signatures.

UNIT 5 LEGAL PROTECTION AGAINST CYBER CRIMES 9 Hrs.

Criminal Liabilities under Information Technology Act, 2000, Common Cyber Crimes and Applicable Legal Provisions: A Snapshot, Civil Liabilities under Information Technology Act, 2000, Civil Liability for Corporate: Cyber Crimes under IPC and Special Laws, The Indian Penal Code, 1860, Cyber Crimes under the Special Acts.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the basic concepts of cybercrimes and its types
CO2 - Enhance the knowledge about the forensics and investigation process
CO3 - Understand the Information Technology Act
CO4 - Explore various electronic records and digital signature.
CO5 - Understand the special laws and the Indian penal code
CO6 - Learn about the Legal Protection against Cyber Crimes

TEXT / REFERENCE BOOKS

1. Michael E. Whitman, Herbert J. Mattord,‖ Principles of Information Security‖, CENGAGE Learning, 4th Edition
2. Graham, cybercrime and digtial deviance, 1st Edition, Taylor and Fancis
3. John R. Vacca, ¯Computer Forensics: Computer crime Scene Investigation‖ Charles RiverMedia, 2nd Edition, 2005.
4. Dr. U.S. Pandey, Cybercrime and laws, Himalaya Publishing House. 1st edition 2017.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3003	LINUX PROGRAMMING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To teach principles of operating system including File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking Commands, Basic Linux commands, Scripts and filters.
- To familiarize fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts.
- To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's), Inter process communication, semaphore and shared memory.

UNIT 1 INTRODUCTION TO LINUX AND LINUX UTILITIES 9 Hrs.

Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin. Text Processing utilities and backup utilities, tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio

UNIT 2 INTRODUCTION TO SHELLS AND FILTERS 9 Hrs.

Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

UNIT 3 GREP, SED, UNIX FILE STRUCTURE AND FILE MANAGEMENT 9 Hrs.

Operation, grep Family, Searching for File Content; Scripts, Operation, Addresses, commands, Applications, grep and sed; Introduction to UNIX file system, inode (Index Node), file descriptors, system calls and device drivers; File Structures, System Calls for File Management - create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API - opendir, readdir, closedir, mkdir, rmdir, umask.

UNIT 4 PROCESS AND SIGNALS 9 Hrs.

Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets. File locking: creating lock files, locking regions, use of read and write with locking, competing locks, other lock commands, deadlocks.

UNIT 5 INTER PROCESS COMMUNICATION AND SOCKETS 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; 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 - Apply various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator.

CO2 - Develop Shell Programs using Linux commands.

CO3 - Design applications to manipulate internal kernel level Linux File System.

CO4 - Develop IPC-API's for to controlling various processes for synchronization.

CO5 - Develop network programs that allows applications to make efficient use of resources available on different machines in a network.

CO6 - Develop socket programs for networking applications.

TEXT / REFERENCE BOOKS

1. W. Richard. Stevens, ¯Advanced Programming in the UNIX Environment‖, 3rd edition, Pearson Education, New Delhi, India, 2013.
2. Behrouz A. Forouzan, Richard F. Gilberg.Thomson, ¯Unix and Shell Programming‖, 2003.
3. Robert Love, ¯Linux System Programming‖, O'Reilly, 2013.
4. W.R.Stevens. ¯Advanced Programming in the UNIX Environment‖, 2nd Edition, Pearson Education, 2013.
5. W.R. Stevens, ¯UNIX Network Programming‖, PHI, 2004.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3004	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamentals of Cryptography, standard algorithms used to provide confidentiality, integrity and authenticity.
- To explore the various key distribution and management schemes, deploy encryption techniques to secure data in transit across datanetworks
- To learn various mechanisms for network security to protect against the threats in the networks.

UNIT 1 INTRODUCTION 9 Hrs.

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security - Security attacks, services and mechanisms - OSI security architecture - Classical encryption techniques: substitution techniques, transposition techniques, steganography).- Foundations of modern cryptography: perfect security - information theory – product cryptosystem – cryptanalysis.

UNIT 2 SYMMETRIC CRYPTOGRAPHY 9 Hrs.

MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic- Euclid_s algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: SDES - Block cipher Principles of DES - Strength of DES - Differential and linear cryptanalysis - Block cipher design principles - Block cipher mode of operation - Evaluation criteria for AES - Advanced Encryption Standard - RC4 - Key distribution.

UNIT 3 PUBLIC KEY CRYPTOGRAPHY 9 Hrs.

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes - Primality Testing - Factorization – Euler_s totient function, Fermat_s and Euler_s Theorem - Chinese Remainder Theorem - Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem - Key distribution - Key management - Diffie Hellman key exchange - ElGamal cryptosystem - Elliptic curve arithmetic- Elliptic curve cryptography.

UNIT 4 MESSAGE AUTHENTICATION AND INTEGRITY 9 Hrs.

Authentication requirement - Authentication function - MAC - Hash function - Security of hash function and MAC - SHA -Digital signature and authentication protocols - DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509

UNIT 5 SECURITY PRACTICE AND SYSTEM SECURITY 9 Hrs.

Electronic Mail security - PGP, S/MIME - IP security - Web Security - SYSTEM SECURITY: Intruders – Malicious software - viruses - Firewalls.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamentals of networks security, security architecture, threats and vulnerabilities

CO2 - Apply the different cryptographic operations of symmetric cryptographic algorithms

CO3 - Apply the different cryptographic operations of public key cryptography

CO4 - Apply the various authentication schemes to simulate different applications.

CO5 - Design network application security schemes such as PGP, S/MIME.

CO6 - Understand various Security practices and System security standards

TEXT / REFERENCE BOOKS

1. William Stallings, ¯Cryptography and Network Security: Principles and Practice‖, Pearson, 2016.
2. C K Shyamala, N Harini and Dr. T R Padmanabhan, ¯ Cryptography and Network Security‖, Wiley India Pvt.Ltd.,2015.
3. BehrouzA.Foruzan, ¯Cryptography and Network Security‖, Tata McGraw Hill 2008.
4. Charlie Kaufman, Radia Perlman, and Mike Speciner, ¯Network Security : Private Communication in a Public World‖, Addison Wesley, 2022.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3005	CYBER PHYSICAL SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVE

- To study the basic concepts, requirements, principles, and techniques in emerging cyber physical systems.
- To provide students hands-on experience in prototyping a cyber-physical system andaddress real-world problems through Cyber Physical Systems
- To develop an exposition of the challenges in implementing a cyber-physical system from a computational perspective

UNIT 1 COMPUTATIONAL FOUNDATION, DESIGN AND SYSTEM REQUIREMENTS 9 Hrs.

Cyber Physical Systems in Real world- Basic Principle of Cyber Physical Systems- Industry 4.0, IIoT, Cyber Physical Systems Design Recommendations- CPS system requirements-Cyber Physical System Application- Case study of Cyber Physical Systems

UNIT 2 PLATFORMS, MODELS AND DYNAMICS BEHAVIOURS 9 Hrs.

Hardware platforms for Cyber Physical Systems (Sensors/Actuators, Microprocessor/Microcontrollers),- Wireless Technologies for Cyber Physical Systems- Continuous Dynamics-Discrete dynamics- Hybrid Systems.

UNIT 3 CONCURRENT MODELS OF COMPUTATION 9 Hrs.

Structure of Model-Synchronous Reactive models-Dataflow models of computation-Timed models of computation.

UNIT 4 STUDY OF EMBEDDED SYSTEMS VS INTERNET OF THINGS VS CYBER PHYSICAL SYSTEM 9 Hrs.

Design of Embedded Systems (I/O Units, Multitasking and Scheduling)- Internet of Things- Architecture-CPS Architecture.

UNIT 5 SECURITY AND PRIVACY IN CYBER PHYSICAL SYSTEMS 9 Hrs.

Security and Privacy Issues in CPSs- Local Network Security for CPSs-Internet-Wide Secure Communication- Security and Privacy for Cloud-Interconnected CPSs- Case Study: Cybersecurity in Digital Manufacturing/Industry 4.0

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Able to understand the need and purpose of the different components of Cyber Physical Systems.
CO2 - Develop the ability to interact with Cyber Physical System
CO3 - Designing a new system and with which a product can be made
CO4 - Understand abstraction and various system architectures
CO5 - The student will be able to understand the semantics of a CPS model
CO6 - Develop the ability to interact with cyber-physical systems protocols

TEXT / REFERENCE BOOKS

1. Principles of Cyber Physical Systems, Rajeev Alur, MIT Press, 2015
2. E. A. Lee, SanjitSeshia , "Introduction to Embedded Systems - A Cyber-Physical Systems Approach", Second Edition, MIT Press, 2017, ISBN: 978-0-262-53381-2
3. Guido Dartmann, Houbing song, Ankeschmeink, ¯Big data analytics for Cyber Physical System‖, Elsevier, 2019
4. Houbing song, Danda B Rawat, Sabina Jeschke, Christian Brecher, ¯Cyber Physical Systems Foundations, Principles and Applications‖, Elsevier, 2017
5. Chong Li, MeikangQiu, ¯Reinforcement Learning for Cyber Physical Systems with Cyber Securities Case Studies‖, CRC press, 2019
6. Houbing Song, Glenn A.Fink, Sabina Jesche, ¯Security and Privacy in Cyber-Physical Systems: Foundations, Principles and Solutions‖, IEEE Press.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3007	ETHICAL HACKING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basics of computer-based vulnerabilities, different foot printing, reconnaissance and scanning methods.
- To explore the enumeration and vulnerability analysis methods, hacking options available in web and wireless applications.
- To explore the options for network protection, tools to perform ethical hacking to expose the vulnerabilities.

UNIT 1 INTRODUCTION 9 Hrs.

Ethical Hacking Overview - Role of Security and Penetration Testers. - Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing. - Network and Computer Attacks - Malware - Protecting Against Malware Attacks. - Intruder Attacks - Addressing Physical Security.

UNIT 2 FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS 9 Hrs.

Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall.

UNIT 3 ENUMERATION AND VULNERABILITY ANALYSIS 9 Hrs.

Enumeration Concepts - NetBIOS Enumeration - SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss.

UNIT 4 SYSTEM HACKING 9 Hrs.

Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network - Wardriving- Wireless Hacking - Tools of the Trade.

UNIT 5 NETWORK PROTECTION SYSTEMS 9 Hrs.

Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams - Honeypots.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - To express knowledge on basics of computer-based vulnerabilities
CO2 - To gain understanding on different foot printing, reconnaissance and scanning methods.
CO3 - To demonstrate the enumeration and vulnerability analysis methods
CO4 - To gain knowledge on hacking options available in Web and wireless applications.
CO5 - To acquire knowledge on the options for network protection.
CO6 - To use tools to perform ethical hacking to expose the vulnerabilities.

TEXT / REFERENCE BOOKS

1. Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2. The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.
3. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, DafyddStuttard and Marcus Pinto, 2011.
4. Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz, 2014

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB1262	BLOCKCHAIN AND CRYPTO CURRENCY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To impart technical understanding of Blockchain technologies, basics of Ethereum that helps developers publish distributed applications
- To learn various aspects of working and use of BitCoin and transfer of money for medium of exchange
- To provide knowledge on security and privacy of Block chain technologies

UNIT 1 INTRODUCTION OF BLOCKCHAIN 9 Hrs.

Peer-to-Peer(P2P) Networking- Block chain Architecture- Design and Integration- key Participants in the block chaining- Blocks in Blockchain- Types of Block chain- the Logical Components of Block chain-Core Components of Block chain Architecture-Smart contracts and their applications.

UNIT 2 ETHEREUM BASICS 9 Hrs.

Ethereum and Smart Contracts-The Turing Completeness of Smart Contract Languages and verification challenges- using smart contracts to enforce legal contracts- comparing Bitcoin scripting vs. Ethereum Smart Contracts- writing smart contracts using Solidity and JavaScript

UNIT 3 INTRODUCTION OF BITCOIN 9 Hrs.

Bitcoin features, Blockchain and Bitcoin-Bitcoin Security- Bitcoin Transaction- Transaction Lifecycle-Consensus Protocol,-Role of Bitcoin Crimes- Dark Side of Bitcoin Crimes-Open Challenges to Bitcoin Crimes.

UNIT 4 FUNDAMENTALS OF CRYPTOCURRENCIES 9 Hrs.

Nodes- P2P- Ledger, Gossip Protocol- Consensus Methods- Messages- Account Balance- Genesis Block and New Coins- How a Crypto currency Works- crypto currency Exchange- Smart Contracts- E-Governance.

UNIT 5 SECURITY AND PRIVACY ISSUES OF BLOCKCHAIN TECHNOLOGY 9 Hrs.

Introduction, Blockchain Aspects for Consideration- Security of block chain- Privacy of blockchains-Security Issues of Blockchain Technology- Privacy Issues of Blockchain Technology- Types of Attack-Security Enhancement to Blockchain Systems- Applications of Blockchain in Health care- Finance.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the concepts of Blockchain technologies.
CO2 - Implement Ethereum block chain contract.
CO3 - Illustrate the concepts of Bitcoin and their usage.
CO4 - Understand basic principles of Cryptocurrencies.
CO5 - Apply security features in blockchain technologies.
CO6 - Use smart contract in real world applications.

TEXT / REFERENCE BOOKS

1. Tapscott, Don, Tapscott, Alex,‖ Blockchain Revolution How the Technology Behind Bitcoin and Other Cryptocurrencies Is Changing the World‖, Penguin, 2018.
2. MerunasGrincalaitis, ¯Mastering Ethereum: Implement Advanced Blockchain Applications using Ethereum-supported Tools, Services, and Protocols‖, Packt Publishing, 2019.
3. Raj, Pethuru Saini, Kavita Surianarayanan, Chellammal,‖ Blockchain Technology and Applications‖, 2020.
4. Melanie Swan,‖ Blockchain Blueprint for a New Economy‖, 2015.
5. Shiho Kim, Ganesh Chandra Deka,‖ Advanced Applications of Blockchain Technology‖, 2019.
6. Rajneesh Gupta,‖ Hands-On Cybersecurity with Blockchain Implement DDoS protection, PKI-based identity, 2FA, and DNS security using Blockchain‖, 2018 .
7. Martin Quest,‖ Cryptocurrency Master Everything You Need to Know About Cryptocurrency and Bitcoin Trading, Mining, Investing, Ethereum, ICOs, and the Blockchain‖, 2018.
8. Narayanan, Bonneau, Felten, Miller and Goldfeder, ¯Bitcoin and Cryptocurrency Technologies A Comprehensive Introduction‖, Princeton University Press, 2016.
9. Josh Thompson, _Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
10. Imran Bashir, ¯Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained‖, Packt Publishing, 2018.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3008	CYBER FORENSICS AND INFORMATION SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To impart knowledge on Cyber Crime and Cyber Forensics
- To learn about Cyber Investigation and Evidence Management
- To understand Digital Forensics

UNIT 1 UNRSTANDING THE THREAT FROM CYBER CRIME 9 Hrs.

Introduction Cyber Threat - Definition of Cyber Crime - Classification - Current Threats and Trends - Diversity of Cyber Crime - Cyber Hate Crimes - Cyber Terrorism.

UNIT 2 RESPONDING TO CYBER CRIME 9 Hrs.

Cyber Strategy - National Security Strategy - Cyber Security Strategy - Organized Crime Strategy - Cyber Crime Strategy - Policy Cyber Crime - International Response - National Cyber Security Structure - Strategic Policy Requirements - Police and Crime Commissioners.

UNIT 3 INVESTIGATING CYBER CRIME 9 Hrs.

Preventing Cyber Crime - Password Protection - Get Safe Online - Cyber Security Guidance for Business - Cyber Crime Investigation Skills - Criminal Investigation - Code of Ethics - Evidence - Hi-Tech Investigations - Capturing and Analysing Digital Evidence.

UNIT 4 DIGITAL FORENSICS 9 Hrs.

Introduction to Digital Forensics - Forensic Software and Hardware - Analysis and Advanced Tools -Forensic Technology and Practices - Forensic Ballistics and Photography - Face, Iris and Fingerprint - Recognition - Audio Video Analysis - Windows System Forensics - Linux System Forensics - Network Forensics.

UNIT 5 CASE STUDY 9 Hrs.

Latest Study Topics on Cyber Crime and Investigations - Recent Cyber Crime Cases - Recent Digital Forensics Cases - Bridging the Gaps in Cyber Crime Investigations between the cyber security stake holders.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Infer the various ideas about cybercrime.
CO2 - Describe the Cyber Crime Strategy.
CO3 - Identify the Cyber Crime Investigation Methodology.
CO4 - Analyse and validate forensics data.
CO5 - Develop security architecture for an organization.
CO6 - Apply the Concepts of Cyber Crime and Digital Forensics in Real Time Scenarios

TEXT / REFERENCE BOOKS

1. Thomas Halt, Adam M. Bossler and Kathryn C. SeigfriedSpellar, ¯Cybercrime and Digital Forensics: An Introduction‖, Routledge Taylor and Francis Group 2017.
2. Bernadette H Schell, Clemens Martin, ¯Cybercrime‖, ABC - CLIO Inc, California, 2004,
3. https://books.google.co.in/books/about/Cybercrime_and_Digital_Forensics.html?id=7SA6DwAAQBAJ&redir_esc=y

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3009	SECURED NETWORK PROTOCOLS AND STANDARDS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of different layers of protocols.
- To provide knowledge and overview about cyber physical system and IoT.
- To make students aware of various cyber risk assessment and threats.

UNIT 1 INTRODUCTION 9 Hrs.

Introduction (overview of network security issues, cryptographic algorithms, authentication techniques) - Layer 2/3 security - Authentication systems, Key establishment protocols, Kerberos- Secure communication at the data link and network layers (IPSEC and IKE) - Secure communication at the transport and application layers (SSL/TLS, email security, PGP) - Vulnerabilities of Internet protocols.

UNIT 2 PROTOCOLS 9 Hrs.

Secure Sockets Layer (SSL) - SSL Protocol Stack - SSL Record Protocol Operation IP Security (IPsec) - IP Security (IPsec) architecture - Benefits of IPsec Hypertext Transfer Protocol Secure (HTTPS) Kerberos - Drawbacks and limitations - Kerberos Vulnerabilities Transport Layer Security (TLS).

UNIT 3 ATTACKS AND THREATS 9 Hrs.

Denial of service (DoS) attacks and defences - Firewalls, IP spoofing prevention - Routing protocols security and router security - Domain name server (DNS) security - Traffic monitoring, Intrusion detection, Honeypots - Wireless networks security - Spam, Phishing, and Pharming - Malware propagation and containment, Botnets - Anonymity and privacy on the Web.

UNIT 4 SECURITY IN NEXT GENERATION SYSTEM 9 Hrs.

Internet Security Protocols and Standards - TCP Attacks, DNS Vulnerabilities, SSL/TLS, DDoS - Next Generation System Designs and Challenges - Cyber-Physical System Overview and Security - Internet of Things and Smart Grid Security - Data & Infrastructure Security in Cloud/Edge Computing.

UNIT 5 CYBER RISK ASSESSMENT 9 Hrs.

Blockchain and Decentralized Applications- Hash cash and other Consensus Protocols Blockchain Security- Smart Contracts - Scalability and Privacy challenges, Security Economics and Risk Modelling - Cyber-Risk Assessment - Threat Information Sharing - Cyber-insurance.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Analyse the security issues and authentication algorithms.
CO2 - Express the various protocols in different layers.
CO3 - Explain the use of different attacks and security mechanism in current networking scenario.
CO4 - Analyse the security issues in IoT and smart grid applications.
CO5 - Evaluate the security methods using blockchain.
CO6 - An Ability to analyse the cyber risk assessment.

TEXT / REFERENCE BOOKS

1. Uyless D. Black,‖ Computer Networks: Protocols, Standards and Interface 2nd Edition‖, 2nd Edition, 2015
2. James F Kurose and Keith W. Ross, "Computer Networking - A Top-Down Approach", Addison-Wesley, Fifth Edition, 2010.
3. L. Peterson and B. Davie, "Computer Networks: A Systems Approach", Elsevier Inc., Fifth Edition, 2011.
4. William Stallins,‖ Network Security Essentials: Applications and Standards‖, Pearson Publication,2016.
5. Yassine Maleh ,‖ Security and Privacy Management, Techniques, and Protocols‖, Morocco, 2018

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SITB3001	ADVANCED JAVA PROGRAMMING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce the basics of Enterprise architecture models and session tracking.
- To understand JSP and to write Custom Tags.
- To impart knowledge on the development of Enterprise Java Beans and advanced Java programming concepts.

UNIT 1 INTRODUCTION AND DATABASE PROGRAMMING 9 Hrs.

J2EE Platform - Enterprise architecture styles - J2EE run times - J2EE API - J2EE architecture - Containers -Introduction to J2EE technologies - Naming and directory services. Database programming with JDBC - JDBC/ODBC bridge - Establishing a connection - Creating and executing SQL statements - Querying - Report statements - Scrollable and updatable result sets - Java.sql packages - JDBC data sources - Connection pooling.

UNIT 2 SERVLET PROGRAMMING 9 Hrs.

Introduction to Servlet Programming - Servlet Implementations - Servlet configuration - Servlet exceptions - Servlet Life Cycle - Servlet Programming - Servlet Security- Servlet communication - Advanced Servlets : Approach to Session Tracking- Demonstrating Session - Lifecycle with Cookies - A simple shopping cart using Sessions - Servlet Context Interface - Servlet Collaboration.

UNIT 3 JSP AND JAVA MAIL 9 Hrs.

Java Server Pages : Intro to JSP - JSP Directives - Scripting elements - Standard Auctions - Implicit objects - Scope - JSP pages as XML documents - JSP Sample Program - Design Strategies - JSP tag Extensions-A simple TAG - Writing TAG Extensions. Java Mail API: Introduction to Java Mail - Mail Protocols- Java Mail Overview- Quick, Send me a Email: An example program.

UNIT 4 ENTERPRISE JAVA BEANS 9 Hrs.

Overview of EJB-EJB Middleware Architecture - EJB Architecture- EJB Containers and its services - Design of EJB Tier - Session java Beans- Stateless and Stateful Beans, Entity Beans and Persistence - Container Vs Bean Managed Persistence, Message Driven Bean - Relationships, EJB Container Services.

UNIT 5 SPRING FRAMEWORK 9 Hrs.

Introduction to Spring-Spring Framework Architecture-Spring MVC-Spring ORM-IOC Container-Spring Event Handling-Introduction to Hibernate-Spring JDBC-Hibernate Mappings-Spring MVC Web Framework-Spring AOP Framework.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Implement JDBC connectivity.
CO2 - Implement advanced Servlets.
CO3 - Implement JSP and Java Mail. CO4 - Implement EJB.
CO4 - Implement Java,J2EE Applications using Spring Framework
CO5 - Develop enterprise java applications thereby meeting the industrial requirements.
CO6 - Apply J2EE Concepts to develop real time applications.

TEXT / REFERENCE BOOKS

1. Subrahmanyam Allamaraju and Cedric Buest ,‖Professional Java Server Programming‖, A press,J2EE 1.3, 2007.
2. Jim Keogh ,‖Completer Reference, J2EE‖,Tata McGraw Hill, 2007.
3. James Holmes-Structs,‖The complete Reference‖, 2nd Edition, Tata McGraw Hill, 2007.
4. http://www.java.sun.com/tutorial.
5. Professional Java Development with the Spring Framework by Rod Johnson et al. John Wiley & Sons 2005

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SITB3003	ADVANCED INTERNET TECHNOLOGIES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the search engine functionality and features and develop an optimized search engine which is user interactive
- To gain knowledge on the various elements of web forms development
- To learn about the recent technological aspects implemented for a modernized Internet Application

UNIT 1 SEARCH ENGINE OPTIMIZATION AND ITS OBJECTIVES 9 Hrs.

Search Engine Basics - Introduction to SEO - Layout of Search Result Pages - Algorithm-Based Ranking System - Search Engine Success Factors - Determining Search Intent and Delivering Relevant and Fresh Content - Analysing Ranking Factors - Using Advanced Search Techniques - Vertical Search Techniques - Country-Specific Search Engines - Determining SEO Objectives.

UNIT 2 DEVELOPING AN SEO FRIENDLY WEBSITE 9 Hrs.

Accessibility of Website to Search engine - Defining Your Site's Information Architecture - Site Auditing to Identify SEO Problems - Web Analytics and Current Server Statistics Software - Determining Top Competitors in SEO - Search Engine Indexing Status - Benchmarking Current Rankings, Traffic Source, and Volumes - Conduct SWOT analysis - Keyword Generation - Using Google Analytics - Creating and Optimizing Pay-Per-Click Campaigns.

UNIT 3 RESPONSIVE WEB DESIGNING WITH HTML5 AND CSS3 9 Hrs.

Getting Started with HTML5, CSS3, and Responsive Web Design - Media Queries - Supporting Differing Viewports - Embracing Fluid Layout - Flexible Images - Proportion-Based Grids - HTML 5 for Responsive Design; Basics of CSS3 - CSS3 Selectors - Pseudo-Classes and Pseudo-Elements - Typography - CSS Color Modes - Stunning Aesthetics with CSS3 - CSS3 Transitions - CSS3 Transformations – Animations.

UNIT 4 FORMS WITH HTML5 AND CSS3 9 Hrs.

Exploring the FORM Element - Exploring the INPUT Element - Exploring the BUTTON Element - Exploring the Multiple-Choice Elements - Exploring the TEXTAREA and LABEL Elements - Exploring the FIELDSET and LEGEND Elements - Describing the DATALIST Element - Submitting a Form - Styling HTML5 Forms with CSS3.

UNIT 5 RICH INTERNET APPLICATION (RIA) AND MASHUP 9 Hrs.

Characteristics of RIA - Moving From Web 1.0 to Web 2.0 - Web Mashup Ecosystems - Mashup Technologies - RIA: AJAX versus Traditional Approach - Technical Background.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Develop understanding on search engines and its optimised functionalities
CO2 - Design a user-friendly search engine with standard features
CO3 - Apply the various trending web applications features with its new improvements
CO4 - Explore the numerous elements of web forms and its features
CO5 - Obtain knowledge on the various elements of web forms development
CO6 - Obtain knowledge on the trending technologies implemented in industries

TEXT / REFERENCE BOOKS

1. Advanced Internet Technology, Deven Shah, DT Editorial Services, Dreamtech Press, 2014.
2. Advanced Internet Technologies, Uyless D. Black, Prentice Hall Series in Advanced Communications Technologies, 1998
3. Advanced Internet Technologies, Rajkamal Sangole, Vision Publications, 2020
4. Advanced Internet Technologies, Mr. Kamil Ajmal Khan, Dr. Pallawi Bulakh, Nirali Prakashan, 2020
5. Advanced Internet Programming: Technologies & Applications, Sergei Dunaev, Charles River Media, Inc., 2001

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A:	10 questions of 2 marks each -No choice	**20 Marks**
PART B:	2 questions from each unit of internal choice; each carrying16 marks	**80 Marks**

SITB3005	BEGINNER FULL STACK WEB DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamentals of web programming, client side scripting and server side development.
- To understand API development with Express Framework, architect databases using NoSQL and SQL databases.
- To learn the advanced client side scripting and ReactJS framework

UNIT 1 WEB DEVELOPMENT USING HTML 9 Hrs.

Clients, Servers, and Communication - The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers-.Introduction to HTML - Browsers and HTML - Editor's Offline and Online - Tags, Attribute and Elements - Doctype Element - Comments -Headings, Paragraphs, and Formatting Text - Lists and Links - Images and Tables

UNIT 2 CSS 9 Hrs.

Introduction CSS - Applying CSS to HTML - Selectors, Properties and Values - CSS Colors and Backgrounds - CSS Box Model - CSS Margins, Padding, and Borders - CSS Text and Font Properties - CSS General Topics

UNIT 3 INTRODUCTION TO JAVASCRIPT 9 Hrs.

Introduction to JavaScript - Applying JavaScript (internal and external) - Understanding JS Syntax - Introduction to Document and Window Object - Variables and Operators -Data Types and Num Type Conversion -Math and String Manipulation -Objects and Arrays - Date and Time -Conditional Statements - Switch Case - Looping in JS – Functions

UNIT 4 JQUERY AND SERVERSIDE JS FRAMEWORK – NODE JS 9 Hrs.

Introduction - jQuery Selectors - jQuery HTML - Animations - Effects - Event Handling - DOM - jQuery DOM Traversing, DOM Manipulation - jQuery AJAX- Introduction - What is Node JS - Architecture - Feature of Node JS - Installation and Setup - Creating web servers with HTTP (Request & Response) - Event Handling - GET & POST implementation - Connect to SQL Database using Node JS

UNIT 5 INTRODUCTION TO ADVANCED CLIENT SIDE PROGRAMMING 9 Hrs.

React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - JS Localstorage - Events - Lifting State Up - Composition and Inheritance.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Write client side scripting HTML, CSS and JS.
CO2 - Implement and architect the server side of the web application.
CO3 - Implement Web Application using NodeJS.
CO4 - Architect NoSQL databases with MongoDB.
CO5 - Implement a full-stack Single Page Application using React, NodeJS
CO6 - Develop web applications using java.

TEXT / REFERENCE BOOKS

1. David Flanagan, ¯Java Script: The Definitive Guide‖, O'Reilly Media, Inc, 7th Edition, 2020.
2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019.
3. Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020.
4. Marc Wandschneider, ¯Learning Node‖, Addison-Wesley Professional, 2nd Edition, 2016
5. Joe Beda, Kelsey Hightower, Brendan Burns, ¯Kubernetes: Up and Running‖, O'Reilly Media, 1 st edition, 2017

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A:	10 questions of 2 marks each -No choice	**20 Marks**
PART B:	2 questions from each unit of internal choice; each carrying16 marks	**80 Marks**

SITB3006	UI / UX DESIGN	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide students with the knowledge of user- centered design, graphic design on screens, simulation and prototyping techniques, usability testing methods, interface technologies and user centered design in corporate perspective.
- The course is organized around a practical project with iterative design of a graphical user interface to organize information about users into useful summaries with affinity diagrams.
- To convey user research findings with personas and scenarios and to learn the skill of sketching as a process for user experience design.

UNIT1 INTRODUCTION TO UI 9 Hrs.

What is User Interface Design (UI) -The Relationship Between UI and UX , Roles in UI/UX, A Brief Historical Overview of Interface Design, Interface Conventions, Approaches to Screen Based UI, Template vs Content, Formal Elements of Interface Design, Active Elements of Interface Design, Composing the Elements of Interface Design, UI Design Process, Visual Communication design component in Interface Design.

UNIT 2 INTRODUCTION TO UX 9 Hrs.

UX Basics- Foundation of UX design, Good and poor design, Understanding Your Users, Designing the Experience-Elements of user Experience, Visual Design Principles, Functional Layout, Interaction design, Introduction to the Interface, Navigation Design, User Testing, Developing and Releasing Your Design.

UNIT 3 WIREFRAMING FOR UI DESIGNERS 9 Hrs.

Wireframing Why and How to Create Wireframes Issues to Solve Steps in Creating a Wireframe Designing on a Grid System (like Bootstrap) Get Critiques Incorporate Feedback & Improve Your Designs Wireframe to Refined Design Iterate & Refine Understanding the Mobile Experience.

UNIT 4 UI OR VISUAL DESIGN CONCEPTS 9 Hrs.

ColorColor Harmonies Creating Contrast with Color Guidelines for Proper Color Usage Typography & Fonts Display Text (Such as Headings) versus Body Text Legibility Type Trends Typeface Selection & Pairing Where to Get Web Fonts Ideal Line Height Column Width (Line Length) Hyphenation & Justification Design Elements Proximity Similarity Continuity.

UNIT 5 THE BUSINESS OF UX AND UI DESIGN 9 Hrs.

The UX & UI Design Industry Getting into the business: strategies and ideas. Resources-Creating Your Portfolio Website Examples of UX & UI portfolio websites What you should include on your portfolio website Get 1-on-1 feedback on your case studies & portfolio website Resume Development What you should include on your resume Get 1-on-1 feedback on your resume.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the definition and principles of UI/UX Design in order to design with intention.

CO2 - Achieve a deep understanding of the entire life cycle of design–the process, purpose, and tools.

CO3 - Discover the industry-standard tools and specific project deliverables in UI/UX.

CO4 - Explain why you made design decisions, through presentations of assignments.

CO5 - Apply the user Interfaces to different devices and requirements,

CO6 - Create high quality professional documents and artefacts related to the design process

TEXT / REFERENCE BOOKS

1. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, ¯Internet and World Wide Web - How to Program‖, Fifth Edition, Pearson Education, 2011
2. Achyut S Godbole and AtulKahate, ¯Web Technologies‖, Second Edition, Tata McGraw Hill, 2012.
3. Thomas A Powell, Fritz Schneider, ¯JavaScript: The Complete Reference‖, Third Edition, Tata McGraw Hill, 2013
4. The Elements of User Experience: User-Centered Design for the Web and Beyond, Second Edition Jesse James Garrett, Pearson Education. 2011.
5. The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Third Edition Wilbert O. Galitz , Wiley Publishing, 2007.
6. The UX Book Process and Guidelines for Ensuring a Quality User Experience, Rex Hartson and Pardha S. Pyla, Elsevier, 2012.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SITB3007	WEB DEVELOPMENT BOOTCAMP	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To create web application using cutting edge technologies
- To learn about JavaScript, functions and invocation patterns
- To master backend development with Node JS

UNIT 1 INTRODUCTION TO HTML AND CSS 9 Hrs.

Fundamentals/ Basic HTML - Text formatting on Web Pages - Hyperlinks - complex image maps - tables and nested tables - Inserting web page - Setting & modifying field properties - Validating HTML - Designing with Style Sheets - Style Sheet Syntax - ID - Class Contextual Selectors - Cascading Order – Properties.

UNIT 2 INTRODUCTION TO JAVASCRIPT 9 Hrs.

Data Types - Javascript Variables - Naming and Naming Conventions for Javascript Variables - String Concatenation - String Lengths and Retrieving the Number of Characters - Basic Arithmetic and the Modulo Operator in Javascript - Increment and Decrement Expressions - Functions and invocation patterns - intermediate JavaScript - JS Objects and Prototypes.

UNIT 3 DOCUMENT OBJECT MODEL (DOM) AND JQUERY 9 Hrs.

Tree structure of HTML based websites - Manipulate and change the HTML elements using DOM - Installing and using the jQuery framework - jQuery functionality - Selectors - HTML Manipulation.

UNIT 4 BOOTSTRAP 9 Hrs.

Fundamentals of UI design for websites - Bootstrap framework - Bootstrap grid layout system- Bootstrap CSS Butons - Bootstrap CSS Forms - Bootstrap CSS Tables - Bootstrap navigation bars.

UNIT 5 NODE JS 9 Hrs.

Components of back-end development - Apply concepts like data types, objects, methods, objectoriented programming, and classes in the context of backend development - Server-Side JavaScript - JavaScript Build Processes - File System Interaction.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand how website work and how HTML, CSS contribute.
CO2 - Design user interactions on web pages
CO3 - Develop back end website applications
CO4 - Prepare mock-ups and storyboards for a web development project
CO5 - Learn to research new methods of development in web applications and programming languages
CO6 - Manage a project from conception to finished product

TEXT / REFERENCES BOOKS

1. Full Stack Web Development Bootcamp with React and Python
2. Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js, 2nd Edition Paperback - Import, 17 April 2020
3. Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker,March 2020
4. https://www.javatpoint.com/document-object-model
5. https://www.geeksforgeeks.org/how-do-you-run-javascript-script-through-the-terminal.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SITB3008	INTRODUCTION TO JAVA SCRIPT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn to use best-practice idioms and patterns.
- To understand concepts commonly used in dynamic language programming, such as introspection, higher-order functions, closures and advanced language features such as prototypical inheritance.
- To become adept at implementing client-side interfaces through the use of the DOM, jQuery and AJAX.

UNIT 1 INTRODUCTION AND LANGUAGE SYNTAX 9 Hrs.

Java Script - Advantages - Variable declaration Operators - Control Statements - Error Handling - Understanding arrays.

UNIT 2 FUNCTIONS 9 Hrs.

Function declaration and invocation syntax-Anonymous functions-Functions as data-The arguments object-Variadic functions-Optional parameters-Named parameters-Function overloading-Duck typing.

UNIT 3 HTML FORMS AND DOM 9 Hrs.

Tags-Document structure-Elements: Text, forms, images, blocks and frames. Selectors-Cascading and inheritance-Text and color tyles -The box model-Layout-The DOM as an document API-Browser information-The setTimer and setTimeout-Element lookup-Tree traversal-Attribute getting and setting-Creating and deleting nodes-Events.

UNIT 4 AJAX WITH JQUERY 9 Hrs.

Overview of jQuery - Cross browser compatibility - The $ function object - Element selectors -Tree traversal: Node creation, insertion, modification and deletion. Getting and setting attributes - styles and class-Wrapping and unwrapping DOM raw objects - AJAX - Asynchronous communication -Callback functions-The get and post formats - Same origin policy - Cross origin requests with JSON- AJAX polling.

UNIT 5 NODE JS 9 Hrs.

Server-side scripting - Threaded vs event-based server models - Working with callbacks - The Express web framework.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify the method required to produce a certain outcome or solve a problem using JavaScript
CO2 - Apply invaluable built-in JavaScript methods.
CO3 - Develop fun, interactive, and dynamic JavaScript web apps, games, and pages
CO4 - Identify the method required to produce a certain outcome or solve a problem using JavaScript
CO5 - Apply invaluable built-in JavaScript methods.
CO6 - Develop fun, interactive, and dynamic JavaScript web apps, games, and pages

TEXT / REFERENCE BOOKS

1. Crockford, Douglas, ¯ JavaScript: The Good Parts.‖, O'Reilly Media, 2008.
2. Flanagan, David, ¯JavaScript: The Definitive Guide‖, O'Reilly Media, 2011.
3. Fulton, Steve, and Fulton, Jeff, ¯HTML5 Canvas: Native Interactivity and Animation for the Web‖, O'Reilly Media, 2013.
4. Resig, John, Bibeault, Bear, ¯Secrets of the JavaScript Ninja‖, Manning, 2013.
5. Mulder, Patrick, ¯Full Stack Web Development with Backbone.js: Scalable Application Design with 100% JavaScript.‖, O'Reilly Media, 2014.
6. Rauschmayer, Axel, ¯Speaking JavaScript: An In-Depth Guide for Programmers‖, O'Reilly Media, 2014

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SITB3009	BACK END TOOLS FOR FULL STACK DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To familiarize students with the basics of Back End Development, including programming languages, web servers, databases, and data modeling techniques.
- To introduce students to the various Back End tools and techniques used in developing, testing, and deploying web applications.
- To expose students to real-world case studies of Back End tools and technologies used in creating e-commerce, social media, and financial services applications.

UNIT 1 DEFINITION AND OVERVIEW OF FULL STACK DEVELOPMENT 9 Hrs.

Introduction to Full Stack Development - Overview of Full Stack Development -History and Evolution of Full Stack Development.Role of Back End Tools in Full Stack Development: Role of Back End Tools in Full Stack Development - Understanding the Back End of a Web Application-Back End Tools and Technologies. Overview of Front End and Back End Technologies:Front End Technologies (HTML, CSS, JavaScript, etc.)-Back End Technologies (Programming Languages, Web Servers, Databases, etc.) - Understanding the Interaction between Front End and Back End.

UNIT 2 PROGRAMMING LANGUAGES FOR BACK END DEVELOPMENT 9 Hrs.

Programming Languages for Back End Development (Java, Python, PHP, Ruby, etc.) - Web Servers and Frameworks (Node.js, Flask, Django, Rails, etc.) -Databases and Data Modeling (SQL, NoSQL, ORM, etc.)-RESTful APIs (HTTP, JSON, XML, etc.)ac.

UNIT 3 TOOLS AND TECHNIQUES FOR BACK END DEVELOPMENT 9 Hrs.

Version Control with Git (creating repositories, branching, merging, pull requests, etc.) - Testing and Debugging (unit testing, integration testing, debugging tools and techniques, performance testing, etc.) - DevOps and Deployment (continuous integration and deployment, deployment tools, infrastructure as code, containerization with Docker, etc.) -Security in Back End Development (common security threats, authentication and authorization, encryption and hashing, OWASP top ten vulnerabilities, etc.).

UNIT 4 PERFORMANCE OPTIMIZATION AND SCALABILITY 9 Hrs.

Scaling and Performance Optimization (horizontal and vertical scaling, load balancing and clustering, caching and content delivery networks, monitoring and optimization, etc.) -Real-Time Communication with Websockets (understanding websockets, implementing websockets with Node.js and Socket.IO, broadcasting and chatting applications, etc.) -Microservices Architecture (overview of microservices, benefits and challenges of microservices, implementing microservices with Docker and Kubernetes, service mesh and API gateways, etc.).

UNIT 5 BEST PRACTICES AND FUTURE TRENDS 9 Hrs.

Case Studies of Back End Tools in Real-World Applications (e-commerce, social media, financial services, etc.) -Best Practices for Back End Development (clean code, design patterns, error handling, etc.) - Trends and Future of Back End Tools (serverless computing, machine learning, blockchain, etc.).

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamentals of Full Stack Development and the role of Back End tools in creating modern web applications.

CO2 - Demonstrate proficiency in at least one programming language and web framework commonly used in Back End Development.

CO3 - Build RESTful APIs using various Back End tools and techniques, including data interchange formats and HTTP methods.

CO4 - Implement performance optimization and scalability techniques, including microservices architecture and real time communication with websockets.

CO5 - Analyze and apply Back End tools and technologies to solve real-world problems in e-commerce, socialmedia, and financial services applications.

CO6 - Identify and evaluate current and future trends in Back End Development, including serverless computing, machine learning, and blockchain.

TEXT / REFERENCE BOOKS

1. Giordani, Leonardo. Back-End Development with Python and Flask. Packt Publishing, 2018.
2. Freeman, Adam, Web Development with Node and Express: Leveraging the JavaScript Stack. O'Reilly Media, 2014.
3. Rails, David, et al. Agile Web Development with Rails 5. Pragmatic Bookshelf, 2017.
4. Shifflett, Scott. PHP 7 Programming Cookbook: Over 80 recipes that will take your PHP 7 web development skills to the next level! Packt Publishing, 2016.
5. Kim, Euiseong, et al. Django Design Patterns and Best Practices: Industry-standard web development techniques and solutions using Python, 2nd ed. Packt Publishing, 2019.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

PART A:	10 questions of 2 marks each -No choice	**20 Marks**
PART B:	2 questions from each unit of internal choice; each carrying16 marks	**80 Marks**

SITB3010	FULL STACK DEVELOPMENT FRAMEWORK	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To become knowledgeable about HTML and CSS
- To familiarize pupils with the components of JSX and React JS.
- To gain expertise in MongoDB and Python connectivity

UNIT 1 HTML 9 Hrs.

Introduction to HTML-Browsers and HTML-Editor's Offline and Online-Tags, Attribute and Elements-Doctype Element-Comments-Headings, Paragraphs, and Formatting Text-Lists and Links-Images and Tables.

UNIT 2 CSS AND JAVASCRIPT 9 Hrs.

Introduction CSS-Applying CSS to HTML-Selectors, Properties and Values-CSS Colors and Backgrounds-CSS Box Model-CSS Margins, Padding, and Borders-CSS Text and Font Properties-CSS General TopicIntroduction to JavaScript-Applying JavaScript (internal and external)-Understanding JS Syntax-Introduction to Document and Window ObjectVariables and Operators-Data Types and Num Type Conversion-Math and String Manipulation-Objects and Arrays-Date and Time-Conditional Statements-Switch Case -Looping in JS-Functions.

UNIT 3 REACT JS 9 Hrs.

React JS-Introduction-Templating using JSX-Components, State and Props-Lifecycle of Components-Rendering List and Portals-Error Handling-Routers Redux and Redux Saga-Immutable.js-Service Side Rendering-Unit Testing-Webpack.

UNIT 4 NODE JS 9 Hrs.

Node js Overview-Node js - Basics and Setup-Node js Console-Node js Command Utilities-Node js Modules-Node js Concepts-Node js Events-Node js with Express js-Node js Database Access.

UNIT 5 MONGODB AND PYTHON 9 Hrs.

MongoDB-SQL and NoSql Concepts-Create and Manage MongoDB-Migration of Data into MongoDB-MongoDB with PHP-MongoDB with NodeJS-Services Offered by MongoDB-Python-Python Installation & Configuration-Developing a Python ApplicationConnect MongoDB with Python Installation & Configuration-Developing a Python Application-Connect MongoDB with Python.

Max. 45 Hrs

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Learn basic HTML comments
CO2 - Practice CSS comments.
CO3 - Templating using JSX-Components, Lifecycle of Components
CO4 - Basics and Setup-Node js
CO5 - Connect MongoDB with python
CO6 - Create web page and validate for real time application.

TEXT / REFERENCE BOOKS

1. Dromey R.G., ¯How to Solve it by Computer‖, Prentice Hall of India, 8th Indian Reprint, 2008.
2. Martin C. Brown, ¯Python: The Complete Reference‖, McGraw Hill, 2018.
3. John M. Zelle, ¯Python Programming: An Introduction to Computer Science‖, Library of Congress.
4. Deitel and Deitel and Nieto, ¯Internet and World Wide Web - How to Program‖, Prentice Hall, 5th Edition, 2011.
5. Jeffrey C and Jackson, ¯Web Technologies A Computer Science Perspective‖, Pearson Education, 2011.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3010	INTRODUCTION TO RASPBERRY PI AND ARDUINO	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide skills for interfacing sensors and actuators with different IoT architectures.
- To understand the various means of communication from Node / Gateway to Cloud Platforms.
- To capable of developing various applications using raspberry pi.

UNIT 1 INTRODUCTION TO SENSORS 9 Hrs.

Sensors- Classification of Sensors- Roles of sensors in IoT- Various types of sensors- Design of sensors- sensor architecture- special requirements for IoT sensors- Role of actuators- types of actuators- Transducers.

UNIT 2 IoT WITH ARDUINO 9 Hrs.

Introduction to the Arduino- About the Arduino Board- creating an Arduino programming Environment- creating an Arduino program- Using Libraries- working with Digital Interfaces- interfacing with Analog devices- Adding Interrupts- communicating with devices using sensors- working with Motors- Using an LCD.

UNIT 3 PROGRAMMING ESP 8266 MODULE 9 Hrs.

ESP8266 Wi-Fi Serial Module: Overview- Setting Up the Hardware- interfacing with Arduino- creating an IoT Temperature and Humidity Sensor System- Overview of DHT-22 Sensor- Interfacing the Hardware: Arduino- ESP8266 Wi-Fi Module- and DHT-22 Sensor- Checking Your Data via ThingSpeak- Connecting Your Arduino Set-up to Blynk via Wi-Fi.

UNIT 4 INTRODUCTION TO RASPBERRY PI 9 Hrs.

Introduction to Raspberry Pi- About the Raspberry Pi Board: Hardware Layout- Operating Systems on Raspberry Pi- Configuring Raspberry Pi- Programming Raspberry Pi with Python- Raspberry Pi Interfaces- Controlling LED with Raspberry Pi- interfacing an LED and Switch with Raspberry Pi- interfacing a Light Sensor (LDR) with Raspberry Pi- Wireless Temperature Monitoring System Using Pi.

UNIT 5 IoT DESIGN USING RASPBERRY PI 9 Hrs.

IoT Applications based on Pi- LAMP Web-server- GPIO Control over Web Browser- Creating Custom Web Page for LAMP- communicating data using on-board module- Home automation using Pi- Node-RED- MQTT Protocol- Using Node-RED Visual Editor on Rpi.

Max. 45 Hrs

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand general concepts of IoT also recognize various devices, sensors and applications.
CO2 - Create IoT solutions using sensors, actuators and Devices.
CO3 - Demonstrate Arduino programming language and IDE
CO4 - Understand the working of Raspberry Pi, its features and how various components can be used with Pi
CO5 - Demonstrate the Raspberry Pi interfaces with Python
CO6 - Design real time IoT Devices.

TEXT / REFERENCE BOOKS

1. Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-On-Approach), 1st Edition, VPT, 2016.
2. Richard Blum,Arduino Programming in 24 Hours, Sams Teach Yourself, Pearson Education, 2017.
3. ¯Practical Electronics for Inventors, Third Edition,‖ by Paul ScherzandSimon Monk. 2016.
4. Making Sense of Sensors: End-to-End Algorithms and Infrastructure Design by OmeshTickoo, Ravi Iyer 2016.
5. Marco Schwartz, ¯Internet of Things with the Arduino Yun‖, Packt Publishing, 2014.
6. Eben Upton and Gareth Halfacree, ¯Raspberry Pi User Guide‖, August 2016, 4th edition, John Wiley & Sons.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3011	IoT PLATFORMS AND SYSTEM DESIGN	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand Smart Objects and IoT Architectures
- To learn about various IoT related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi.

UNIT 1 INTRODUCTION TO IoT 9 Hrs.

Introduction to IoT, Current technological trends and future prospects- Evolution of IoT - IoT Devices - IoT Devices vs. Computers - Trends in the Adoption of IoT - Societal Benefits of IoT -, Business Scope, Relation with embedded system - IoT Reference Architecture - physical-logical design of IoT-From M2M to IoT, Software define Network.

UNIT 2 IoT PLATFORMS DESIGN METHODOLOGY 9 Hrs.

Introduction, IoT Design and Methodology- Purpose and requirements specification, Process specification, Domain model specification, Information model specification, service specification, IoT level specification, functional view specification, Operational view specification, Device and component integration, application development.

UNIT 3 IoT AND CLOUD 9 Hrs.

Interoperability in IoT - Introduction to Arduino Programming - Integration of Sensors and Actuators with Arduino - Cloud computing in IoT, IoT in cloud architecture, Logging on to cloud,- cloud based IoT platforms - IBM Watson, Google cloud.

UNIT 4 DATA ANALYTICS AND SUPPORTING SERVICES 9 Hrs.

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest - Role of Machine Learning - No SQL Databases - Hadoop Ecosystem - Apache Kafka, Apache Spark - Edge Streaming Analytics and Network Analytics - Xively Cloud for IoT, Python Web Application Framework - Django - AWS for IoT – System Management with NETCONF-YANG- Cisco IoT system - IBM Watson IoT platform.

UNIT 5 CASE STUDIES/APPLICATION BUILDING WITH IoT 9 Hrs.

Introduction- Smart Perishable Tracking with IoT and Sensors-Smart Healthcare - Elderly Fall Detection with IoT and Sensors- Smart Inflight Lavatory Maintenance with IoT- IoT-Based Application to Monitor Water Quality- Smart Warehouse Monitoring- Smart Retail - IoT Possibilities in the Retail Sector- Prevention of Drowsiness of Drivers by IoT-Based Smart Driver Assistance Systems- System to Measure Collision Impact in an Accident with IoT- Integrated Vehicle Health Management.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand integrating IoT Services to other third party Clouds.
CO2 - Illustrate the application of IoT in various Domains
CO3 - Interpretation of different IoT platforms design methodology
CO4 - Interpret the vision of IoT from a global context.
CO5 - Apply data analytics and use cloud offerings related to IoT.
CO6 - Analyze applications of IoT in real time scenario

TEXT / REFERENCE BOOKS

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ¯IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things‖, Cisco Press, 2017
2. Olivier Hersent, David Boswarthick, Omar Elloumi, ¯The Internet of Things - Key applications and Protocols‖, Wiley, 2012 .
3. Vijay Madisetti, Arshdeep Bahga, ¯Internet of Things: A Hands-On Approach‖ Orient Black swan Private Limited - New Delhi; First edition (2015).
4. Jan Ho¨ ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Hakima Chaouchi, ¯The Internet of Things Connecting Objects to the Web‖ ISBN : 978-1- 84821-140-7, Wiley Publications
6. Internet of Things, RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, John Wiley and Sons.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3012	IoT ARCHITECTURE AND ITS PROTOCOLS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand Smart Objects and IoT Architectures
- To understand design methodology for IoT platforms.
- To learn management and security protocols of IoT

UNIT 1 INTRODUCTION TO IoT 9 Hrs.

Basics of internet of things (IoT): Introduction to Internet of Things- Physical Design of IoT- Logical Design of IoT- IoT Levels- IoT Enabling Technologies: Wireless sensor networks-Cloud Computing- Big data Analytics- Communication Protocols. Domain Specific IoTs: Home Automation- Cities- Environment- Energy- Retail- Logistics-Agriculture- Industry- Health and Life Style.

UNIT 2 IoT ARCHITECTURE AND DESIGN 9 Hrs.

Drivers -IoT Architecture:oneM2M, IoT World Forum (IoTWF) and Alternative IoT models - Simplified IoT Architecture - The Core IoT Functional Stack -IoT Data management and Compute Stack: Fog, Edge and Cloud in IoT **.**

UNIT 3 IoT DATA LINK AND NETWORK LAYER PROTOCOL 9 Hrs.

IEEE 802.15.4e - IEEE 802.11 ah- WirelessHART - Z-Wave - Bluetooth Low Energy- Zigbee Smart Energy- DASH7- HomePlug - G.9959 - LTE-A- LoRaWAN- Weightless-DECT/ULE - Network Layer: IPv4 - IPv6 - 6LoWPAN - 6TiSCH - ND - DHCP- ICMP - RPL - CORPL - CARP.

UNIT 4 TRANSPORT AND SESSION LAYER PROTOCOLS 9 Hrs.

Transport Layer: TCP - MPTCP - UDP - DCCP - SCTP - TLS - DTLS - Session Layer: HTTP- CoAP - XMPP - AMQP – MQTT - SMQTT – DDS.

UNIT 5 IoT MANAGEMENT AND SECURITY PROTOCOLS 9 Hrs.

Interconnection of Heterogeneous Datalinks - Smart Transducer Interface - Security in IoT Protocols: MAC 802.15.4 - 6LoWPAN - RPL- TLS-SSL - IoT Challenges.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand building blocks of Internet of Things and characteristics.
CO2 - Identify the basics of various IoT Architecture.
CO3 - Analyze applications of IoT in real time scenario.
CO4 - Understand the characteristics of protocols in Data link and Network layers.
CO5 - Apply security mechanism related to IoT.
CO6 - Choose the appropriate protocol for communication between IoT.

TEXT / REFERENCE BOOKS

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ¯IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things‖, Cisco Press, 2017
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ¯The Internet of Things - Key applications and Protocols‖, Wiley, 2012 .
3. Vijay Madisetti, Arshdeep Bahga, ¯Internet of Things: A Hands-On Approach‖ Orient Black swan Private Limited - New Delhi; First edition (2015).
4. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Hakima Chaouchi, ¯The Internet of Things Connecting Objects to the Web‖ ISBN: 978-1- 84821-140-7, Wiley Publications
6. Internet of Things, RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, John Wiley and Sons.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3013	WIRELESS TECHNOLOGY, SECURITY AND COMMUNICATION PROTOCOLS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamentals of wireless sensor networks and its application
- To learn about the issues and challenges in the design of wireless technology
- Understand the transport layer and security issues possible in Ad hoc and Sensor networks

UNIT 1 INTRODUCTION 9 Hrs.

Introduction: Fundamentals of wireless communication technology - the electromagnetic spectrum radio propagation - characteristics of wireless channels - modulation techniques - multiple access techniques -wireless LANs, PANs, WANs, and MANs, Wireless Internet.Key definitions of sensor networks - unique constraints and challenges - advantages of sensor network - driving applications - issues in wireless networks - issues in design of sensor network - sensor network architecture - data dissemination and gathering.

UNIT 2 MEDIUM ACCESS CONTROL PROTOCOLS 9 Hrs.

MAC Protocols: Issues in designing MAC protocols for ad hoc wireless networks - design goals - classification of MAC protocols - MAC protocols for sensor network - location discovery - quality - other issues - S-MAC - IEEE 802.15.4.

UNIT 3 ROUTING PROTOCOLS 9 Hrs.

Routing Protocols: Issues in designing a routing protocol - classification of routing protocols- table-driven - on-demand - hybrid - flooding - hierarchical and power aware routing protocols.

UNIT 4 TRANSPORT AND QOS IN WIRELESS SENSOR NETWORKS 9 Hrs.

Data-Centric and Contention-Based Networking - Transport Layer and QoS in Wireless Sensor Networks - Congestion Control in network processing - Operating systems for wireless sensor networks – Examples.

UNIT 5 SECURITY IN WSN 9 Hrs.

Security Attacks - Key Distribution and Management - Intrusion Detection - Software based Anti-tamper techniques - Water marking techniques - Defence against routing attacks - Secure Ad hoc routing protocols - Broadcast authentication WSN protocols - TESLA - Biba - Sensor Network Security Protocols – SPINS.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamentals of wireless technology.
CO2 - Technically know how in building a WSN network.
CO3 - Identify different issues in wireless networks.
CO4 - Apply the knowledge to identify appropriate physical and MAC layer protocols.
CO5 - Understand the transport layer and security issues in sensor networks.
CO6 - Analysis of various critical parameters in deploying a WSN.

TEXT/ REFERNCE BOOKS

1. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education - 2008.
2. Feng Zhao and Leonides Guibas, "Wireless sensor networks ", Elsevier publication - 2004.
3. Jochen Schiller, "Mobile Communications", Pearson Education, 2nd Edition, 2003.
4. William Stallings, "Wireless Communications and Networks ", Pearson Education - 2004
5. Holger Karl, Andreas willig, ―Protocol and Architecture for Wireless Sensor Networks‖, John wiley publication, Jan 2006.
6. Charles E. Perkins, ―Ad Hoc Networking‖, Addison Wesley, 2000.
7. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, ―Wireless sensor networks: a survey ―, computer networks, Elsevier, 2002, 394 - 422.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3014	SENSORS AND ACTUATORS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand basics of sensors, actuators and their operating principle.
- To provide information about interfacing of sensors and signal conditioning circuits to establish any controlsystem or monitoringsystem.
- To provide knowledge about simulation and characterization of different sensors and to provide an understanding on characteristic parameters to evaluate sensor performance.

UNIT 1 SENSORS /TRANSDUCERS 9 Hrs.

Sensors/Transducers - Principles - Classification - Parameters - Characteristics - Environmental Parameters (EP),-Characterization-Mechanical and Electromechanical Sensors: Introduction- Resistive potentiometer- Strain Gauge- Inductive Sensors- Capacitive Sensors- Electrostatic Transducer- Force/Stress Sensors using Quartz Resonators- Ultrasonic Sensors.

UNIT 2 THERMAL/MAGNETIC SENSORS 9 Hrs.

Gas Thermometric Sensors- Acoustic Temperature Sensor- Nuclear Thermometer- Magnetic Thermometer- Resistance Change Type Thermometric Sensors- Thermoemf Sensors- The PTAT Sensor- Thermal Radiation Sensors- Quartz Crystal Thermoelectric Sensors - Magnetic Sensors: Magneto resistive Sensors- Hall Effect and Sensors- Inductance and Eddy Current Sensors- Switching Magnetic Sensors: The Wiegand Sensor-The Pulse Wire Sensor- SQUID Sensors.

UNIT 3 RADIATION SENSORS 9 Hrs.

Basic Characteristics, Types of Photosensistors / Photodetectors- X-ray and Nuclear Radiation Sensors- Fibre Optic Sensors - Recent Trends in Sensor Technologies: Film Sensors- Thick Film Sensors- Thin Film Sensors, Semiconductor IC Technology–Standard Methods,-Micro electro mechanical Systems (MEMS) - Nano-sensors.

UNIT 4 SENSORS—THEIR APPLICATIONS 9 Hrs.

On-board Automobile Sensors- Flow-rate Sensors- Pressure Sensors-Temperature Sensors- Oxygen Sensors- Torque and Position Sensors- Home Appliance Sensors-Aerospace Sensors- Static Pressure Sensors, Temperature Sensing- Fluid Velocity Sensors- Sensing Direction of Air-flow, Measuring Air-speed on Aircrafts- Monitoring Strain- Force- Thrust and Acceleration- Sensors for Manufacturing- Distance sensing- Medical Diagnostic Sensors- Sensors for Environmental Monitoring.

UNIT 5 ACUTATORS 9 Hrs.

Actuators: Pneumatic and Hydraulic Actuation Systems- Actuation systems- Pneumatic and hydraulic systems-Directional Control valves-Pressure control valves- Cylinders- Servo and proportional control valves- Process control valves- Rotary actuators- Mechanical Actuation Systems Types of motion- Kinematic chains- Cams, Gears- Ratchet and pawl- Belt and chain drives- Bearings- Mechanical aspects of motor selection- Electrical Actuation Systems- Electrical systems-Mechanical switches-Solid-state switches-Solenoids- D.C. Motors- A.C. Motors- Stepper motors.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the principle of operation of different sensors and their applications.

CO2 - Be updated on the recent trends in sensor technologies.

CO3 - Analyze various premises, approaches, procedures and results related to sensors and actuators.

CO4 - Create analytical design and developments solutions for sensors and actuators.

CO5 - Conduct experiments and measurements in laboratory and on real components, sensors and actuators.

CO6 - Describe developmentand application of sensors and actuators and take part in team workand be able to Independently present various professional materials.

TEXT/ REFERENCE BOOKS

1. D. Patranabis, ―Sensors and Transducers‖, PHI Learning Private Limited.
2. W. Bolton, ―Mechatronics‖, Pearson Education Limited.
3. Sergej Fatikow and Ulrich Rembold, ― Microsystem Technology and Microbotics‖, First edition, Springer -Verlag NEwyork, Inc, 1997.
4. Jacob Fraden, ―Hand Book of Modern Sensors: Physics, Designs and Application‖ Fourth edition, Springer, 2010.
5. Robert H Bishop, ―The Mechatronics Hand Book‖, CRC Press, 2002.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3016	BLOCK CHAIN TECHNOLOGY FOR BUSINESS INNOVATION AND APPLICATIONS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To know how the structures and architecture of firms in blockchain.
- To learn about collaborations of society in blockchain.
- To develop blueprint for new social contract and understand various trust models

UNIT 1 INTRODUCTION TO BUSINESS MODELS 9 Hrs.

Business models, opportunities for blockchain to disrupt or displace traditional centralized business models, bitcoin, double spending problem, no-censorable content, trustless transactions, smart contracts, and autonomous agents.

UNIT 2 BLOCKCHAIN AND THE C-SUITE 9 Hrs.

Blockchain and the C-Suite, how blockchain changes the deep structures and architecture of the firm, impact of block chain on management and the roles of the C-Suite, Navigating the balance between blockchain's hype and its true potential, impact of blockchain technologies on businesses.

UNIT 3 THE NEXT ERA 9 Hrs.

Leadership for the Next Era, Blockchain as a tool, costless verification , blockchain technology and last mile problem, Self-governance of blockchain through collaborations of civil society, private sector, government, and stakeholders in non- state networks, the idea of blockchain governance networks , how blockchain governance networks can support blockchain stewardship at three levels, the platform level, the application level, and the ecosystem level, the conditions that are necessary for a blockchain-based hub of innovation to succeed.

UNIT 4 DIGITAL CONTRACTING 9 Hrs.

Blueprint for a New Social Contract, digital revolution unfolds, global economy, labour markets, old institutions, and society as a whole. the potential of the blockchain revolution, need of business leader collaboration in a new social contract., Self-sovereign identity and web3.0 technological stack, Bootstrapping network effects through blockchain technology and cryptoeconomics.

UNIT 5 THE FUTURE OF BLOCK CHAIN TECHNOLOGY 9 Hrs.

Trust and vulnerability, impact of AI on block chain, digital privacy, Short history of the scaling out of human trust, High and Low trust societies, Types of Trust model: Peer-to-Peer, Leviathan, and Intermediary.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analysis opportunity in blockchain properly.
CO2 - Able to implement any problem by writing their own business idea.
CO3 - Define a Suitable Model
CO4 - Analyzing business and propose model in blockchain.
CO5 - Design an efficient blockchain business administrator.
CO6 - Realize the Trust and Vulnerability in block chain.

TEXT / REFERENCE BOOKS

1. Drescher, Daniel., ―Blockchain Basics: A Non-Technical Introduction in 25 Steps‖, Apress, 2017.
2. Narayanan, Arvind., Bonneau, Joseph., Felten, Edward., Miller, Andrew., Goldfeder, Steven, ―Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction‖,Princeton University Press, 2016.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3017	CYBER DIGITAL TWIN	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain knowledge in cyber security and digital firmware.
- To understand about Risk Management and Twin Constructions
- To make students aware of security concerns while implementing Cyber Digital Twin Technology

UNIT 1 INTRODUCTION 9 Hrs.

Introduction - Cyber Digital Twin-definition - benefits - need for digital twin - working principle. Digital thread - digital shadow - building blocks of digital twin - digital twin technology drivers and enablers.

UNIT 2 DATA MODELLING ENVIRONMENT 9 Hrs.

Types of digital twin - Based on Product and Process - Based on Functionality - Based on Maturity.Development considerations - Overview of Data Modelling Environment - model and data management - Managing data - implementing the model - Cloud and IOT technologies.

UNIT 3 DIGITAL TWIN OPTIMIZATION 9 Hrs.

Cyber range vs digital twin - human behavior modelling in digital twin - optimization using digital twin - digital twin and cyber security - Techniques. Technologies - Industrial IOT and Digital Twin - Simulation and Digital Twin - Machine Learning and Digital Twin - Virtual Reality and Digital Twin - Cloud Technology and Digital Twin.

UNIT 4 RISK MANAGEMENT 9 Hrs.

Digital Twin and Risk Assessment - Digital Twin reference model - Implementation - Development of risk assessment plan - Development of communication and control system - Development of digital twin tools - Integration - platform validation - Difficulties - Practical implications.

UNIT 5 APPLICATIONS 9 Hrs.

Applications: Digital Twin in Manufacturing - Digital Twin in Automotive - Digital Twin in Healthcare - Digital Twin in Utilities - Digital Twin in Construction - Digital Twin in Education - Digital Twin in Medicine.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Implement fundamental Cyber System and Digital Twin Technology
CO2 - Understand types and data modelling of Digital twin
CO3 - Understand the optimization, simulation and validation
CO4 - Know about the risk and Control development
CO5 - Understand the application in different fields
CO6 - Develop applications using Cyber Digital Twin Technologies

TEXT / REFERENCE BOOKS

1. Cyber-physical System and Digital Twins - Michael E. Auer Kalyan Ram B.Digital - Part of the Lecture Notes in Networks and Systems book series.
2. Development and Deployment on the Cloud - Nassim Khaed, Bibin Pattel and Affan Siddiqui - Elsevier 2020.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB1461	BLOCKCHAIN ARCHITECTURE DESIGN AND USECASES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OUTCOMES

- To learn blockchain basics and primitives along with architecture
- To understand how to consensus, work along with design goals.
- To create privacy and security policy and cryptography schemes

UNIT 1 INTRODUCTION 9 Hrs.

Blockchain Basics-Introduction to Blockchain- History: Digital Money to Distributed Ledgers-Design Primitives: Protocols, Security, Consensus, Permissions, Privacy-Blockchain Architecture and Design-Basic crypto primitives: Hash, Signature-Hashchain to Blockchain-Basic consensus mechanisms-Consensus-Requirements for the consensus protocols-Proof of Work (PoW)- Scalability aspects of Blockchain consensus protocols-Permissioned Blockchains- Design goals-Consensus protocols for Permissioned Blockchains.

UNIT 2 HYPERLEDGER FABRIC AND BLOCKCHAIN 9 Hrs.

Use-cases-Hyperledger Fabric I- Decomposing the consensus process 2.2 Hyperledger fabric components- Chaincode Design and Implementation-Hyperledger Fabric II- Beyond Chaincode: fabric SDK and Front End 2.5 Hyperledger composer Tool-Use case I: Blockchain in Financial Software and Systems (FSS)-Settlements, KYC,8 Capital markets, Insurance-Use case II: Blockchain in trade/supply chain- Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting, etc.

UNIT 3 BLOCKCHAIN FOR GOVERNMENT AND BLOCKCHAIN 9 Hrs.

Security-Use case III: Blockchain for Government-Digital identity, land records and other kinds of record keeping between -government entities, Public distribution system / social welfare systems - Blockchain Cryptography- Privacy and Security on Blockchain.

UNIT 4 RESEARCH ASPECTS AND ADVANCED TOPICS 9 Hrs.

Research aspects I-Scalability of Blockchain consensus Protocols-Case Study - Various recent works on Scalability-Research aspects II-Secure cryptographic protocols on Blockchain-Case Study - Secured Multi-Party Computation Blockchain for science: making better use of the data-mining network- Case Studies: Comparing Ecosystems - Bitcoin, Hyperledger, Ethereum and more

UNIT 5 HANDS-ON BLOCKCHAIN TOOLS AND TECHNOLOGIES 9 Hrs.

Development of Blockchain Application using Hyperledger Fabric-Department of Computer Science and Engineering-The LNMIIT, Jaipur-Development of Decentralized applications (DApps) in Bitcoin- Smart Contract development in Ethereum and Solidity.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Discuss the basic concepts and idea behind the Blockchain.
CO2 - Explain various terms associated with the Blockchain and cryptocurrency.
CO3 - Understand the applicability of Blockchain in various applications.
CO4 - Provide Privacy and Security on Blockchain models.
CO5 - Develop distributed application (DApps) for various domains.
CO6 - Apply various technology to design and develop DApps.

TEXT / REFERENCE BOOKS

1. Joseph J. Bambara, Paul R. Allen and Kedar Iyer, Michael Wuehler, , Rene Madsen, SolomonLederer),Blockchain:APracticalGuidetoDevelopingBusiness,Law,andTechnologySolutions, McGraw-HillEducation, 1st edition, 2018
2. Melanie Swan, Blockchain: Blueprint for aneweconomy,O'ReillyMedia,Inc., 1st edition,2015.
3. Andreas Antonopoulos, Mastering Bitcoin: Programming the Open Blockchain, 2ndEdition, 2017
4. Narayan Prusty,Building Blockchain Projects, Packt Publishing Ltd,1st edition,2017

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB1562	ENTERPRISE BLOCK CHAIN PLATFORMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To teach the concepts of block chain technologies
- To cover the technical aspects of Hyperledger, applications of Ripple and Stellar and the use of Corda and Quorum
- To learn, how these systems work and how to engineer secure software that interacts with the Bit coin network and other crypto currencies.

UNIT 1 INTRODUCTION 9 Hrs.

Block Chain: Architecture - Challenges - Applications - Principles - Ecosystem - consensus problem - Byzantine Fault Tolerance Agreement: Synchronous and Asynchronous - Block chain key protocols: Analysis - Nakamoto Consensus on permission - P2P Block chain network - Abstract Models for Block chain.

UNIT 2 HYPERLEDGER 9 Hrs.

Hyperledger - Hyperledger Framework: Public and Private Ledgers - Hyperledger Fabric - Hyperledger sawtooth - Hyperledger Iroha - Hyperledger burrow - Hyperledger Indy. Hyperledger Tools: Hyperledger Caliper - Hyperledger Cello - Hyperledger Composer - Hyperledger Explorer - Hyperledger Quilt.

UNIT 3 RIPPLE AND STELLAR 9 Hrs.

Ripple - Framework - Consensus Algorithm - Ledger - Case Study.Stellar - Framework - Consensus Protocol - Ledger - Smart Contract - Case Study - Comparison of Ripple and Stellar.

UNIT 4 CORDA AND QUORUM 9 Hrs.

Corda - Framework - Consensus Algorithm - Asynchronous Byzantine Fault Tolerance - Ledger - Case Study. Quorum - Framework - Consensus Protocol - Ledger - Smart Contract - Case Study.

UNIT 5 TEZOS AND DRAGONCHAIN 9 Hrs.

Tezos - Framework - Consensus Algorithm - Delegated Proof of Stake - Ledger-Case Study. Dragon Chain-Framework-Consensus Algorithm- Context-Based Verification with five levels of Consensus - Ledger - Case Study

Max. 45 Hrs.

COURSEOUTCOMES

On completion of the course, student will be able to

CO1 - Understand emerging abstract models for Block Chain Technology
CO2 - Analyse the concept of Hyperledger
CO3 - Apply the tools for understanding the background of Blockchain Platforms
CO4 - Identify major research challenges and technical gaps existing between various Blockchain Platforms
CO5 - Understanding of latest advances in Block Chain Platform.
CO6 - Identify the appropriate blockchain platform for an application

TEXT / REFERENCE BOOKS

1. Melanie Swan, ¯Block Chain: Blueprint for a New Economy‖, O"Reilly, first edition - 2015.
2. Daniel Drescher, ¯Block Chain Basics‖, Apress; 1stedition, 2017
3. Imran Bashir, ¯Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained‖, Packt Publishing, first edition - 2012.
4. Ritesh Modi, ¯Solidity Programming Essentials: A Beginner"s Guide to Build Smart Contracts for Ethereum and Block Chain‖, Packt Publishing.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3018	PYTHON FOR DATA SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamental and complex data structures in Python.
- To clean, scale and normalize the data sets.
- To develop skill sets that are required to build prediction models and visualize it.

UNIT 1 PYTHON FUNDAMENTALS 9 Hrs.

Basic Data Types & Variables - Operators - Complex Data Structures - Control Flow - Loops - Functions & Methods - Classes - Objects - Modules - Import Packages - Documentation.

UNIT 2 PACKAGES FOR DATA SCIENCE 9 Hrs.

NumPy: NumPy Arrays - Random Array Module - Data Distribution - NumPy ufuncs -, Pandas: Pandas Series, Pandas Dataframe, Read CSV, JSON - Analyze Data - Pandas Correlation.

UNIT 3 DATA PREPROCESSING USING PYTHON 9 Hrs.

Python Data Operations - Python Data cleansing - Python Processing CSV Data, JSON Data, XLS Data - Scaling - Normalization - Relational databases - NoSQL Databases - Date and Time - Data Wrangling - Data Aggregation - Reading HTML Pages - Processing Unstructured Data - word tokenization - Stemming and Lemmatization.

UNIT 4 MODELLING PROCESS USING SCIKITLEARN 9 Hrs.

Scikitlearn : Splitting the dataset - Train the Model - Model Persistence: Dump & Load - Estimator API : Choose a class of model Choose model hyperparameters Arranging the data Model Fitting Applying the model - Predict(), Transform() - Refitting & Updating Parameters.

UNIT 5 ANALYSING ANDVISUALIZING DATA 9 Hrs.

Data Analysis: Filtering - Cleaning Data Group by Operations - Pivot Tables -Data Visualization - Plotting with Matplotlib - Bar Charts - Scatter Plots - Histograms - Customizing Visualizations - Visualization of Normal, Binomial, Poisson, Uniform, Logistic, Multinomial, Exponential, Distribution.

Max. 45 Hrs.

COURSE OUTCOMES

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

CO1 - Appreciate the beauty of various packages
CO2 - Do preprocessing effectively
CO3 - Represent data efficiently
CO4 - Analyze the data at higher level
CO5 - Exploit various functions required to build a model
CO6 - To visualize the model using appropriate packages

TEXT / REFERENCE BOOKS

1. Python for Data Analysis, William Mc Kinney, O'Reilly, 2017
2. .Machine Learning with Python Cookbook: Practical Solutions from Preprocessing to Deep Learning, Chris Albon, O'Reilly, 2017
3. Automate the Boring Stuff with Python: Practical Programming for Total Beginners, Al Sweigart, No Starch Press, 2015
4. https://www.tutorialspoint.com/scikit_learn/index.htm
5. https://www.tutorialspoint.com/python_data_science/index.htm

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3019	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basic ideas and principles of neural networks.
- To develop skill sets that are required to build convolutional neural networks.
- To introduce dimensionality reduction methods and techniques that support optimization.

UNIT 1 NEURAL NETWORKS 9 Hrs.

Introduction to Neural Networks - Biological neurons and artificial neurons - Models of single neurons - Neural network models - Perceptron - Single-layer perceptron - Multilayer perceptron - Feedforward neural network - Back propagation - Training procedures.

UNIT 2 DEEP LEARNING 9 Hrs.

Introduction to Deep Learning - History of Deep Learning - Artificial Intelligence vs Machine Learning vs Deep Learning - Shallow Networks vs Deep Networks - Deep Learning and its Applications - CNN - Convolutional Networks Architectures - AlexNet, VGG, Inception, ResNet - Generative Adversarial Networks (GAN).

UNIT 3 DIMENSIONALITY REDUCTION 9 Hrs.

Feature extraction, selection and reduction methods - manifold and metric learning - PCA, LDA - Auto encoders.

UNIT 4 OPTIMIZATION AND GENERALIZATION TECHNIQUES 9 Hrs.

Gradient Descent - Stochastic gradient descent and ADAM (adaptive methods) - batch normalization - VC Dimension - Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM.

UNIT 5 CASE STUDY AND APPLICATIONS 9 Hrs.

Imagenet - Audio WaveNet - Natural Language Processing (Word2Vec) - Joint Detection - BioInformatics - Face Recognition - Scene Understanding - Gathering Image Captions.

Max. 45 Hrs.

COURSE OUTCOMES

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

CO1 - Understand Neural Network architecture and activation function.
CO2 - Build feedforward, backpropagation and recurrent neural networks.
CO3 - Realign high dimensional data using reduction techniques.
CO4 - Analyze optimization and generalization in deep learning.
CO5 - To design and implement Convolutional Neural Networks.
CO6 - Understand the Techniques of image classification.

TEXT / REFERENCE BOOKS

1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ¯Deep Learning‖, MIT Press, 2016.
4. Ragav Venkatesan, Baoxin Li, ¯Convolutional Neural Networks in Visual Computing‖, CRC Press, 2018.
5. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3020	SOCIAL NETWORK ANALYSIS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To illustrate basic principles behind network analysis algorithms.
- To introduce to computational study of people's opinions, sentiments, emotions, moods, and attitudes.
- To solve problems such as emotion detection and opinion mining.

UNIT 1 INTRODUCTION TO SOCIAL NETWORKS 9 Hrs.

Types of Social Networks: General Random Networks, Small World Networks, Scale-Free Networks; Examples of Information Networks; Network Centrality Measures; Strong and Weak ties; Homophily; Groups - Subgroups and Cliques, Clustering, Block models, Dyads and Individuals - Ego networks, Reciprocity, Social capital, structural holes, equivalence.

UNIT 2 STRUCTURES, MODELS AND PROCESSES OF A SOCIAL NETWORK 9 Hrs.

Models and Simulation of Network Evolution, Diffusion in Networks, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited; Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, clustering of connectivity, The Erdos Renyi Model, Clustering Models.

UNIT 3 NETWORKS AND LANGUAGE 9 Hrs.

Introduction: Integration of text and network analysis, Types of networks extracted from texts across disciplines, Natural Language Processing and Linguistics for Information and Relation Extraction - link prediction - Feature based Link Prediction - Event Detection: Classification of Text Streams, Event Detection and Tracking: Bag of Words, Temporal, location, ontology based algorithms, Evolution Analysis in Text Streams.

UNIT 4 SENTIMENT AND EMOTION DETECTION 9 Hrs.

Introduction, Sentiment analysis applications, Sentiment analysis research, Sentiment analysis as mini-NLP, Sentiment classification and clustering, Document Sentiment Classification, Supervised sentiment classification, Unsupervised sentiment classification, Sentiment rating prediction - Temporal sentiment analysis, differences between sentiment analysis and emotion detection.

UNIT 5 SOCIAL INFLUENCE ANALYSIS AND OPINION ANALYSIS 9 Hrs.

Influence measures, Social Similarity - Measuring Influence, Influencing actions and interactions. Influence maximization - Definition of opinion, Definition of opinion summary, different types of opinions, Opinion extraction - Irony detection in opinion mining

Max. 45 Hrs.

COURSE OUTCOMES

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

CO1 - Understand different types of social networks.
CO2 - Design the structure of a social network.
CO3 - Be capable of analyzing real work networks.
CO4 - Build the model for sentimental analysis.
CO5 - To mine the interest of the user using NLP techniques.
CO6 - Learn to discover interesting patterns for opinion analysis.

TEXT / REFERENCE BOOKS

1. Sentiment Analysis in Social Networks By Federico Pozzi, Elisabetta Fersini, Enza Messina, Bing Liu · 2016
2. Networks, Crowds and Markets by David Easley and Jon Kleinberg, Cambridge University Press, 2010
3. Influence and Behavior Analysis in Social Networks and Social Media
4. Social and Economic Networks by Matthew O. Jackson, Princeton University Press, 2010.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3021	ARTIFICIAL INTERNET OF THINGS (AIoT)	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To get in-depth knowledge of the AIoT technology in emerging computing.
- To apply Artificial Intelligence to the data and makes it possible to get the most out of them and make sense of all this information.
- To get intelligent solutions for cities, industry, the health and transportation sectors, among others.

UNIT 1 INTRODUCTION TO AIoT 9 Hrs.

AIoT (artificial intelligence of things) - From AI and IoT to AIoT - AI capable IoT platforms - Understand the basic concepts of AIoT - Applications and examples of AIoT - Benefits and challenges of AIoT - Future of AIoT - Importance of AIoT - Potential Uses of AIoT.

UNIT 2 AIoT FOR SMART ENVIRONMENTS 9 Hrs.

Components in smart environment - Data pre-processing - Data processing - Sensors - Environment control (actuators) - Sensors for homes - Wireless sensor networks - Home-based sensor platform - Sensor technologies - Smart monitoring and controlling hut - Challenges.

UNIT 3 APPLICATIONS-ORIENTED SMART CITIES BASED ON AIoT 9 Hrs.

Introduction - Smart cities overview and AIoT - The framework deployment and architecture of Smart City - AIoT-powered Smart City transformation - Functions and features of Smart Cities - Instruments that aid in the creation of a Smart City - AIoT and challenges in building Smart City.

UNIT 4 AIoT-BASED WASTE MANAGEMENT SYSTEMS 9 Hrs.

Various types and techniques for waste disposal - IoT-based waste management system - Main features of AIoT-based framework for waste management - Data and proposed methodology - Design model - Waste collection model - Working of intelligent bin process - Intelligent bin control by using AI.

UNIT 5 AIoT TECHNOLOGIES, APPLICATIONS AND FUTURE PERSPECTIVES 9 Hrs.

IoT in smart manufacturing system - Challenges for smart manufacturing - Challenges in the area of IoT and Big Data analytics - Challenges in the area of IoT and blockchain computing - Security issues and challenges - The concept of blockchain technology - The applications of blockchain technology utilized in the current period - Potential challenges in AIoT technology - Future perspectives and research directions.

Max. 45 Hrs.

COURSE OUTCOMES

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

CO1 - Remember the basic concepts of AI and IoT technologies to get the idea about AIoT

CO2 - Understand the concept of analysing the data by using AI-integrated IoT devices to reveal patterns and insights.

CO3 - Analyse continually to get improved decisions from the data collected by the Devices used for smart cities.

CO4 - Implement the AI-integrated IoT waste management devices to analyse data to reveal patterns and insights and adjust system operations to become more efficient.

CO5 - Recognize the smart connected network of devices that seamlessly communicate over powerful networks unleashingthe power of data better and faster than ever.

CO6 - Construct a Real-time monitoring systems to save time, to reduce expensive business interruptions and It involves constant supervision by the system to detect anomalies and make predictions or make decisions based on the same.

TEXT / REFERENCE BOOKS

1. Dirk Slama, Tanja Rückert, Sebastian Thrun, Ulrich Homann, Heiner Lasi eds. The Digital Playbook: A Practitioner‘s Guide to Smart, Connected Products and Solutions with AIoT, Springer Nature Switzerland AG, 1st ed. 2023.
2. Ajantha Devi, Anand Nayyar, Fadi Al-Turjman, Piyush Kumar Shukla, Intelligence of Things: AI-IoT Based Critical-Applications and Innovations (AIoT Innovation), Springer Nature Switzerland AG, 1st ed. 2021.
3. Chenshu Wu, Kun Qian, Yi Zhang, Zheng Yang, Smart Wireless Sensing: From IoT to AIoT Hardcover - Import, 28 October 2021, Springer Verlag, Singapore, 1st ed. 2021.
4. Chander Prakash, Lakhwinder Pal Singh, Ajay Gupta, Role of AIoT-based intelligent automation in robotics, UAVs, and drones, ebook-Source: AIoT Technologies and Applications for Smart Environments, Publication date December 2022, IET Digital Library.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3022	PROBABILISTIC GRAPHICAL MODELS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To solve problems using graphical models and inference algorithms.
- To learn the structure of the graphical model from data.
- To develop the knowledge and skills required for design, implement and apply these models to solve real problems.

UNIT 1 INTRODUCTION 9 Hrs.

Fundamentals of Probability Theory - Overview of Graphs - Probabilistic Graphical Models with Examples - Probability Theory - Probability Distributions - Random Variables and Joint Distributions - Independence and Conditional Independence - Graphs - The Bayesian Network Representation (Directed Models) - The Naive Bayes Model (Conditional Independence) - Independencies in Graphs - Bayesian Implementation using Python.

UNIT 2 REPRESENTATION 9 Hrs.

Undirected Graphical Models - Parameterization - Markov Network Independencies - Bayesian Networks and Markov Networks - Partially Directed Models - Local Probabilistic Models - Template-Based Representations - Gaussian Network Models - Construct Markov model using Python.

UNIT 3 INFERENCE 9 Hrs.

Exact Inference: Variable Elimination - Complexity and Graph Structure: Variable Elimination - Conditioning - Clique Trees - Message Passing: Sum Product and Belief Propagation (Sum Product) - Constructing a Clique Tree -Inference as Optimization - Particle-Based Approximate Inference - MAP Inference - Sampling Based Inference, Variational Inference.

UNIT 4 LEARNING 9 Hrs.

Learning Graphical Models - Goals - Learning as Optimization - Parameter Estimation - MLE for Bayesian Networks - Bayesian Parameter Estimation in Bayesian Networks - Learning Models with Shared Parameters - Generalization Analysis - Structure Learning in Bayesian Networks - Structure Scores and Search - Bayesian Model Averaging - Partially Observed Data - Approximate Inference - Bayesian Learning with Incomplete Data - learning structure using pgmpy.

UNIT 5 ACTIONS AND DECISIONS 9 Hrs.

Causal Models - Mechanisms and Response Variables - Partial Identifiability in Functional Causal Models - Counterfactual Queries - Learning Causal Models - Utilities and Decisions - Utility Curves - Utility Elicitation - Preference and Utility Independence - Decision Trees - Influence Diagrams - Backward Induction in Influence Diagrams - Generalized Variable Elimination - Strategic Relevance and Global Optimality - Ignoring Irrelevant Information - Case Study: Multinomial HMM implementation in Python.

Max. 45 Hrs.

COURSE OUTCOMES

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

CO1 - Comprehend the Joint distributions and Conditional Independence.

CO2 - Understand the mathematical framework of probabilistic graphical models.

CO3 - Analyze the basic algorithms for probabilistic inference in graphical models.

CO4 - Implement the algorithms for learning graphical models.

CO5 - Recognize and Apply Bayesian principles behind modelling domain knowledge under uncertainty.

CO6 - Construct new methodologies for stating various statistical and causal models.

TEXT / REFERENCE BOOKS

1. Koller, D. and Friedman, N., ¯ Probabilistic Graphical Models: Principles and Techniques‖, MIT Press, 2009.
2. Jensen, F. V. and Nielsen, T. D., ¯Bayesian Networks and Decision Graphs. Information Science and Statistics‖, Springer, 2nd edition, 2002.
3. Kevin P. Murphy, ¯ Machine Learning: A Probabilistic Perspective‖, 4th Printing. MIT Press, 2013.
4. Barber, D., ¯Bayesian Reasoning and Machine Learning‖, Cambridge University Press, 1st edition, 2011.
5. Bishop, C. M. ¯Pattern Recognition and Machine Learning (Information Science and Statistics)‖, Springer, 2nd printing, 2011.
6. Wainwright, M. and Jordan, M, ¯Graphical Models, Exponential Families, and Variational Inference. Foundations and Trends in Machine Learning‖, 2008.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3023	DATA VISUALIZATION TECHNIQUES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To develop skills to both design and critique visualizations.
- To introduce visual perception and core skills for visual analysis.
- To understand visualization for correlation analysis and multivariate analysis.

UNIT 1 INTRODUCTION TO DATA VISUALIZATION 9 Hrs.

Value of Visualization - What is Visualization and Why do it: visual perception- External representation - Interactivity - Difficulty in Validation. effective data analysis - traits of meaningful data - visual perception -making abstract data visible - building blocks of information visualization - analytical interaction - analytical navigation - optimal quantitative scales - reference lines and regions - trellises and crosstabs - multiple concurrent views - focus and context - details on demand - over-plotting reduction - analytical patterns - pattern examples.

UNIT 2 TIME-SERIES, RANKING, AND DEVIATION ANALYSIS 9 Hrs.

Time-series analysis - time-series patterns - time-series displays - time-series best practices - part-to-whole and ranking patterns - part-to-whole and ranking displays - best practices - deviation analysis - deviation analysis displays - deviation analysis best practices.

UNIT 3 DISTRIBUTION, CORRELATION, AND MULTIVARIATE ANALYSIS 9 Hrs.

Distribution analysis - describing distributions - distribution patterns - distribution displays - distribution analysis best practices - correlation analysis - describing correlations - correlation patterns - correlation displays - correlation analysis techniques and best practices - multivariate analysis - multivariate patterns - multivariate displays - multivariate analysis techniques and best practices.

UNIT 4 EXPLORATORY VISUALIZATION USING TABLEAU AND POWERBI 9 Hrs.

Introduction to Tableau- Creating visualizations with Tableau-Sorting, Top N, bottom N-Filtering-Mapping-Editing, Building, and Formatting Views Introduction to PowerBI- Connecting to Data using Power Query- Joining and Editing Data- Building Visualization using Power Query- Adding Interactivity to Power View Reports.

UNIT 5 INFORMATION DASHBOARD DESIGN 9 Hrs.

Introduction - Dashboard design principles-dashboard design issues and assessment of needs - Building Dashboards-Formatting Dashboards - Adding Interactivity to Dashboards-- Building Stories.
Canvas Selection - Tiled Object - Floating Object - Pixel Perfect Alignment- Summary Box - Chart Titles and Captions - Adding Image and Text - Adding Shading - Adding Separator Lines - Dynamic Chart Title - Information Icons - Creating a Story

Max. 45 Hrs.

COURSE OUTCOMES

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

CO1 - Explain principles of visual perception
CO2 - Apply core skills for visual analysis
CO3 - Apply visualization techniques for various data analysis tasks
CO4 - Design information dashboard
CO5 - Prepare data for visualization
CO6 - Demonstrate skills on creating visual representation of Data

TEXT / REFERENCE BOOKS

1. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
2. Edward R. Tufte, "The visual display of quantitative information", Second Edition, Graphics Press, 2001.
3. Evan Stubbs, "The value of business analytics: Identifying the path to profitability", Wiley, 2011.
4. Gert H. N. Laursen and Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010.
5. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.
6. Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013.
7. Stephen Few, "Now you see it: Simple Visualization techniques for quantitative analysis", Analytics Press, 2009.
8. Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3024	NATURAL LANGUAGE PROCESSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the fundamentals of natural processing
- To understand the way to measure one or more qualities of an algorithm or a system
- To gain knowledge of the linguistics concerned with the interactions between computers and human.

UNIT 1 OVERVIEW AND LANGUAGE MODELLING 9 Hrs.

Overview: Origins and challenges of NLP- Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata - English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT 2 WORD LEVEL AND SYNTACTIC ANALYSIS 9 Hrs.

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff - Word Classes, Part-of-Speech Tagging,Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging - Hidden Markov and Maximum Entropy models.

UNIT 3 SYNTACTIC AND SEMANTIC ANALYSIS 9 Hrs.

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar - Dependency Grammar - Syntactic Parsing, Ambiguity, Dynamic Programming parsing - Shallow parsing - Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures - Semantic Analysis- Requirements for representation- Lexical semantics and word-sense disambiguation- Compositional semantics- Semantic Role Labeling and Semantic Parsing.

UNIT 4 INFORMATION RETRIEVAL AND LEXICAL RESOURCES 9 Hrs.

Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval - valuation Lexical Resources: World Net-Frame Net-Stemmers-POS Tagger- Research Corpora.

UNIT 5 DISCOURSE ANALYSIS AND LEXICAL RESOURCES 9 Hrs.

Discourse segmentation, Coherence - Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm - Coreference Resolution - Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brills Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand NLP problems and survey the literature about that problem
CO2 - Understand language modeling
CO3 - Describe automated natural language generation and machine translation
CO4 - Learn the natural language generation.
CO5 - Analyse the logic and semantics of world knowledge
CO6 - Analyze and compare the use of different statistical approaches for different types of NLP applications.

TEXT / REFERENCE BOOKS

1. Richard M Reese, Natural Language Processing with Java, OReilly Media, 2015.
2. Nitin Indurkhya and Fred J. Damerau,Handbook of Natural Language Processing, Second Edition,Chapman and Hall/CRC Press, 2010.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB1612	PREDICTIVE AND ADVANCED ANALYTICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSEOBJECTIVES

- To learn the concepts and applications of datamining
- To explore the Automated Models for Categorical and Continuous targets
- To analyse the performance in different models

UNIT 1 INTRODUCTION TO DATA MINING 9 Hrs.

Introduction to Data Mining-Concepts of Data mining, Technologies Used-Data Mining Process- KDD ProcessModel- CRISP - DM-Mining on various kinds of data-Applications of DataMining-Challenges of DataMining.

UNIT 2 DATA UNDERSTANDING AND PREPARATION 9 Hrs.

Introduction- Reading data from various sources- Data visualization- Distributions and summary statistics- Relationships amongvariables- Extent of Missing Data- Segmentation- Outlier detection, Automated Data Preparation-Combining data files-Aggregate Data-Duplicate Removal-Sampling data-Data Caching-Partitioning data-Missing Values.

UNIT 3 MODEL DEVELOPMENT AND TECHNIQUES 9 Hrs.

Data Partitioning- Model selection-Model Development Techniques-Neural networks-Decision trees-Logistic regression-Discriminant analysis-Support vector machine-Bayesian Networks-Linear Regression-Cox Regression-Association rules.

UNIT 4 MODEL EVALUATION AND DEPLOYMENT 9 Hrs.

Introduction- Model Validation-Rule Induction Using CHAID- Automating Models for Categorical and Continuous targets-Comparing and Combining Models-Evaluation Charts for Model Comparison-Meta Level Modeling

UNIT 5 DEPLOYING MODEL 9 Hrs.

Assessing Model Performance, Updating a Model, Bias- Variance and model complexity-Bias-variance trade off-Optimisim of the training error rate, Esimate of In-sample prediction error

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the process of formulating business objectives, data selection/collection.
CO2 - Successfully design, build, evaluate models.
CO3 - Implement predictive models for various business applications.
CO4 - Compare the underlying predictive modeling techniques.
CO5 - Select appropriate predictive modeling approaches to identify cases to progress with.
CO6 - Deploy model and assess the performance.

TEXT / REFERENCE BOOKS

1. Larose, Daniel T., ¯ Data Mining and Predictive Analytics‖, Wiley, 2015.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, ¯The Elements of Statistical Learning-Data Mining, Inference, and Prediction‖,Second Edition , Springer Verlag, 2009.
3. C.M.Bishop , ¯Pattern Recognition and Machine Learning‖,Springer,2006.
4. Wasserman, Larry, ¯ All of Statistics: A Concise Course in Statistical Inference.‖,Ukraine, Springer New York, 2013.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

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SCSB3026	APPLICATIONS OF MACHINE LEARNING IN INDUSTRIES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To determine the factors involved in decision support that can improve business performance across the provider / payer ecosystem.
- To identify opportunities for business applications in healthcare by applying journey mapping and pain point analysis in a real world context.
- To identify differences in methods and techniques in order to appropriately apply to pain points using case studies.

UNIT 1 ADVANCED MACHINE LEARNING 9 Hrs.

Deep learning for customer services - Chatbot: Deep learning approach, AI powered marketing systems - Deep learning in cyber security - Types of cyber-attacks in banks - Deep learning methods used in cyber security - Deep learning v/s restricted Boltzmann machines - Convolution Neural Networks (CNNs) - Recurrent neural networks - Machine learning techniques: Loan underwriting and sentiment/news analysis - Sentiment or news analysis - Current challenges and opportunities: Banking and security domain.

UNIT 2 MACHINE LEARNING IN BANKING AND SECURITIES 9 Hrs.

Role of machine learning in banking sector - Use of AI in banking and finance - Fraud detection - Customer data management - Personalized marketing - Challenges of banking sector and securities - Widely used machine learning algorithms in banking and security - Fraud prevention and detection systems - Rule based and machine learning based approach in fraud detection - Anomaly detection: Ways to expose suspicious transactions in banks - Advanced fraud detection systems - Risk management systems.

Case study: Application of machine learning for financial risk management - Credit risk analysis using machine learning classifier - Investment prediction systems.

UNIT 3 MACHINE LEARNING IN HEALTHCARE AND LIFE SCIENCES 9 Hrs.

Applications of machine learning in health and life sciences - Role of machine learning in drug discovery - Medical image analysis - Why deep learning for medical image analysis - Neural network and deep learning architecture - Comparisons between architecture of different types of deep learning models - Machine learning in genetics and genomics - Genomics and AI background - Interpreting deep learning models - Predictive medicine: Prognosis and diagnostics accuracy - Predictive medicine: Examples - ML applications in breast cancer diagnosis and prognosis.

UNIT 4 MACHINE LEARNING IN EDUCATION 9 Hrs.

Advantages of machine learning in education, learning analytics, Academic analytics, Action research, Educational data mining, Recommender system, Personalized adaptive learning, Learning analytics process Case study: Sentimental analysis for student‘s feedback using ML, Recommender systems in education, Domain model, Learner model, Students classification algorithm, Recommendation model, Case study: Application of ML in predicting students‘ performance, Proposed methodology, Data description, Sample data sets, Visualization, Selection of machine learning technique.

UNIT 5 MACHINE LEARNING IN MEDIA AND COMMUNICATION 9 Hrs.

Machine learning in communication - media and entertainment - Usage of machine learning in media and entertainment industry - Machine learning techniques for customer sentiment analysis - World embedding's Sentiment analysis with long short term memory networks - Real-time analytics in communication - media and entertainment industries - Real time analytics and social media - Deep

learning for social media analytics - Recommendations engines - Collaborative filtering - Memory based collaborative filtering - Model based collaborative filtering - Content based filtering - Hybrid recommendation systems - Summary of recommendation systems - Deep learning techniques on recommender systems.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Comprehend advanced concepts of machine learning and deep learning.
CO2 - Analyze concepts of machine learning on banking domain.
CO3 - Apply concepts of Machine Learning in Healthcare sectors.
CO4 - Appreciate the various applications in Education sectors.
CO5 - Identify the applications in Media and Communication Sectors.
CO6 - Recognize and apply various machine learning concepts on case studies from different business sectors.

TEXT / REFERENCE BOOKS

1. ―Building Cognitive Applications with IBM Watson Services: Volume 1 Getting Started‖, . N.p., IBM Redbooks, 2017.
2. ―Machine Learning Algorithms for Industrial Applications, Studies in Computational Intelligence‖, Springer Book series, 2021.
3. Pedro Larrañaga, David Atienza, Javier Diaz-Rozo, Alberto Ogbechie, Carlos Esteban Puerto-Santana, Concha Bielza, ―Industrial Applications of Machine Learning‖, CRC press, 1st edition, 2020.
4. Ian Goodfellow, YoshuaBengio, and Aaron Courville, ―Deep Learning‖, ISBN: 978-0262035613
5. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, ―The Elements of Statistical Learning: Data Mining, Inference, and Prediction‖, Springer series in statistics, 2nd edition, 2019, ISBN: 978-0387848570.
6. Drew Conway and John Myles White, ―Machine Learning for Hackers: Case Studies and Algorithms to Get you Started‖, First Edition, O‘Reilly Media, 2020.
7. John D. Kelleher, Brian Mac Namee, and Aoife D‘Arcy, 13. Fundamentals of Machine Learning forPredictive Data Analytics: Algorithms, Worked Examples, and Case Studies, MIT press, 1st edition,2020.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3027	DATA SCIENCE AND SOCIETY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the mathematical foundations required for data science.
- To provide solutions to societal challenges and gain knowledge on legal and ethical issues related to data science.
- To learn machine tools and techniques and interpret data using visualization libraries in Python.

UNIT 1 DESCRIBING RELATIONSHIPS 9 Hrs.

Correlation -Scatter plots -correlation coefficient for quantitative data -computational formula for correlation coefficient - Regression -regression line -least squares regression line - Standard error of estimate - interpretation of r2 -multiple regression equations -regression towards the mean**.**

UNIT 2 INTRODUCTION TO DATA SCIENCE 9 Hrs.

Data Science: Importance, Benefits, uses and applications-Scope of Data Science- Data Science with other fields - facets of data - Types of Data - Types of Variables -Describing Data with Tables and Graphs -Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores-Data Science Process: Overview - Defining research goals - Retrieving data - Data preparation - Exploratory Data analysis - build the model- presenting findings and building applications - Data Mining - Data Warehousing - Basic Statistical descriptions of Data.

UNIT 3 DATA SCIENCE AND SOCIETY 9 Hrs.

Data Science for Social Good**,** Importance and Benefits of Data Science in Society, Business value of Data Science, Data Types Used to Improve Public Health and Welfare, Solutions for societal challenges, Private Law and data science, Legal and ethical issues related to data science. Intellectual Property Rights, Data Science: Privacy, Security, and Protection.

UNIT 4 MACHINE LEARNING TOOLS, TECHNIQUES AND APPLICATIONS 9 Hrs.

Supervised Learning, Unsupervised Learning, Reinforcement Learning, Dimensionality Reduction, Principal Component Analysis, Classification and Regression models, Tree and Bayesian network models, Neural Networks, Testing, Evaluation and Validation of Models.

UNIT 5 DATA CLEANING, PREPARATION AND VISUALIZATION 9 Hrs.

Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers- String Manipulation: Vectorized String Functions in pandas.

Data Visualization - Basic principles, ideas and tools for data visualization- Need for Visualization- Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots **t**hree dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn- Examples of exciting projects- Case studies.

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Explain the basic terms of Linear Algebra and Statistical Inference.
CO2 - Describe the Data Science process and how its components interact.
CO3 - Apply Machine Learning algorithms to solve real-world problems.
CO4 - Analyze the performance of parameters that can be achieved by applying different models.
CO5 - Apply visualization Libraries in Python to interpret and explore data
CO6 - Apply the python libraries used for data analysis.

TEXT / REFERENCE BOOKS

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, ¯Introducing Data Science‖, Manning Publications, 2016. (Unit I).
2. Introduction to Linear Algebra - By Gilbert Strang, Wellesley-Cambridge Press, 5 th Edition.2016.
3. Applied Statistics and Probability For Engineers - By Douglas Montgomery.2016.
4. Robert S. Witte and John S. Witte, ¯Statistics‖, Eleventh Edition, Wiley Publications, 2017.
5. Jake VanderPlas, ¯Python Data Science Handbook‖, O'Reilly, 2016. (Units IV and V).
6. Allen B. Downey, ¯Think Stats: Exploratory Data Analysis in Python‖, Green Tea Press,2014.
7. Avrim Blum, John Hopcroft and Ravindran Kannan.Foundations of Data Science.
8. Anne Beaulieu, Sabina Leonelli , ¯Data and Society, A Critical Introduction‖, Sage Publishing, 2021.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3028	MATHEMATICAL TOOLS FOR DATA SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the mathematical foundations required for data science.
- To provide a comprehensive calculus background required to solve standard Data Science problems.
- To identify and implement standard solutions to generic problems of optimization and integration encountered in Data Science.

UNIT 1 LINEAR ALGEBRA 9 Hrs.

Linear Algebra: Vector and matrices -vectors 2D, 3D and ND- matrices - Systems of Linear Equations- Null Space- Rank- Eigen values and Eigen Vectors, Singular Value Decomposition.Matrix operations: addition, multiplication, transpose, inverse - Principal component analysis (PCA)

UNIT 2 PROBABILITY AND STATISTICS 9 Hrs.

Basic probability- conditional probability- Bayes' rule - Application to web search algorithms: Link analysis and Page Rank-Descriptive Statistics- Covariance and Covariance matrix- Normal Distribution- Probability density function - Hypothesis Testing.Differentiation and integration - Optimization techniques (gradient descent, Newton's method) - Multivariable calculus - Partial derivatives - Probability and Statistics: - Probability theory and distributions - Bayesian statistics

UNIT 3 FOUNDATIONS OF STATISTICAL LEARNING 9 Hrs.

Basics of statistical learning: models- regression- curse of dimensionality- overfitting- Optimization and convexity -Gradient descent - Newton's method

UNIT 4 CLASSIFICATION AND CLUSTERING 9 Hrs.

Linear discriminant analysis - Logistic Regression - Support vector machines (SVM)- Similarity and distances- Nearest neighbour methods - Decision tress and application of entropy- Clustering Algorithm

UNIT 5 OPTIMIZATION ANDINFORMATION THEORY 9 Hrs.

Linear programming - Nonlinear programming - Convex optimization - Entropy - Mutual information - Compression algorithms- Numerical Methods - Root finding algorithms - Interpolation and extrapolation - Numerical integration.

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Explain the rationale behind second order conditions to optimize smooth multivariate functions in the constrained and unconstrained scenarios
CO2 - Describe, choose and apply numerical methods to optimize smooth and rough functions
CO3 - Apply essential calculus concepts relevant to Data Science
CO4 - Apply and use both analytical and numerical methods for integration
CO5 - Implement some of these techniques in one of the standard programming languages
CO6 - Analyze and correlate the results to the solutions

TEXT / REFERENCE BOOKS

1. Deisenroth, Marc Peter., Faisal, A. Aldo., Ong, Cheng Soon, ¯Mathematics for Machine Learning‖, Cambridge University Press, 2020.
2. Goodfellow, I., Bengio, Y., Courville, A., ¯Deep Learning‖, MIT Press, 2016.
3. Bishop, Christopher M., ¯Pattern Recognition and Machine Learning‖, Springer New York, 2006.
4. Lay, David C, Lay, Steven R., McDonald, Judi., ¯Linear Algebra and Its Applications‖, Global Edition, Pearson Education, 2021.
5. Blitzstein, Joseph K.., Hwang, Jessica, ¯Introduction to Probability‖, Second Edition. CRC, Press, 2019.
6. Press, William H., ¯Numerical Recipes: The Art of Scientific Computing‖, Cambridge University Press, 3rd Edition, 2007.
7. Boyd, Stephen P, Vandenberghe, Lieven, ¯Convex Optimization‖, Cambridge University Press, 2004.
8. Strang, Gilbert, ¯Introduction to Linear Algebra‖, Wellesley, 2016.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3029	MACHINE LEARNING FOR DATA SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To impart Knowledge of machine learning techniques for data handling
- To develop skills of using recent machine learning software for solving practical problems.
- To describe a flow process for data science problems and tools for data visualization.

UNIT 1 INTRODUCTION TO MACHINE LEARNING 9 Hrs.

Introduction, Examples of various Learning Paradigms, Perspectives and Issues, Version Spaces, Finite and Infinite Hypothesis Spaces, PAC Learning, VC Dimension

UNIT 2 SUPERVISED LEARNING ALGORITHMS 9 Hrs.

Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Decision Trees: ID3, Classification and Regression Trees (CART), Regression: Linear Regression, Multiple Linear Regression, Logistic Regression. Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Support vector machines: Linear and Nonlinear, Kernel Functions, K-Nearest Neighbors

UNIT 3 UNSUPERVISED LEARNING 9 Hrs.

Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, Self- Organizing Map, Expectation Maximization, Gaussian Mixture Models, Principal Component Analysis (PCA), Locally Linear Embedding (LLE), Factor Analysis

UNIT 4 EXPLORATORY DATA ANALYSIS AND THE DATA SCIENCE PROCESS 9 Hrs.

Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Data Visualization - Basic principles, ideas and tools for data visualization- Examples of exciting projects- Data Visualization using Tableau.

UNIT 5 INTRODUCTION TO PYTHON 9 Hrs.

Data structures-Functions-Numpy-Matplotlib-Pandas- Series and DataFrame- Manipulating Data Frames- Extracting Information- Plotting- Scikit-learn-Partitioning the Data - Standardization- Fitting and Prediction- Testing the Model

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand complexity of Machine Learning algorithms and their limitations.
CO2 - Apply various supervised learning methods to appropriate problems.
CO3 - Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own.
CO4 - Create probabilistic and unsupervised learning models for handling unknown pattern.
CO5 - Describe the Data Science process and how its components interact.
CO6 - Simulate Data Visualization in exciting projects

TEXT / REFERENCE BOOKS

1. Ethem Alpaydin, "Introduction to Machine Learning‖, MIT Press, Prentice Hall of India, Third Edition 2014.
2. CathyO'Neil and Rachel Schutt.Doing DataScience, Straight Talk From The Frontline.O'Reilly.2014.
3. D.P. Kroese, Z.I. Botev, T. Taimre, R. Vaisman. Data Science and Machine Learning: Mathematical and Statistical Methods, Chapman and Hall/CRC, Boca Raton, 2019.
4. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science
5. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning‖, MIT Press, 2012

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3030	PROGRAMMING IN R	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basic Fundamentals of R language.
- To fit some basic types of statistical models.
- To able to appreciate and apply the R programming from a statistical perspective.

UNIT1 INTRODUCTION TO R 9 Hrs.

Introduction, History and overview of R, elements and data structures, Sessions and Functions, Variables, Data Types, Vectors, Scalars, Conclusion, Data Frames, Lists, Matrices, Arrays, Classes, Data input/output, Data storage formats, Subsetting objects, Vectorization.

UNIT 2 MATRICES, ARRAYS AND LISTS 9 Hrs.

Matrices, Arrays And Lists Creating matrices - Matrix operations - Applying Functions to Matrix Rows and Columns - Adding and deleting rows and columns - Vector/Matrix Distinction - Avoiding Dimension Reduction - Higher Dimensional arrays - lists - Creating lists - General list operations - Accessing list components and values - applying functions to lists - recursive lists.

UNIT 3 DATA MANIPULATION 9 Hrs.

Math and Simulation in R, Functions, Math Function, Probability Calculation - Cumulative Sums and Products- Minima and Maxima- Data sorting, Linear Algebra Operation on Vectors and Matrices, Set Operation.

UNIT 4 CONTROL STATEMENTS, FUNCTIONS, R GRAPHS 9 Hrs.

Control statements - Arithmetic and Boolean operators and values - Default values for arguments - Returning Boolean values - functions are objects - Environment and Scope issues -Writing Upstairs - Recursion - Replacement functions - Tools for composing function code - Math and Simulations in R Creating Graphs - Customizing Graphs - Saving graphs to files - Creating three-dimensional plots.

UNIT 5 INTERFACING 9 Hrs.

Interfacing R to other languages - Parallel R - Basic Statistics - Linear Model - Generalized Linear models - Non-linear models - Time Series and Auto-correlation - Clustering.

Max. 45 Hrs.

COURSEOUTCOMES

On completion of the course,student will be able to

CO1 - State the capabilities of R and its data, variable types
CO2 - Describe various operators, control statements and scoping rules in R
CO3 - Apply R programming for manipulation of datasets
CO4 - Clear understanding on how to organize data and analyse data using real time examples
CO5 - Produce various graphs and distribution plots using R.
CO6 - Develop Interfacing R to other Languages

TEXT / REFERENCE BOOKS

1. Chris Brunsdon, Lex Comber, An Introduction to R for Spatial Analysis and Mapping, 2nd Revised Edition, Sage Publications Ltd (UK), ISBN: 9781446272954, 2019
2. Norman Mat off, ¯The Art of R Programming: A Tour of Statistical Software Design‖, No Starch Press, 2011.
3. Mark Gardener, Beginning R -The Statistical Programming Language, John Wiley and Sons, Inc., ISBN: 9781118164303, 2012.
4. Jared P. Lander, ¯R for Everyone: Advanced Analytics and Graphics‖, Addison-Wesley Data & Analytics Series, 2013.
5. Robert Knell, ¯Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R‖, Amazon Digital South Asia Services Inc, 2013.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3031	COMPUTER VISION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To discuss on different algorithms for 3D reconstruction and recognition.
- To emphasize the core vision tasks of scene understanding and recognition.
- To discuss on Applications to 3D modeling, video analysis, and video surveillance, object recognition and vision based control.

UNIT 1 INTRODUCTION 9 Hrs.

Image Processing, Computer Vision and Computer Graphics, What is Computer Vision - Low-level, Mid-level, High-level, Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.

UNIT 2 IMAGE FORMATION MODELS 9 Hrs.

Monocular imaging system, Radiosity: The _Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc, Orthographic & Perspective Projection, • Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading, Photometric Stereo, Depth from Defocus, Construction of 3D model from images.

UNIT 3 IMAGE PROCESSING AND MOTION ESTIMATION 9 Hrs.

Image preprocessing, Image representations (continuous and discrete), Edge detection.Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.

UNIT 4 SHAPE REPRESENTATION AND SEGMENTATION 9 Hrs.

Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, and Multiresolution analysis.

UNIT 5 OBJECT RECOGNITION AND IMAGE UNDERSTANDING 9 Hrs.

Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component Analysis, Shape priors for recognition, Pattern recognition methods, HMM, GMM and EM, Application: Surveillance - foregroundbackground separation - particle filters - Chamfer matching, tracking, and occlusion - combining views from multiple cameras - human gait analysis Application: In-vehicle vision system: locating roadway - road markings - identifying road signs – locating pedestrians.

Max. 45 Hrs.

COURSE OUTCOMES

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

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

TEXT / REFERENCE BOOKS

1. David A. Forsyth, Jean Ponce.‖Computer Vision: A Modern Approach‖, 2 nd Edition Pearson Education Limited, 2015
2. E. Trucco and A. Verri, ¯Introductory Techniques for 3D Computer Vision‖, Prentice Hall, 1998.
3. Mark Nixon and Alberto S. Aquado, ¯Feature Extraction & Image Processing for Computer Vision‖, 3rd Edition, Academic Press, 2012.
4. E. R. Davies, Computer & Machine Vision, 4th Edition, Academic Press, 2012.
5. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010.
6. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3033	EXPLORATORY DATA ANALYSIS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To focus on the significance of data and software tools
- To emphasize the relationship between variables and gain knowledge about univariate data analysis
- To explore multivariate data analysis and visualize the data

UNIT 1 INTRODUCTION 9 Hrs.

EDA fundamentals - Understanding data science - Significance of EDA - Making sense of data - Comparing EDA with classical and Bayesian analysis - Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.

UNIT 2 THE EXPLORATORY PERSPECTIVE 9 Hrs.

Introduction: Overview - Sources of Data - Process for Making Sense of Data - Describing Data: Observations and Variables - Types of Variables - Central Tendency - Distribution of the Data - Confidence Intervals - Hypothesis Tests - Distributions Of Single Variables.

Displaying Data: The Stem and Leaf - Summarizing Data - Resistant Statistics and Number Summaries - The Box and Whisker -Understanding Data : Skewness - Outliers - Gaps and Multiple Peaks.

UNIT 3 RELATIONSHIPS BETWEEN VARIABLES 9 Hrs.

Preparing Data Tables: Cleaning - Displaying Relationships -The Scatter Plot -Summarizing Relationships - Fitting A Line - Smoothing the Data - Median and Hinge Traces -Examining Residuals – Understanding Relationships: Outliers - Nonlinear Monotonic Relationships.

UNIT 4 REEXPRESSION AND UNIVARIATE ANALYSIS 9 Hrs.

Choosing Re-expressions: Nonlinear Monotonic Functions - Nonmonotonic Functions. Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread -Scaling and Standardizing - Inequality - Univariate data: measures of center and spread, transformations.

UNIT 5 MULTIVARIATE ANALYSIS AND VISUALIZATION 9 Hrs.

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Bivariate Analysis - Multivariate Analysis - Casual Analysis.Basics of Matplotlib, Plotting with Pandas and Seaborn, Other Python Visualization Tools.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand about the significance of exploratory data analysis
CO2 - Analyse the data statistically
CO3 - Summarize data and understanding their relationship
CO4 - Perform univariate data exploration and analysis
CO5 - Apply multivariate data exploration and analysis
CO6 - Perform dataexploration and visualization techniques

TEXT / REFERENCE BOOKS

1. Glenn J. Myatt, Wayne P. Johnson - Making Sense Of Data | A Practical Guide To Exploratory Data Analysis And DataMining, Second Edition
2. Frederick Hartwig, Brian E. Dearing · 1979, Exploratory Data Analysis
3. Suresh Kumar Mukhiya, Usman Ahmed, Hands-On Exploratory Data Analysis with Python, Packt Publishing, 2020.
4. Jake Vander Plas, ¯Python Data Science Handbook: Essential Tools for Working with Data‖, First Edition, O Reilly, 2017.
5. Catherine Marsh, Jane Elliott, Exploring Data: An Introduction to Data Analysis for Social Scientists, Wiley Publications, 2nd Edition, 2008.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3034	PREDICTIVE ANALYTICS AND SEGMENTATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn about fundamentals of data modelling techniques.
- To gain knowledge about regression and classification.
- To understand more about additive and boosting methodsTo learn about fundamentals of data modelling techniques.

UNIT 1 INTRODUCTION TO PREDICTIVE ANALYTICS 9 Hrs.

Need for Analytics - Introduction to Tools and Environment - Application of Modeling in Business - Databases & Types of data and variables - Data Modeling Techniques - Missing imputations etc. Need for Business Modeling - Regression – Concepts -Blue Property-Assumptions-Least Square Estimation - Variable Rationalization - Model Building.

UNIT 2 REGRESSION AND CLASSIFICATION 9 Hrs.

Model Theory - Model fit Statistics - Model Conclusion - Analytics applications to various Business Domains etc. Regression Vs Segmentation - Supervised and Unsupervised Learning, Tree Building - Regression, Classification - Over fitting, Pruning and complexity -Multiple Decision Trees etc.

UNIT 3 MODEL ASSESSMENT AND SELECTION 9 Hrs.

Bias,Variance and model complexity - Bias-variance trade off - Optimism of the training error rate - Estimate of In-sample prediction error - Effective number of parameters - Bayesian approach and BIC - Cross- validation - Boot strap methods, conditional or expected test error.

UNIT 4 ADDITIVE MODELS AND TREES 9 Hrs.

Additive Models, Trees, and Related Methods: Generalized additive models - Tree Based Methods - PRIM: Bump Hunting - Multivariate Adaptive Regression Splines - Hierarchical Mixture of Experts - Boosting methods- Numerical Optimization via gradient boosting - Right-sized trees for Boosting - Regularization.

UNIT 5 SURVIVAL ANALYSIS 9 Hrs.

Survival Analysis: Survival Analysis Measurements - Kaplan Meier Analysis - Parametric Survival Analysis - Proportional Hazards Regression - Extensions of Survival Analysis Models - Evaluating Survival Analysis Models.

Max: 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the concept of data analytics and modelling
CO2 - Analyze data and build models
CO3 - Apply the models and predict error
CO4 - Create additive models and Trees
CO5 - Understand the usage of survival analysis
CO6 - Apply the prediction model for decision making for a given set of problems.

TEXT / REFERENCE BOOKS

1. Gareth James Daniela Witten Trevor Hastie Robert Tibshirani, ¯An Introduction to Statistical Learning with Applications in R‖, Springer, 2017.
2. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy ¯Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms Worked Examples‖, MIT Press, 2nd Edition, 2020.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman , ¯The Elements of Statistical Learning-Data Mining, Inference, and Prediction‖ ,Second Edition , Springer Verlag, 2009.
4. Dean Abbott., ¯Applied Predictive Analytics: Principles and Techniques for The Professional Data Analyst‖, Wiley, 2022.
5. Anasse Bari, Mohammad Chaouchi, Tommy Jung, ¯Predictive Analytics for Dummies‖, 2nd Edition, 2017.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3035	COGNITIVE SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn basics and develop skills in Cognitive Science with focus on acquisition.
- To understand the mind and intelligence that connects psychology, artificial intelligence, neuroscience and linguistics.
- To gain knowledge about the methods and tools to solve real time issues.

UNIT 1 INTRODUCTION TO COGNITIVE SCIENCE 9 Hrs.

The Cognitive view -Some Fundamental Concepts - Computers in Cognitive Science - Applied Cognitive Science - The Interdisciplinary Nature of Cognitive Science.

UNIT 2 COGNITIVE PSYCHOLOGY 9 Hrs.

Cognitive Psychology: The Architecture of the Mind - The Nature of Cognitive Psychology- A Global View of the Cognitive Architecture- Propositional Representation- Schematic Representation- Cognitive Processes, Working Memory, and Attention- The Acquisition of Skill- The Connectionist Approach to Cognitive Architecture.

UNIT 3 LANGUAGE ACQUISITION, SEMANTICS AND PROCESSING MODEL 9 Hrs.

Milestones in Acquisition - Theoretical Perspectives- Semantics and Cognitive Science - Meaning and Entailment -Reference - Sense - Cognitive and Computational Models of Semantic Processing - Information Processing Models of the Mind- Physical symbol systems and language of thought- Applying the Symbolic Paradigm- Neural networks and distributed information processing- Neural network models of Cognitive Processes.

UNIT 4 INTEGRATION CHALLENGE 9 Hrs.

Cognitive Science and Integration Challenge: Levels of explanation, Local integration, Tackling the Integration Challenge: Intertheoretic reduction, Marr‘s tri-level hypothesis, Models of mental architecture.

UNIT 5 NEURAL NETWORK MODELS OF COGNITIVE PROCESSES 9 Hrs.

Language learning, Neural network models of children‘s physical reasoning, Challenges and Applications, The massive modularity hypothesis, Hybrid architectures, Tools: Working with Concept Maps.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify and describe the relationships between Cognitive Systems with different Cognitive Disciplines.

CO2 - Enumerate and characterize various neuroscientific theories of cognitive systems.

CO3 - Analyze and describe the representation, and use of knowledge by individual minds, brains, and machines.

CO4 - Perform neuroscience and linguistics based real time experiments.

CO5 - Implement the knowledge of neuro science with its advanced techniques towards the cognitive field.

CO6 - Formulate hypothesis and computational models to draw conclusions that embeds cognitive psychology and neuroscience.

TEXT / REFERENCE BOOKS

1. Jose Luis Bermudez, ¯Cognitive Science: An Introduction to the Science of the Mind‖, Cambridge University Press, New York, 2014.
2. Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein, ¯Cognitive Science: An Introduction‖, Second Edition, MIT press, 1995.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3036	MALWARE DATA SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamental concepts and techniques of malware analysis and reverse engineering.
- To learn how to identify, classify, and analyze different types of malware, including viruses, worms, Trojans, ransomware, and others.
- To understand the anatomy of malware, including how it spreads, hides, and communicates with command and control servers.

UNIT 1 INTRODUCTION AND STATIC ANALYSIS 9 Hrs.

Introduction: Malware Analysis - Why Malware Analysis - Types of Malware Analysis - Static Analysis: Determining the File Type - Fingerprinting the Malware - Extracting, Strings - Determining File Obfuscation - Comparing and Classifying the Malware.

UNIT 2 DYNAMIC ANALYSIS 9 Hrs.

Dynamic Analysis: System and Network monitoring - Dynamic analysis monitoring Tools-Dynamic Analysis Steps - Tools -Analyzing a Malware Executable - Dynamic Link Library (DLL) Analysis.

UNIT 3 MALWARE FUNCTIONALITIES AND PERSISTENCE 9 Hrs.

Functionalities - Downloader - Dropper - Keylogger - Malware Command Control - PowerShell-based Execution. Persistence Methods: Scheduled Tasks - Startup Folder - Winlogon Registry Entries - Image File Execution Options - COM hijacking - Service.

UNIT 4 NETWORK CONSTRUCTION AND ANALYSIS 9 Hrs.

Identifying Attack Campaigns using Malware Networks: Nodes and Edges, Bipartite Networks, Visualizing Malware Networks - Building Malware Networks and shared Image Relationship Network, Shared Code Analysis: Preparing Samples, Using the Jaccard Index and Using Similarity Matrices for Evaluation.

UNIT 5 DETECTION, EVALUATION AND VISUALIZATION 9 Hrs.

Understanding ML Based Malware Detectors: Steps for Building ML based Detector, Types of Machine Learning Algorithms, Evaluating Malware Detection Systems, Building ML Detectors: Decision Tree based Detector, Basic Visualization.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the concepts and techniques of Malwares for system security
CO2 - Compare the techniques of Static and Dynamic methods to identify and classify Malwares
CO3 - Analyze the functionalities of malware by applying persistence methods
CO4 - Construct the network and Formulate the analysis test to detect malware for securing community applications.
CO5 - Simulate a detector system and evaluate to scale better along with visualization.
CO6 - Design a case study for any Network with a malware detector and compare the performance of the various classifiers and algorithms.

TEXT / REFERENCE BOOKS

1. Monnappa K A, ¯Learning Malware Analysis‖, Packet Publisher, 2018.
2. Joshua Saxe and Hillary Sanders, ¯Malware Data Science - Attack Detection and Attribution‖, September 2018.
3. Michael Ligh, Steven Stair, ¯Malware Analyst's Cookbook and DVD: Tools and Techniques for Fighting Malicious Code‖, Wiley Publishing Inc., 2011.
4. Alexey Kleymenov and Amr Thabet, ¯Mastering Malware Analysis: The complete malware analyst's guide to combating malicious software, APT, cybercrime, and IoT attacks‖,Packt Publisher, 2019.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3037	COMPREHENSIVE LINUX FOR ALL	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To emphasize the significance of server management concepts of an Enterprise Linux Operating System.
- To comprehend the importance of GIT repositories and Security vulnerability in Linux Operating System.
- To explore the cloud level services offered by Linux Operating System

UNIT 1 STARTING WITH LINUX 9 Hrs.

Understanding What Linux Is- Exploring Linux History- Understanding How Linux Differs from Other Operating Systems- Understanding How Linux Distributions Emerged- Creating the perfect Linux desktop- Lab: Ubuntu OS installation on Virtual machines- Starting with the Ubuntu Desktop Live image- Handling Ubuntu desktop- Using the Desktop- Understanding the importance of threads- Lab: Understanding Basic Desktop Application Management in Ubuntu- Adding an application launcher- Managing files and folders-- Installing and managing additional software- Lab: Knowing Advanced Desktop Application management in Ubuntu- Using tools- Lab: Configuring basic tools in Ubuntu OS- Working with shell in UBUNTU- Lab1: Getting aquatinted with different types of shell- LAB3: Basic Shell Management.

UNIT 2 GAINING ACCESS 9 Hrs.

Using the root User Account-Exploring Administrative Commands, Configuration Files, and Log Files- Using Other Administrative Accounts- Lab: Implementing privilege escalation- Using Shell Variables, expanding arithmetic expressions Expanding variables- Lab: Manipulating environmental/shell variable- Getting Information about Commands and help- Managing user accounts in UBUNTU- User Management- Lab: Managing Regular User Account-Group Management-Lab: Group Management- Moving around the file system UBUNTU- File Management- Lab: Working with basic file system- Permission Management- Lab: Working with file system permissions- Access Control Lists- Lab: Managing User and Group Permissions- Working with text files in UBUNTU.

UNIT 3 FILE MANIPULATIONS 9 Hrs.

Editing text files from shell prompt- Managing running processes- Process Management-Lab: Monitoring process activity- Writing simple shell scripts- Understanding Shell Scripts- Lab: Implementing basic shell programs- Understanding server managing in RHEL- Install the server RHEL- Lab: RHEL 8 Installation on Virtual Machine- Initial Server Configuration- Lab: Configuring and Verifying the Initial Server Settings-Remote Server Management- Lab: RHEL Remote Server management-Initial Server Configuration- Lab: Configuring and Verifying the Initial Server settings-Remote Server Management-Lab: RHEL Remote Server management- File Transfer-Lab: Securely coping files between Servers-Log Management- Lab1: Monitoring system logs-Lab2: Recording and Managing Server Logs- Server Monitoring- Lab: Monitoring the Health of the server.

UNIT 4 MANAGING SOFTWARE IN RHEL 9 Hrs.

System software and package management- administering networking in RHEL- Lab: Examining and Configuring Network in Server- Starting and stopping services in RHEL- Lab: Managing Daemons and Services in RHEL- Configuring a web server in RHEL- Lab: Managing a Basic Webserver- Advance Webserver Management-Lab: Advance Webserver Management- Secure Webserver-Lab: Securing the Webserver Effectively- Managing disks and file systems- Lab: Making Simple Partitions- Logical Volume Management- Lab: Implementing Logical Volume Management (LVM)- Configuring Samba

server in RHEL- Lab: Deploy a samba share directory- Configuring an NFS file server in RHEL- Lab: Deploy a NFS Share export- Introducing container technology.

UNIT 5 INTRODUCTION TO GIT 9 Hrs.

Getting started with GIT and its architecture- Lab: Installing and Configuring GIT in RHEL- Remote Repositories- Lab:Exploring GIT Remote Repository- Branching and Merging- Lab: Learning and Exploring Branches in GIT- Configuring databases in LINUX- Lab: MariaDB (MYSQL) installation and configuration in RHEL-MongoDB-Lab: MongoDB installation and configuration in RHEL-Understanding Linux Security OS- Lab: Kali Linux Installation on Virtual Machine- Description about Different Security tools in Kali Linux-Hands-on Study on Nmap and Metasploit-Lab: Gathering information using NMAP-Metasploit-Lab: Vulnerability Management using Metasploit- Knowing LINUX as cloud workhorse-Amazon Web Service (AWS- Lab: Operating and Managing an EC2 Instance in AWS Cloud.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify the need of a Linux Operating System.
CO2 - Know the process management functions of a Linux Operating System.
CO3 - Understand the need of users and group management in Linux Operating System.
CO4 - Find the significance of GIT repositories and databases.
CO5 - Recognize the essentials of file management part of a Linux Operating System.
CO6 - Gain an insight of the importance of cloud and security in Linux Operating System.

TEXT / REFERENCE BOOKS

1. ¯Comprehensive Linux for All ¯, Red Hat, 1st Edition, 2023.
2. Petersen, Richard, ¯Red Hat Enterprise Linux 8: Desktops and Administration, Surfing Turtle Press, 2019.
3. Colino, Miguel Perez, ¯Red Hat Enterprise Linux 8 Administration: Master Linux Administration Skills ¯, Packt Publishing, 2021.
4. Günther, Tobias, ¯Learn Version Control with Git: A Step-By-step Course for the Complete Beginner,Independently Published, 2017.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3038	ADVANCED COMPUTER NETWORKS	L	T	P	EL	Credits	Total Marks
		2	0	2	0	3	100

COURSE OBJECTIVES

- This course intends to introduce topics related to computer networks and internet operating system.
- To gain knowledge on how to develop products networks.
- To introduce basics of Linux kernel architecture where the network devices based on and its interface with various products developed for these devices.

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UNIT 1 LINUX KERNEL 9 Hrs.

Linux Kernel Programming Introduction, Static & Dynamic Linking of modules, User vs Kernel Space, Systems Calls, Makefile for modules. Shell Programming.

Programming Assignments**:** Writing shell programs related to shell function, line count of several files and wait and sleep commands.

UNIT 2 NETWORK DRIVERS 9 Hrs.

Introduction to Network Device Drivers.Character Device Driver Development, Process Synchronization and Scheduling, Interrupt Handling, Kernel Debugging.

Programming Assignments: Writing a kernel program, compiling and inserting and removing a module in kernel.

UNIT 3 eBPF- NETWORKING AND SECURITY 9 Hrs.

Basics of eBPF, Packet Filters basics, Introduction to Kernel's Traffic Control Layer, Use of C for eBPF

Programming Assignments:Writing a simple C program to interact with eBPF using syscall.

UNIT 4 NETWORK OPERATING SYSTEM PROGRAMMING MODULE 9 Hrs.

Introduction to Internet Operating System. Basics of Cisco IOS XR7, Cisco IOS and Open Network Linux. Socket basics, basics of Client-Server Architecture, Basics of Overlay Networking and Virtualization, Content Delivery Networks and Network Automation.

Programming Assignments: Writing a simple C program on SNULL (Simple Network Utility for Loading Localities). Writing a C program to capture network packets.

UNIT 5 NETWORK DRIVERS TESTING 9 Hrs.

Socket basics, Loopback Addressing, Structure of SNULL (Simple Network Utility for Loading Localities).

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamentals of Linux Kernel architecture.
CO2 - Develop products related to advanced computer networks.
CO3 - Deep knowledge in structure of networks to the protocol content and usage level.
CO4 - Understand the internet operating systems running in routers and switches
CO5 - Develop products run in these networks and network devices.
CO6 - Test and maintain the products run in the networks.

TEXT / REFERNCE BOOKS

1. Robert Love, ―Linux Kernel Development‖, 3rd edition, Addison Wesley, 2010.
2. Andrew S.Tanenbaum, David J.Wetherall, ―Computer Networks‖, 5th Edition, Pearson, 2019.
3. M J Bach, ―The Design of the Unix Operating System‖, 1st edition, Pearson Education, 2015.
4. J Cooperstein, ―Writing Linux Device Drivers - A Guide with Exercises‖, Createspace, 2009.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SITB3002	WEB DESIGNING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To define the principles of Web page design
- To visualize the basic concept of HTML
- To understand the basics concept of CSS

UNIT 1 WEB DESIGN PRINCIPLES 9 Hrs.

Basic principles involved in developing a web site - Planning process - Five Golden rules of web designing - Designing navigation bar - Page design - Home Page Layout - Design Concept - Brief History of Internet - What is World Wide Web - Why create a web site - Web Standards - Audience requirement.

UNIT 2 INTRODUCTION TO HTML 9 Hrs.

What is HTML - HTML Documents - Basic structure of an HTML document - Creating an HTML document - Mark up Tags - Heading-Paragraphs - Line Breaks - HTML Tags - Introduction to elements of HTML - Working with Text - Working with Lists, Tables and Frames - Working with Hyperlinks, Images and Multimedia - Working with Forms and controls.

UNIT 3 INTRODUCTION TO CASCADING STYLE SHEETS 9 Hrs.

Concept of CSS - Creating Style Sheet - CSS Properties - CSS Styling (Background, Text Format, Controlling Fonts) - Working with block elements and objects - Working with Lists and Tables - CSS Id and Class - Box Model (Introduction, Border properties, Padding Properties, Margin properties) - CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) - CSS Color - Creating page Layout and Site Designs.

UNIT 4 INTRODUCTION TO WEB PUBLISHING OR HOSTING 9 Hrs.

Creating the Web Site - Saving the site - Working on the web site - Creating web site structure-Creating Titles for web pages - Themes-Publishing web sites.

UNIT 5 RESPONSIVE WEB DESIGN WITH BOOTSTRAP 9 Hrs.

Introduction to Responsive Design - Common device dimensions - Using CSS media queries - view-port tag - Basic custom layout - Introduction to Bootstrap - Installation of Bootstrap - Grid system - Forms – Buttons – Icons Integration.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand Web page design principles
CO2 - Create simple webpage using HTML forms and controls
CO3 - Design a webpage with CSS
CO4 - Create and publishing website
CO5 - Develop web Applications using Responsive web design
CO6 - Application of Bootstrap in website design

TEXT / REFERENCE BOOKS

1. Kogent Learning Solutions, ¯Html 5 In Simple Steps‖, India: Dreamtech Press, 2010.
2. Steven M. Schafer , ¯HTML, XHTML, and CSS Bible‖, 5th edition, Wiley India, 2011.
3. Ian Pouncey, Richard York , ¯Beginning CSS: Cascading Style Sheets for Web Design‖, Wiley India, 2011.
4. Kogent Learning , ¯Web Technologies: HTML, Javascript‖, Wiley India, 2009.
5. Murray,Tom Lynchburg, ¯Creating a Web Page and Web Site‖, College,2002.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3006	SOFTWARE VULNERABILITY TESTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVE

- To understand the fundamentals of Testing and analyse the different methodologies.
- To conduct online web testing.
- To understand about Ethical hacking and information gathering methodologies.

UNIT 1 FUNDAMENTALS OF TESTING AND ANALYSIS 9 Hrs.

A Framework -Principles - Test and Analysis - Basic Techniques: Finite models - Dependency and data flow - Symbolic Executions - Finite state Verification.

UNIT 2 TESTING 9 Hrs.

Functional - Combinational - Structural - Data Flow - Model Based - Fault Based - Inspection - Program Analysis - OOTesting - Integration and Component based - System - Acceptance - Regression.

UNIT 3 INTRODUCTION TO WEB APPLICATIONS SECURITY 9 Hrs.

Threats and Principles, introduction to secure design - web server: introduction a secure setup of apache - firewalling a server Browser: general concepts - functionalities - browsers war - configuration - attack to browsers - users tracking / profiling - browser security & secure browsing.

UNIT 4 ETHICAL HACKING 9 Hrs.

Five stages of hacking-Vulnerability Research-Legal implication of hacking - Impact of hacking - Foot printing & Social engineering. Information gathering methodologies: Competitive Intelligence- DNS Enumerations- Social Engineering attacks. Scanning & Enumeration Port Scanning-Network Scanning-Vulnerability Scanning- NMAP scanning tool- OS Finger printing Enumeration - System Hacking Password.

UNIT 5 SNIFFERS AND SQL INJECTION ACTIVE AND PASSIVE SNIFFING 9 Hrs.

ARP Poisoning- Session Hijacking - DNS Spoofing- Conduct SQL Injection attack - Counter measures. Cracking techniques - Key loggers - Escalating privileges - Hiding Files - Steganography technologies - Counter measures.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the concepts of Testing.
CO2 - Get knowledge of Vulnerability Testing,
CO3 - Test web applications for Vulnerability.
CO4 - Implement open password- protected files.
CO5 - Design and implement vulnerable software applications.
CO6 - Apply common phishing techniques.

TEXT / REFERENCE BOOKS

1. Software Testing and Analysis: Process, Principles, and Techniques, Mauro Pezze,Michal Young, wiley publications, 2008
2. The art of software security assessment : Mark Dowd, John McDonald, Justin Schuh, Pearson Education, 20-Nov-2006 – 20021
3. The Art of Software Security Testing: Chris Wysopal, Lucas Nelson, Elfriede Dustin, Dino Dai Zovi, Pearson Education, 17-Nov-2006.
4. The Hacker Playbook 2: Peter Kim, Secure Planet, LLC, 2015.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB1231	DATASCIENCE AND APPLICATIONS	L	T	P	EL	Credits	TotalMarks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn how to process raw data into formats necessary for analysis.
- To gain in-depth knowledge of fundamental data science concepts through motivating real-world case studies.
- To understand the methods of data handling and big data.

UNIT 1 DATA ACQUISITION 9 Hrs.

Data Acquisition-Sources of acquiring the data - Internal systems and External systems- Web APIs, Data preprocessing-Exploratory Data Analysis (EDA)- Basic tools (plots, graphs and summary statistics) of EDA -Open Data Sources, Data APIs,Web Scrapping-Relational Database access(queries)to process/access data.

UNIT 2 DATA PREPROCESSING AND PREPARATION 9 Hrs.

Data Munging, Wrangling - Data Visualization Basics -Plyr packages - Cast/Melt. Tableau: Creating Visualizations in Tableau-Data hierarchies,filters,groups,sets,calculated fields-Map based visualizations-Build interactive dashboards-DataStories

UNIT 3 DATA QUALITY AND TRANSFORMATION 9 Hrs.

Data imputation -Data Transformation (minmax, log transform, z-score transform etc.,). - Binning, Classing and Standardization. -Outlier/Noise&Anomalies

UNIT 4 HANDLING TEXTDATA 9 Hrs.

Bag-of-words- Regular Expressions - Sentence Splitting and Tokenization - Punctuations and Stop words, Incorrect spellings -Properties of words and Word cloud-Lemmatization and Term-Document TxDcomputation-Sentiment Analysis(CaseStudy)

UNIT 5 PRINCIPLES OF BIGDATA 9 Hrs.

Introduction to BigData-Challenges of processing BigData (Volume,Velocity andVariety perspective)-UseCases.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Explore the fundamental concepts of Data science.
CO2 - Identify the basic data formats.
CO3 - Applydata preprocessing and data visualization techniques to data.
CO4 - Improve the data quality through various transformations.
CO5 - Implement the methods of handling text data.
CO6 - Analyse the challenges in processing Big Data.

TEXT / REFERENCE BOOKS

1. Jeroen Janssens, ¯Data Science at the Command Line‖, O'Reilly, 2015.
2. Wes McKinney, ¯Python for Data Analysis‖, O'Reilly, 2018.
3. Cathy O'Neil and Rachel Schutt, ¯Doing Data Science, Straight Talk from The Frontline‖, O'Reilly. 2014.
4. Avrim Blum, John Hopcroft and Ravindran Kannan, ¯Foundations of Data Science‖, Cambridge University Press, 2020.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3032	CLOUD COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To discuss the basic principles and implementation of cloud computing and different architecture available to deploy the cloud environment.
- To emphasize on the security issues that have to be considered on implementation of cloud.
- To elaborate on the various cloud storage.

UNIT 1 INTRODUCTION 9 Hrs.

Origins of Cloud computing - Cloud components - Essential characteristics - On-demand self-service, Broad network access, Location independent resource pooling, Rapid elasticity, measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT 2 CLOUD INFRASTRUCTURE 9 Hrs.

Datacenter Components: IT Equipment and Facilities Design Considerations: Requirements, Power, Efficiency& Redundancy Power Calculations, PUE and Challenges in Cloud Data Centers Cloud Management and Cloud Software Deployment Considerations -Virtualization, Types of Virtualization - Implementation Levels of Virtualization (CPU, Memory, I/O).

UNIT 3 CLOUD ARCHITECTURE 9 Hrs.

Layers and Models Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption.
Cloud deployment model: Public clouds - Private clouds - Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT 4 CLOUD COMPUTING SOFTWARE SECURITY 9 Hrs.

Cloud Information Security Objectives, Confidentiality, Integrity, Availability, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Secure Development practices, Approaches to Cloud Software Requirement Engineering, Cloud Security Policy Implementation.

UNIT 5 CLOUD STORAGE 9 Hrs.

Introduction to Storage Systems Cloud Storage Concepts Distributed File Systems (HDFS, Ceph FS) Cloud Databases (HBase, MongoDB, Cassandra, Dynamo DB) Cloud Object Storage (Amazon S3, OpenStack Swift, Ceph).

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Implement fundamental cloud computing environment
CO2 - Virtualize a cloud on the system
CO3 - Understand the various architecture that can be implemented in cloud
CO4 - The various security issues that has to be considered while deploying the cloud
CO5 - Understand the process of storing in the cloud
CO6 - Develop applications by deploying a secured cloud environment

TEXT / REFERENCE BOOKS

1. Rao, M. N., ¯ Cloud Computing‖, India: Prentice Hall India Pvt., Limited, 2015.
2. Comer, D., ¯The Cloud Computing Book: The Future of Computing Explained‖, United Kingdom: CRC Press, 2021.
3. John Wtinghouse, James F.Ransome, ¯Cloud Computing Implementation, Management and Security‖, CRC Press.
4. Ronald L. Krutz, Russell Dean Vines, ¯Cloud Security a Comprehensive Guide to secure Cloud Computing‖ , Wiley.
5. Anthony T.Velte , Toby J. Velte Robert Elsenpeter , ¯Cloud Computing A Practical Approach ¯, TATA McGraw- Hill , New Delhi, 2010

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3511	KNOWLEDGE MANAGEMENT SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSEOBJECTIVES

- To study the basic rudiments of knowledge management.
- To learn the coding tools and procedures.
- To explore the faster decision making with knowledge transfer systems.

UNIT 1 KNOWLEDGE MANAGEMENT 9 Hrs.

KMMyths-KMLifeCycle-UnderstandingKnowledge-Knowledge,intelligence-Experience - Common Sense - Cognition and KM - Types of Knowledge - Expert Knowledge - Human ThinkingandLearning.

UNIT 2 KNOWLEDGE MANAGEMENT SYSTEM LIFE CYCLE 9 Hrs.

Challenges in building KM systems- Conventional vsKM System Life Cycle (KMSLS) - Knowledge creation and knowledge architecture - Nonaka's model of knowledge creation and transformation - Knowledge architecture.

UNIT 3 CAPTURING KNOWLEDGE 9 Hrs.

Evaluating the expert - Developing a relationship with experts - Fuzzy reasoning and the quality of knowledge - Knowledge capturing techniques - Brain storming - Protocol analysis - ConsensusDecision making-Repertory grid -Concept mapping-Blackboarding.

UNIT 4 KNOWLEDGE CODIFICATION 9 Hrs.

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 KNOWLEDGE TRANSFER AND SHARING 9 Hrs.

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.

COURSEOUTCOMES

On completion of the course the student will be able to

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

TEXT / REFERENCE BOOKS

1. Elias.M.Awardand Hassan M.Ghaziri, ¯Knowledge Management‖ , Pearson Education, 2007.
2. Guus Schreiber, Hans Akkermans, Anjo Anjewierden, Robertde Hoog, Nigel Shadbolt, Walter Vande, Universities Press, 2001.
3. Veldeand Bob Wielinga, ¯Knowledge Engineering and Management‖,Universities Press, 2001.
4. C.W.Holsapple, ¯Handbooks on Knowledge Management‖, Springer Berlin Heidelberg, 2013.
5. Becerra-Fernandez,I.Sabherwal,R., ¯ Knowledge Management:Systems and Processes‖, M.E.SharpeInc.,2010.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice **20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB1511	KNOWLEDGE REPRESENTATION AND REASONING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the foundations of KRR and the tradeoff betweenrepresentation and reasoning
- To understand which knowledge-based techniques are appropriate forwhich tasks;
- To apply KRR systems to research and challenging problems;

UNIT 1 KNOWLEDGE REPRESENTATION AND REASONING 9 Hrs.

Introduction to Knowledge Base, Models, and Knowledge-Based Agents, Challenges and issues in knowledge representation and reasoning.Nature of Knowledge, Knowledge Acquisition Techniques - Classical Logic.

UNIT 2 LOGIC-BASED KNOWLEDGE REPRESENTATION 9 Hrs.

First-Order Logic: Syntax and Semantics (predicates, variables, quantifiers), First-Order Logic Knowledge Representation Language, Model, Interpretation, Inferences in First Order Logic-Forward Chaining-Backward Chaining. Propositional Logic vs. First-Order Logic-Universal Instantiation, Existential Instantiation, Substitution and Unification, Generalized MP Rule, Soundness of GMP, Resolution Inference Rule, CNFLogic Programming - Prolog.

UNIT 3 NON-LOGIC-BASED KNOWLEDGE REPRESENTATION 9 Hrs.

Semantic networks: nodes, arcs, and semantic inheritance. Frames and scripts: representing structured knowledge using attribute-value pairs and slots.

Conceptual graphs: graphical representation of knowledge and its formal semantics.Ontologies: introduction to ontology languages (such as RDF, OWL) and their role in representing domain knowledge.

UNIT 4 KNOWLEDGE REPRESENTATION AND PLANNING 9 Hrs.

Ontological engineering - categories and objects - events - mental objects and modal logic -reasoning systems for categories - reasoning with default information-Classical planning - algorithms for classical planning - heuristics for planning - hierarchical planning - non-deterministic domains - time, schedule, and resources – analysis.

UNIT 5 APPLICATIONS OF KRR 9 Hrs.

Case studies in Artificial Intelligence: applications of knowledge representation and reasoning in intelligent systems- Planning, robotics, natural language understanding, and intelligent tutoring systems – Intelligent Agents - Robotics and Automation.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamental principles and challenges of knowledge representation and reasoning.
CO2 - Review critical properties of a knowledge-based system
CO3 - Analyze and evaluate different formalisms and languages used for representing knowledge.
CO4 - Apply reasoning techniques to derive new knowledge from existing knowledge.
CO5 - Design and implement knowledge representation systems using logic-based and non-logic-based approaches
CO6 - Examine and incorporate different modelling approaches to solve KRR Problems.

TEXT / REFERNCE BOOKS

1. Stuart Russell and Peter Norvig , "Artificial Intelligence: A Modern Approach", Prentice Hall, 2022.
2. Ronald Brachman and Hector Levesque , "Knowledge Representation and Reasoning", MK Publishers, 2004.
3. Dean Allemang and James Hendler, ¯Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL", Elsevier Science, 2011.
4. Michael Gelfond and Yulia Kahl , "Knowledge Representation, Reasoning, and the Design of Intelligent Agents: The Answer-Set Programming Approach", Cambridge University Press, 2014.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice **20 Marks**
PART B :2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SITB3004	FULL STACK WEB DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand and familiar with JavaScript and NodeJS environments
- To learn about NoSQL database and basics of MongoDB
- To acquire knowledge of connecting the ReactJS Frontend and ExpressJS Backend using fetch

UNIT 1 INTRODUCTION 9 Hrs.

Introduction to JavaScript - Brief History of NodeJS and its alternatives - Installing and Setting up NodeJS Environment - Introduction to NPM Package Manager and Registry - Introduction to Callbacks and Events - File system access and handling streams - Introduction to Common Utility Modules (OS, Path).

UNIT 2 NOSQL DATABASE WITH MONGODB 9 Hrs.

Introduction to NoSQL - Benefits and Disadvantages of NoSQL Databases - Introduction to MongoDB - Installing and Setting up MongoDB Environment - Data Model Design (Embedded and Normalized) - Database Manipulation (Create, Drop, Create & Drop Collections) - Document Manipulation (Insert, Delete, Update, Query (Limit, Sort, Aggregation) - Projection - Introduction and Setting Up Mongoose ORM - Handling Models and Queries with Mongoose.

UNIT 3 FRONTEND DEVELOPMENT WITH REACTJS 9 Hrs.

Introduction to ReactJS - Installation and Creating a Basic React Application - Introduction to JSX - Components and Props - State and Lifecycle - Events and Effects - Conditional Rendering - Introduction to HTTP Requests and fetch - Making HTTP GET and POST Requests - Handling Data from API.

UNIT 4 BACKEND DEVELOPMENT WITH EXPRESSJS 9 Hrs.

Introduction to ExpressJS- Separating the Tasks of Frontend and Backend - Installing and Setting Up ExpressJS Environment - Introduction to APIs - Routing and URL Building - Error Handling -Project Directory Structuring - Handling Form Data and Request Data - Handling and Serving Files - Authentication using Session Keys- Handling Request of Multiple Methods and their placement (GET, POST, DELETE, PATCH) - Documenting an API.

UNIT 5 CREATING A FULL STACK WEB APPLICATION 9 Hrs.

React Page with Input Fields - Extracting and validating Data from Input Field(s) - Making a HTTP Request with Data from Input Field(s) -Using Mongoose with an ExpressJS Application - Inserting Document with Data from HTTP Request - Writing, Handling URL Query Parameters and using its Values to Write Queries with Mongoose - Displaying Data Returned from Backend - Handling Errors in API Requests.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Obtain basic knowledge of JavaScript and its environment.

CO2 - Discuss NoSQL Databases and delve deeper into it using MongoDB and performing basic database operations in it.

CO3 - Familiarize with JSX and React JS to display and manipulate data in a webpage and to make basic HTTP Requests and handle them.

CO4 - Distinguish the roles of frontend and backend, and to work with ExpressJS.

CO5 - To create a basic, complete API and interact with it from the ReactJS frontend.

CO6 - Create real time web applications.

TEXT / REFERENCE BOOKS

1. Bradshaw, Shannon., Brazil, Eoin., Chodorow, Kristina, ¯MongoDB: The Definitive Guide: Powerful and Scalable Data Storage‖, United States: O'Reilly Media, 2019.
2. Ethan Brown, ¯Web Development with Node and Express: Leveraging the JavaScript Stack‖ United States: O'Reilly Media, 2019.
3. Stefanov, Stoyan, ¯React: Up & Running‖, United States: O'Reilly Media, 2021.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice **20 Marks**

PART B :2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3015	BLOCKCHAIN AND DISTRIBUTED LEDGER TECHNOLOGY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand conceptual elements for Blockchain and Distributed Ledger Technologies.
- To acquire knowledge about Blockchain, Cryptocurrencies and Distributed Ledgers.
- To use Hyper Ledger Fabric and Ethereum platform to implement Blockchain applications.

UNIT 1 INTRODUCTION TO BLOCKCHAIN, CRYPTOCURRENCIES AND DISTRIBUTED LEDGERS 9 Hrs.

Blockchain Distributed Ledgers - Cryptographic basics for cryptocurrency - Hashing -Signature schemes - Encryption schemes and elliptic curve cryptography - CAP theorem and blockchain - Categories of blockchains: Public, Private blockchains -Permissioned Ledger - Tokenized blockchains, Tokenless blockchains - Sidechains.

UNIT 2 ESSENTIALS OF CRYPTOCURRENCIES 9 Hrs.

Distributed identity: Public and private keys - Digital identification and wallets - Decentralized network - Distributed ledger: Permissioning framework -Blockchain data structure - Double spending - Network consensus -Sybil attacks - Block rewards and miners, Difficulty under competition - Forks and consensus chain - the 51% attack - Confirmations and finality - The limits of proof-of-work - Alternatives to proof of work.

UNIT 3 BLOCKCHAIN IMPLEMENTATION 9 Hrs.

Bitcoin: Bitcoin and Merkle Root - Eventual Consistency and Bitcoin - Byzantine Fault Tolerance - Bitcoin and Secure Hashing - Bitcoin block-size - Bitcoin Mining - Proof of Work (PoW) - Bitcoin Scripting. Blockchain Collaborative Implementations: Hyper ledger, Corda - ERC 20 and the token explosion.

UNIT 4 FUTURE USE CASES OF DISTRIBUTED LEDGER TECHNOLOGIES 9 Hrs.

Financial Services: Accounting and audit - Global payments - Programmable money - Citizen Identification - Voting - Healthcare: Electronic health records system - Supply chain management- Trade finance - Tokenization of real assets.

UNIT 5 DISTRIBUTED LEDGER TECHNOLOGY IN ALTERNATIVE BLOCKCHAIN 9 Hrs.

Alternative Blockchains: Kadena, Ripple, Stellar, Rootstock, Drivechain, Quorum - Transaction manager: Crypto Enclave - Quorum Chain - Network manager: Tezos, Storj, Maidsafe, BigChainDB.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the cryptographic basis for cryptocurrency.
CO2 - Choose a blockchain implementation based on real time scenario.
CO3 - Categorize the various types of blockchains.
CO4 - Examine the techniques for anonymity preservation.
CO5 - Identify and understand the use cases of distributed ledger technology.
CO6 - Evaluate alternative Blockchains and their applicability.

TEXT / REFERENCE BOOKS

1. Treccani, A., Lipton, A., ¯ Blockchain And Distributed Ledgers: Mathematics, Technology, And Economics‖ , First Edition, Singapore: World Scientific Publishing Company, 2021.
2. Wattenhofer, R.,¯Blockchain Science: Distributed Ledger Technology‖, Third Edition, United States: Independently Published, 2019.
3. Goldfeder, S., Bonneau, J., Miller, A., Felten, E., Narayanan, A., ¯Bitcoin and Cryptocurrency Technologies ¯, First Edition, Princeton University Press, 2016.
4. Bashir, I.,¯Mastering Blockchain: A Deep Dive Into Distributed Ledgers, Consensus Protocols, Smart Contracts, DApps, Cryptocurrencies, Ethereum, and More‖, Third Edition, United Kingdom: Packt Publishing, 2020.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A : 10 Questions of 2 marks each-No choice	**20 Marks**
PART B : 2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SCSB3025	STATISTICAL MACHINE LEARNING	L	T	P	EL	Credits	TotalMarks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand fundamental concepts, techniques of Statistical Learning
- To know how the computer programs, detect human actions, images using pattern recognition**.**
- To understand Supervised Learning algorithms and Unsupervised Learning algorithms.

UNIT 1 STATISTICAL LEARNING 9 Hrs.

Statistical Learning: Estimate f, Supervised Vs Unsupervised Learning, Regression Vs Classification problems, Accessing Model Accuracy, The learning problem: Risk functions, Bias and Variance, Curse of Dimensionality.

UNIT 2 PREDICTION AND CLASSIFICATION 9 Hrs.

Linear Regression: Simple Linear Regression, Multiple Linear Regression, Multivariate Regression - Classification: Overview of Classification, Logistic Regression - Support Vector Machine - Decision Tree - Bayesian Belief Network - Comparison of Classification methods.

UNIT 3 PATTERN RECOGNITION AND ANALYSIS 9 Hrs.

Means and distances - Fisher discriminant analysis - Singular value decomposition - PCA and LDA - Learning paradigms, Bayesian decision theory: Minimum error rate classifier - Parameter estimation: Maximum likelihood and Bayesian Estimation, Hidden Markov models; Nonparametric techniques: Nearest neighbour rules (KNN), Parzen windows.

UNIT 4 CLUSTERING AND ENSEMBLE METHODS 9 Hrs.

Clustering: Partitional - Hierarchical - Ensemble models: Types and techniques - Applications of Ensemble modelling - Evaluation measures - Hypothesis testing - Cross-validation and Hyper parameter optimization – Bootstrapping and Uncertainties.

UNIT 5 KERNEL METHODS, SURVIVAL ANALYSIS AND CASESTUDY 9 Hrs.

Kernel Methods: Mercel kernels- kernel classification- kernel PCA- kernel tests of independence.
Survival Analysis: Survival and Censoring times- Censoring- Kaplan-Meier Survival Curve- Log-Rank Test- Regression models with Survival Response- Shrinkage for the Cox model.
Case Study: Survival Analysis of Brain Cancer data- Publication data and Call Center data.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Use appropriate statistical methods to analyze data.
CO2 - Recognize objects/actions by applying pattern recognition techniques.
CO3 - Apply Reasoning and Uncertainty using Supervised models.
CO4 - Prediction and analysis of data using Unsupervised models.
CO5 - Use Kernel methods to test data independence.
CO6 - Analyse and do prediction of real time data.

TEXT / REFERENCE BOOKS

1. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, ¯Introduction to Statistical Machine Learning with Application in R‖, Springer, Second Illustrated Edition, 2021.
2. Bishop, Christopher M,‖Pattern Recognition and Machine Learning‖, 2013.
3. John Shawe-Taylor, Nello Cristianini, ¯Kernel Methods for Pattern Analysis‖, Cambridge University Press, 2006.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice **20 Marks**
PART B :2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB1251	ARTIFICIAL INTELLIGENCE SEARCH METHODS AND REASONING	L	T	P	EL	Credits	TotalMarks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the different search strategies in AI.
- To gain knowledge in solving AI problems.
- To master the concepts of learning and communication in AI.

UNIT 1 BASIC SCIENCE BEHIND AI 9 Hrs.

Intelligence - Memory - Computation - Learning - AI's Foundation and History - Intelligent Agents: Features -Behaviour in the environment - Rationality - Nature and its Structure - Case Study: AI Programming Languages History: LISP - Prolog -Python.

UNIT 2 SEARCHING TOWARDS SOLUTION 9 Hrs.

Searching Strategies: Informed Search: BFS - DFS - Depth Bounded DFS - Uninformed Search: Heuristic Functions - HillClimbing Search - Best First Search - Local Maxima - Solution Space Search – Adversarial Search - Constraint SatisfactionProblem-CaseStudy:N-QueensProblem.

UNIT 3 KNOWLEDGE: ROLE AND REPRESENTATION 9 Hrs.

Knowledge - Definition and Management - Types: Declarative and Procedural Knowledge - Knowledge Engineering behindLogical Agents: Propositional Logic - First Order Logic - Inference: Forward and Backward Chaining - Ontological Engineering -CaseStudy:Ontology based knowledge representation.

UNIT 4 APPROACHES BEHIND PLANNING AND REASONING 9 Hrs.

Algorithm for Planning as State Space Search - Analysis of Planning Approach - Reasoning: Bayes Rule - Bayesian Network and its approximation-Hidden Markov Model-Kalman Filters-Decision Networks-CaseStudy: Wumpus World Problem.

UNIT 5 DECODING AND LEARNING INTELLIGENCE 9 Hrs.

Learning Algorithms: Classification and Regression with Linear Model - Non-Parametric Models - Ensemble Learning -Explanation Based Learning - Learning with Hidden Variables - AI Real Time Applications - Case Study: Nature Inspired Computation.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Identify the search algorithm for the AI problems.
CO2 - Represent a problem using first order logic.
CO3 - Provide the knowledge-based agent to solve the problem.
CO4 - Understand the Informed search strategies.
CO5 - Apply the Bayes rule to solve the problems of societal concern
CO6 - Design user centric applications using AI concepts.

TEXT / REFERENCE BOOKS

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

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice **20 Marks**
PART B :2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3039	ADVANCED DATA STRUCTURES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To acquire knowledge of organizing the data in nonlinear fashion.
- To get the idea of balancing the height of trees to optimize the structure and search time.
- To understand the method of designing the table data structure and its applications

UNIT 1 TREE STRUCTURES 9 Hrs.

AVL Trees-Single rotation, Double rotation- Splay Trees-Red-Black Trees, B-Trees: Definition of B-trees- Basic operations on B-trees- Deleting a key from a B-tree-2-3 Trees.

UNIT 2 DIGITAL SEARCH STRUCTURES 9 Hrs.

Digital Search trees- Binary tries and Patricia- Multiway Tries-Suffix trees,-Standard Tries- Compressed Tries Pattern matching Introduction- The naive string-matching algorithm-The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm.

UNIT 3 HEAPS 9 Hrs.

Introduction, Binary Heaps- Basic Heap Operations- Binomial Heaps/Queues- Binomial Queue Structure- Binomial Queue Operations- Implementation of Binomial Heaps.

UNIT 4 SETS 9 Hrs.

Sets: Representation - Operations on sets - The Disjoint Sets Class - Equivalence relation- Basic Data Structure,-Union and Find algorithms-Smart Union and Path compression algorithm- Applications.

UNIT 5 TABLES 9 Hrs.

Rectangular tables - Jagged tables - Inverted tables - Symbol tables - Static tree tables - Dynamic tree tables - Hash tables- Hash Function- Separate Chaining-Linear Probing- Quadratic Probing,-Double Hashing- Rehashing-Universal Hashing- Extendible Hashing.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Design and Implement operations on augmenting data structures.
CO2 - Apply String Matching techniques for solving problems effectively.
CO3 - Apply the basic heap operations to design and implement various types of Heaps.
CO4 - Perform the operation like Union, find min, extract min and delete operation on sets.
CO5 - Design table data structure and apply it for many applications.
CO6 - Analyze the given scenario and choose appropriate Data Structure for solving problems.

TEXT / REFERENCE BOOKS

1. Jean-Paul Tremblay, Paul G. Sorenson, ¯An Introduction to Data Structures with Application‖, TMH, 2017.
2. Mark Allen Weiss, ¯Data Structures and Algorithm Analysis in C++‖, Fourth Edition, 2014.
3. Larry R. Nyhoff, ¯ADTs, Data Structures, and Problem Solving with C++‖, Pearson Education, 2009.
4. Thomas H. Cormen, Charles E. Leiserson, ¯Introduction to Algorithms‖, 4th Edition, MIT Press, 2022.
5. Goodrich MT, Tamassia R, Goldwasser MH.,¯Data structures and algorithms in Python‖, John Wiley and Sons Ltd; 2013.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice **20 Marks**
PART B :2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB3642	INTELLIGENT ROBOTS AND DRONE TECHNOLOGY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To explore the knowledge of intelligent robots.
- To explore the mechanism of drone technology.
- To understand the various applications of drones in real world.

UNIT 1 INTRODUCTION 9 Hrs.

Overview of robotics - Robotics in AI - Embedded Systems - Agent Task Environment model-Embodied Systems - Sensors and signal processing - Planning approaches to robot control: STRIPS and SHAKEY- Robot manipulator kinematics

UNIT 2 APPROACHES 9 Hrs.

Control Theory: Feedback, feed forward and open loop control - Linear first order lag processes - Limitations of control theory- Probability Based Approaches: Markov Decision Processes (MDPs) - Navigation - Behaviour-Based Control: The subsumption architecture - Hybrid architectures - Formalising behaviour based control (SMDPs) - Adaptive approaches to robot control- Reinforcement learning for control- Model Based learning approaches to control- Learning maps - Evolutionary approaches

UNIT 3 DRONE TECHNOLOGY 9 Hrs.

Drone Concepts - Terminologies - History of drone - Types of current generation of drones based on their method of propulsion - Drone design and fabrication: Classifications of the UAV - Overview of the main drone parts technical characteristics of the parts Function of the component parts

UNIT 4 DRONE PROGRAMMING 9 Hrs.

Drones' configurations The methods of programming drone Download program Install program on computer Running Programs Multirotor stabilization Flight modes - Drone flying and operation: Concept of operation for drone Flight modes - Drone accessories - Sensors - Onboard storage capacity Removable storage devices Linked mobile devices and applications

UNIT 5 DRONE MAINTENANCE 9 Hrs.

Drone commercial applications: Drones in agriculture - Drones in inspection of transmission lines and power distribution - Drones in filming and panoramic picturing - Future of drones : Miniaturization of drones - Increasing autonomy of drones - The use of drones in swarms

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the basics behind robotics and embedded system
CO2 - Learn basic approaches behind robotic controls
CO3 - List out different terminologies and concept behind drone
CO4 - Design and develop programs for drone movement and configuration
CO5 - Apply drone technology for various commercial applications
CO6 - Develop drones for real time societal needs

TEXT / REFERENCE BOOKS

1. Nitin Goyal, Sharad Sharma, Arun Kumar Rana, Suman Lata Tripathi, Internet of Things Robotic and Drone Technology, CRC Press, 2021.
2. Neil Wilkins, Robotics: What Beginners Need to Know about Robotic Process Automation, Mobile Robots, Artificial Intelligence, Machine Learning, Autonomous Vehicles, Speech Recognition, Drones, and Our Future, Independently Published ,2019.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice **20 Marks**
PART B :2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB1371	PRIVACY AND SECURITY IN ONLINE SOCIAL MEDIA	L	T	P	EL	Credits	Total Marks
		3	0	0	3	3	100

COURSE OBJECTIVES

- To discuss about privacy in social networks
- To study the different encryption system in social network
- To know the importance of K-Anonymity

UNIT 1 ANALYSIS OF PRIVACY IN SOCIAL NETWORKS 9 Hrs.

Introduction to social media- Modern social media outlets- Three-Layered Framework-Characteristics Used to Analyze Social Web Privacy-Social Media: End Users and Business - Privacy Issues Related to Social Web Users-Privacy Issues Related to Service Providers-Security and Privacy for Digital Facets-Identifiable Facets-Private Facets- Technological safeguards.

UNIT 2 ENCRYPTION FOR PEER-TO-PEER SOCIAL NETWORKS 9 Hrs.

Introduction to P2P bases OSN Architecture-Essential Criteria for the P2P Encryption Systems-Existing P2P OSN Architectures-Evaluations of Existing Encryption Schemes Based on Our Criteria-Broadcast Encryption-Predicate Encryption-Survey of Unethical Behaviour-Influencing factors.

UNIT 3 STEALING REALITY AND K-ANONYMITY 9 Hrs.

Stealing Reality- Social Attack Model- Social Learnability- k-Anonymity- k-Degree Anonymity- k-Neighbourhood Anonymity- k-Automorphism- k-Isomorphism-L-diversity- Attack Model and Privacy Guarantee- Insights from an ℓ-Diversified Graph- Anonymization Techniques.

UNIT 4 LINKS RECONSTRUCTION ATTACK AND BITCOIN SYSTEM 9 Hrs.

Privacy in Social Networks- Link Prediction- Feature Extraction- Communities Datasets- Electronic Currencies- Anonymity- The Bitcoin System- The Transaction Network- The User Network- Anonymity Analysis- Integrating Off-Network Information- The Bitcoin Faucet- Voluntary Disclosures- TCP/IP Layer Information- Context Discovery- Flow and Temporal Analyses.

UNIT 5 PRIVACY-PRESERVING DATA INTEGRATION USING DECOUPLED DATA 9 Hrs.

Record Linkage - Privacy- Preserving Computation- Use Case and the Threat Model - Use Case for Privacy- Preserving Record Linkage- Threat Model for Privacy-Preserving Record Linkage - Information and Privacy - Sensitivity and Identifiability - Decoupled Data Access Model - Social Security Numbers- Need for Chaffing.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the concepts of privacy in social network.
CO2 - Apply the Different encryption techniques
CO3 - Know How to Steal and Attack social model
CO4 - Understand the importance of Bitcoin System.
CO5 - Analyze the privacy preserving for decoupled data.
CO6 - Develop the use-case models for privacy preservation

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice	**20 Marks**
PART B :2 Questions from each unit with internal choice, each carrying 16 marks	**80 Marks**

SBAB4001	PRINCIPLES AND PRACTICES OF MANAGEMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To analyse how the field of Management has evolved and its significant contributions
- To analyse and apply the critical role of managers in modern organizational settings.
- To illustrate and evaluate the importance of planning, organizing, directing and controlling in decision making.

UNIT 1 INTRODUCTION 9 Hrs.

Definition- Functions- Process- Scope and Significance of Management.Nature of Management- Managerial Roles- Managerial Skills and Activities- Difference between Management and Administration.Significance of Values and Ethics in Management.

UNIT 2 SCHOOLS OF MANAGEMENT 9 Hrs.

Evolution of Management Thought - Contributions of F.W. Taylor- Henry Fayol- Elton Mayo- Approaches of Management Thought (including MBO & MBE) Functions of Management. Concept of Leadership- Theories and Styles

UNIT 3 PLANNING AND ORGANIZING 9 Hrs.

Nature- Scope- Objective and Significance of Planning- Elements and Steps of Planning- Decision Making Organizing Principles- Span of Control- Line and Staff Relationship- Authority- Delegation and Decentralization. Effective Organizing- Organizational Structures- Formal and Informal Organizations- Staffing.

UNIT 4 DIRECTING 9 Hrs.

Effective Directing- Supervision- Motivation: Different Theories of Motivation - Maslow- Herzberg- Mc Clelland- Vroom- Porter and Lawler- Job Satisfaction. Communication Process- Channels and Barriers- Effective Communication.

UNIT 5 CONTROLLING AND COORDINATING 9 Hrs.

Elements of Managerial Control- Control Systems- Management Control Techniques- Effective Control Systems.Coordination Concept- Importance- Principles and Techniques of Coordination- Concept of Managerial Effectiveness.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course,student will be able to

CO1 - Understanding of basic management concepts, principles, and practices.
CO2 - Develop planning and decision-making strategies in an organization.
CO3 - Summarize the concept and complete the process of organizing.
CO4 - Develop an understanding of staffing, leadership, directing and motivation in an organization.
CO5 - Predict the dynamics of controlling and its emerging issues in management.
CO6 - Assess managerial practices and choices relative to ethical principles and standards

TEXT / REFERENCE BOOKS

1. Stephen P. Robbins, David A. Decenzo, Fundamentals of Management, Pearson Education, 9th Edition.
2. Harold Koontz, O'Donnell and Heinz Weihrich, Essentials of Management. New Delhi, 9th edition, Tata McGraw Hill.
3. Management Fundamentals: Concepts, Applications, & Skill Development, 6th edition, Sage.
4. Richard L. Daft, Principles of Management, Cengage Learning.
5. Prasad, L.M. Principles and Practice of Management, Sultan Chand.
6. Jhunjhunwala J Mohanty, Management Principles and Applications, Himalaya Publishing House.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice **20 Marks**
PART B :2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

S41BPB41	VENTURE CREATION	L	T	P	EL	Credits	Total Marks
		2	0	0	3	3	100

COURSE OBJECTIVES

- To develop an entrepreneurial mindset, understand the concept of entrepreneurship and identify personal strengths and weaknesses
- To understand the design thinking process and apply design thinking to real-world problems
- To identify problems and opportunities and develop ideas for new ventures by assessing market potential
- To develop a value proposition, business model canvas, build MVP to create sustainable differentiation for the venture with a well-structured business plan, unit economics, go-to-market strategies and funding plan for managing business growth
- To build an idea pitch and deliver it with confidence to potential stakeholders

UNIT 1 INTRODUCTION TO ENTREPRENEURSHIP 9 Hrs.

Defining Entrepreneurship, evolution the concept & Emerging Trends in Entrepreneurship (Domain specific), Understanding the unique opportunities-Why be an Entrepreneur? Entrepreneurship in Indian Scenario & Its role in economic development-Success stories of Entrepreneur (Domain specific)-Entrepreneurial style assessment tool-Developing the Entrepreneurial mindset- Attributes & skills, recognizing your sweet spot for starting up-Principles of Effectuation-Myths about Entrepreneurship-Types of Entrepreneurs-Entrepreneur vs Intrapreneur-Role of Entrepreneurial Teams.

UNIT 2 DESIGN THINKING AND OPPORTUNITY DISCOVERY 9 Hrs.

Introduction to Design Thinking for startups -Design Thinking principles & process-Define the problem using Design thinking principles and validate Problem-Generation of ideas, Idea generation techniques and evaluating creative ideas-Identify problem worth solving-Sharpen your Problem Pitch.

UNIT 3 CUSTOMER, MARKETS AND CREATING A SUSTAINABLE DIFFERENTIATION 9 Hrs.

Differentiate between a customer and a consumer -Who is your customer and what is your segment -Customer Job, Pains, and Gains using Value proposition Canvas -Build solution using Value Proposition Canvas -Market Estimation-TAM,SAM,SOM-Competitive analysis -Minimum viable product – what is MVP -Build - Measure - Learn, differentiate between solution Demo & MVP -How to validate MVP- Achieve a Product – Market fit.

UNIT 4 BUSINESS MODEL, BUSINESS PLANNING AND GO TO MARKET STRATEGIES 9 Hrs.

Introduction to Business model -Business plan -Lean approach 9 block lean canvas model-Financial feasibility: Costs, revenue streams- Pricing- Financial Projections- Key Financial Metrics using financial template- Managing growth & targeting scale- Unit economics-Selecting the Right Channel-Introduction to Digital Marketing and tools-Branding strategy.

UNIT 5 FUNDING STRATEGY 9 Hrs.

Sources of funds: Debt &Equity -Map the Start-up Lifecycle to Funding Options-Build an Investor ready pitch deck.

COURSE OUTCOMES

On completion of the course,student will be able

CO1 - To define entrepreneurship and explain emerging trends in entrepreneurship

CO2 - To identify and evaluate business opportunities and assess market potential

CO3 - To conduct customer discovery, market research, build a lean canvas, develop a business plan and marketing strategies

CO4 - To identify sources of funding and develop a funding strategy, understand basic legal requirement for starting and running a business

CO5 - To build an idea pitch and deliver it with confidence to various stakeholders

TEXT / REFERENCE BOOKS

1. Hisrich, R. D., Peters, M. P., & Shepherd, D. A. Entrepreneurship (10th ed.). McGraw-Hill Education. (2017).
2. Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business. (2011).
3. Blank, S. G., & Dorf, B. The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company. K&S Ranch. (2012).
4. Roy, R. Indian Entrepreneurship: Theory and Practice. New Delhi: Oxford University Press. (2017).
5. Chandan, J. S., & Rana, S. S. Entrepreneurship Development and Management. New Delhi: McGraw Hill Education. (2019).
6. Sinek, S. Start with Why: How Great Leaders Inspire Everyone to Take Action. Portfolio. (2011).
7. Choudhary, R., & Mehta, N. From Zero to One: How to Build a Successful Startup in India. Notion Press. (2019).
8. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).
9. Mitra, P., & Banerjee, A. Startup Minds: The Entrepreneur's Journey from Idea to Success. SAGE Publications India. (2019).
10. Thiel, P. Zero to One: Notes on Startups, or How to Build the Future. Crown Business. (2014).
11. Zappos, T. Delivering Happiness: A Path to Profits, Passion, and Purpose. Business Plus. (2010).

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice **20 Marks**

PART B :2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB4006	SOFTWARE PROJECT MANAGEMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamental principles of software project management.
- To have a good knowledge of responsibilities of project manager.
- To be familiar with the different methods and techniques used for project management

UNIT 1 INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9 Hrs.

Introduction to Software Project Management - Activities covered by software project management - Plans - Methods and methodologies - Categorizing software projects - Project evaluation and programme management - Project portfolio management - Evaluation of individual projects -Cost benefit evaluation techniques - Risk evaluation - Programme management - Managing the allocation of resources within programme management - An overview of project planning.

UNIT 2 SELECTION OF APPROPRIATE PROJECT APPROACH, EFFORT ESTIMATION 9 Hrs.

Selection of an appropriate project approach - Choosing methodologies and technologies - Software processes and process models - Choice of process models - Structure versus speed of delivery - Software effort estimation - Problems with over and under-estimates - Software effort estimation techniques - Bottom-up estimation - Top-down approach and Parametric models - Expert judgment - Estimating by analogy - COCOMO model - Cost estimation - Staffing pattern - Effect of schedule compression.

UNIT 3 ACTIVITY PLANNING AND RISK MANAGEMENT 9 Hrs.

Activity planning - Project schedules - Projects and activities - Sequencing and scheduling activities - Network Planning models - Risk management - Categories of risk - Risk Management approaches - A Framework for dealing with risk - Risk identification - Risk assessment - Risk planning - Risk management - Boehm‘s Top 10 risks and counter measures - Resource allocation - Nature of resources - Identifying resource requirements - Scheduling resources - Creating critical paths - Counting the cost.

UNIT 4 MONITORING AND CONTROL 9 Hrs.

Monitoring and control - Creating the framework - Collecting the data - Review - Visualizing progress - Cost monitoring - Earned value analysis - Prioritizing monitoring - Getting the project back to target - Change control - Software configuration management - Managing contracts - Managing people in software environment - Understanding behavior - Organizational behavior - Selecting the right person for the job - Instruction in the best methods - Motivation - The Oldham-Hackman job characteristics model - Stress management.

UNIT 5 SOFTWARE QUALITY 9 Hrs.

Software quality - Importance of software quality - Defining software quality - Software quality models - ISO 9126 - Product and process metrics - Product versus process quality management - Quality Management Systems - Process capability models -Techniques to help enhance software quality - Testing - Software reliability - Quality plans.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Apply project management concepts and techniques to an IT project.
CO2 - Identify issues that could lead to IT project success or failure.
CO3 - Explain project management in terms of the software development process.
CO4 - Describe the responsibilities of IT project managers.
CO5 - Apply project management concepts through working in a group as team leader
CO6 - Be an active team member on an IT project.

TEXT / REFERENCE BOOKS

1. Bob Hughes, Mike Cotterell, Rajib Mall, Software Project Management, TMH Edition 6, 2018.
2. Walker Royce, Software Project Management, Pearson Edition, 2005.
3. Stellman and Greene, Applied Software Project Management 1st Edition, Kindle Edition
4. Richard Thayer, Edward Yourdon, Software Engineering Project Management, WILEY
5. Jack Marchewka, Information Technology Project Management providing measurable organizational value, WILEY 2016.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice **20 Marks**
PART B :2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSB1714	SMART PRODUCT DEVELOPMENT	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce basic working principles of sensor devices
- To educate different interface medium for communication
- To impart knowledge on different automation system

UNIT 1 INTRODUCTION TO SENSOR DEVICES 9 Hrs.

Piezoresistive pressure sensor- Piezoresistive Accelerometer - Capacitive Sensing- Accelerometer and Microphone - Resonant Sensor and Vibratory Gyroscope - Low-Power, Low Voltage Sensors- Micro Electro Mechanical Systems Analysis and Design of MEMS Devices- Nano Sensors.

UNIT 2 INTERFACING SENSOR INFORMATION AND MCU 9 Hrs.

Amplification and Signal Conditioning- Integrated Signal Conditioning- Digital conversion- MCU Control MCUs for Sensor Interface Techniques and System Considerations- Sensor Integration.

UNIT 3 CONTROL TECHNIQUES AND STANDARDS 9 Hrs.

Control of Sensors using - State Machines, Fuzzy Logic, Neural Networks, Adaptive Control. Control Application using - CISC, RISC, DSP Control and IEEE 1451 Standards.

UNIT 4 COMMUNICATION FOR SMART SENSORS 9 Hrs.

Wireless Data Communications- RF Sensing- Telemetry- Automotive Protocols- Industrial Networks Home Automation- MCU Protocols.

UNIT 5 SMART CITIES USE CASE 9 Hrs.

Smart Adaptive advertising - Customized Digital experience, Disaster Prevention, Smart Agriculture, Smart Health, Smart Security and Surveillance, Smart Virtual Assistance - Leadership & Policy Makers, Challenges & Solutions in Building AI, IoT, case study: IoT Application for Water & Waste Management.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Comprehend the requirements of product design
CO2 - Analyse of different design.
CO3 - Develop different interfaces
CO4 - Work in different communication medium
CO5 - Understand the automation process
CO6 - Develop applications using AI technique

TEXT / REFERENCE BOOKS

1. Designing the Internet of Things, Adrian McEwen & Hakim Cassimally, Wiley, 2014.
2. Smart Sensors for Industrial Applications (Devices, Circuits, and Systems) by Krzysztof Iniewski, CRC Press, 2017.
3. IoT Google, Amazon Alexa, Signal Jammer, ESP 8266 NodeMCU and Location Tracker etc.,: New model technology development, Anbazhagan k, 2019 .

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 **Exam Duration : 3 Hrs.**

PART A :10 Questions of 2 marks each-No choice **20 Marks**
PART B :2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**