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

COURSE OBJECTIVES

- To understand specialized subject tare as and skills included for their study.
- To comprehend and reactinoral and written forms to the specialized texts.
- To respondtolistening,reading and writing tasks by using 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 : Self Introduction, 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.
Language Focus : Parts of Speech, Tense and its types, Voice - Impersonal Passive.
Language Lab work : Focus Digital literacy: 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 byreadingcontent.
Writing : Writing compare/ contrast paragraphs, process description, E-Mail Writing.
Vocabulary : Verbal phrases,Prepositions and Prepositional phrases,Concord,Discourse Markers.
Language Focus: Clauses,Conjunctions, SentenceTypes - Simple,Compound & Complex.
LanguageLab : Digitalliteracy:RespondingtoquizusingKahootapplication.

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 open ended questions-SurveyReport-Arranging the sentences in the right order.
Vocabulary : Paired expressions, Adjectives/ adverbs, Technical definitions, Compound. Nouns Language
Focus : Punctuation,Editing,Samewordsusedasdifferentpartsofspeech.
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	:	Essaywriting,Check list preparation,Notemaking.
Vocabulary	:	Homophones/Homonyms,Idioms and Phrases.
Language Focus:		Negatives, Tag questions, Similes and Metaphors.
Language Lab	:	Digitalliteracy: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 the min 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 - Interprettechnical definitions related to the text and design a user manual using instructions.
CO5 - Summarize reading materials and outline a nessayon any topic given.
CO6 - Demonstrate their language learning activities in the classroom /online group environment.

TEXT / REFERENCE 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 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**

SMTB1103	CALCULUS AND NUMERICAL METHODS	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 DIFFERENTIAL CALCULUS 9 Hrs.

Definitions – Derivative of standard functions (Results only) - Differentiation of function of function – Logarithmic differentiation – Derivatives of implicit function – Partial derivatives (Simple Problems only).

UNIT 2 INTEGRAL CALCULUS 9 Hrs.

Integral of standard functions (Results only) – Integration by the method of substitution– Integration using partial fractions – Integration by parts – Generalization of integration by parts – Definite integral – Properties – Simple problems.

UNIT 3 DIFFERENTIAL EQUATIONS 9 Hrs.

Higher order linear differential equations with constant coefficients – Particular Integral for e^{ax}, sinax or cosax, x^n, $x^n e^{ax}$– Method of Variation of Parameters – Homogeneous equation of Euler's – System of simultaneous linear differential equations with constant coefficients.

UNIT 4 NUMERICAL METHODS FOR SOLVING EQUATIONS 9 Hrs.

Solution of algebraic equation and transcendental equation: RegulaFalsi 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 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 - Evaluate Definite Integrals and analyze properties of Beta and Gamma functions.
CO2 - Examine the maxima and minima of functions of several variables..
CO3 - Solve any higher order linear differential equations.
CO4 - Categorize and implement the numerical solutions of algebraic, transcendental, simultaneous linear equations.
CO5 - Appraise various numerical methods for Interpolation.
CO6 - Develop the solutions for Numerical differentiation and integration.

TEXT / REFERENCE BOOKS

1. Narayanan, S. and Manickavachagam Pillai, T.K., Calculus, Vol.I and Vol. II, S.Viswanathan Printers & Publishers, 2009.
2. P.R.Vittal., Calculus -Margham Publications, 2000.
3. Veerarajan T., Engineering Mathematics for First Year, II Edition, Tata McGraw Hill Publishers, New Delhi, 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, New Delhi 2011.
6. Steven C .Chapra, Raymond P. Canale, Numerical Methods for Engineers, Tata McGraw Hill Publishing Co., New Delhi, 2003.
7. Kandasamy P., Thilagavathy K., and Gunavathy K., Applied Numerical Methods, S. Chand & Co., New Delhi, 2003.

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**

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 the Identify 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

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

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

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

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

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 and analyse acoustic properties of typically used materials for design consideration.

CO5 - Understanding the working, design considerations and applications of various semi conducting 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 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**

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

COURSE OBJECTIVES

- 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.

UNIT 1 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.

UNIT 2 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.

UNIT 3 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.

UNIT 4 SEMICONDUCTOR 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.

UNIT 5 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. 45 Hrs.

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 - Demonstrate the characteristics of various semi-conductor devices

CO5 - Analyze characteristics of Switched Mode Power Supply

CO6 - Design power supply unit using regulator IC.

TEXT / REFERENCE BOOKS

1. Dr. Ramana Pilla, Dr. M Surya Kalavathi & Dr. G T Chandra Sekhar, Basic Electrical Engineering, S.Chand & Co.,2022.
2. Dr.Sanjay Sharma ,Electronic Devices and Circuits,2nd edition,S.K.Kataria & Sons,2012.
3. B.N.Mittle & 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 & Co.,2009.
6. G.K.Mithal, Basic Electronic Devices and circuits,2nd Edition, G.K.Publishers Pvt,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**

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 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.

Practical:

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.

Practical:

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

Practical:

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 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

Practical:

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

Practical:

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 Cost
   (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 Practical 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
2. R.G.Dromey “How to solve it by computer”, Pearson Education, Low Price Edition.
3. Balagurusamy, “Programming in ANSI C”, McGrawHill Publications, Eighth Edition.
4. Greg Perry, Dean Miller “C Programming Absolute Beginner’s Guide”, Third 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 carrying 16 marks **80 Marks**

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

LIST OF SUGGESTED 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 fiber.
11. Photoelectric effect
12. Michelson Interferometer.
13. V-I characterization 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 minimum deviation by spectrometer.

CO3 - Analyze 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.

SMTB1203	DISCRETE STRUCTURES	L	T	P	EL	CREDITS	TOTAL MARKS
		2	0	0	3	2	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 thinkig is attained.

UNIT 1 LOGIC 9 Hrs.

Statements – Truth Tables – Connectives – Equivalent Propositions – Tautological Implication – Normal Forms – Inference Theory – Consistency and Inconsistency of Premises. Proportional Functions – Quantifiers – Universal and Existential – Inference Theory – Rules of Inference Theory – Problems.

UNIT 2 ALGEBRAIC STRUCTURES 9 Hrs.

Algebraic system – Semigroups – Monoids (definitions and examples only) – Groups – Cyclic groups – Subgroups – Cosets – Lagrange's Theorem.

UNIT 3 COMBINATORICS 9 Hrs.

Mathematical Induction – Recurrence Relation – Solving Homogeneous and Non- Homogeneous Recurrence Relations – Generating Functions-Partial order relation – Hasse Diagram – Lattices – Properties of Lattices – Duality of Lattices – Special Lattices – Modular lattices – Complemnented Lattices – Distributive Lattices.

UNIT 4 BOOLEAN ALGEBRA 9 Hrs.

Boolean Identities – Atomic Boolean Algebra – Boolean Functions – Simplification of Boolean Functions.

UNIT 4 GRAPH THEORY 9 Hrs.

Introduction to Graphs – Graph Terminology – Cycles – Paths – Complete and Bipartite Graphs – Matrix Representation of Graphs – Graph Isomorphism – Connectivity – Trees – Euler and Hamiltonian Graphs

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 predicate calculus. Distinguish PCNF and PDNF.

CO2- Understand the basics of group properties and cosets. Apply the above concepts to derive Lagrange's theorem.

CO3 - Appraise the solution of mathematical induction and pigeon hole principle. Develop the recurrence relation and generating functions.

CO4 - Distinguish PCNF and PDNF. Analyze properties of functions and groups.

CO5 - Develop Euler, Hamiltonian paths. Identify graph isomorphism.

CO6 - Illustrate the generality of tree, binary tree and tree expression.

TEXT / REFERENCE BOOKS

1. Kenneth H. Rosen, Discrete Mathematics and its applications, 6thEdition, McGraw- Hill, 2007.
2. Veerarajan T., Discrete mathematics with Graph Theory and Combinatorics, Tata Mcgraw Hill Publishing Co., NewDelhi, 2006.
3. NarasinghDeo, 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 carrying 16 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 STRUCTUR 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 H2 – 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 (CO2 and H2O) – Determination of Force constant – Electronic transitions in organic molecules – Mathematical derivation of Beer-Lambert's law.

UNIT 3 ELECTROCHEMISTRY 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/SOCl2 cell - Li/I2 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, 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.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

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

PARTA:	10 Questions carrying 2 marks each – No choice	**20 Marks**
PARTB:	2 Questions from each unit of internal choice, each carrying 16marks	**80 Marks**

S11BLH31	INTRODUCTION TO IOT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of Internet of Things To identify the various elements of an IoT System.
- To understand the various means of communication from Node / Gateway to Cloud Platforms.
- To transfer data from IoT devices to various cloud providers.
- To make students aware of various domain specific applications and challenges while implementing IoT solutions.

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 ELEMENTS OF IoT 9 Hrs.

Application Sensors & Actuators - Edge Networking (WSN) Gateways - IoT Communication Model WPAN & LPWA, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards, Wearable Development Boards .

UNIT 3 COMMUNICATION AND CONNECTIVE TECHNOLOGIES 9 Hrs.

IoT Communication Model - Wireless medium access issues - MAC protocol survey -Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination. Communication technologies, Long-range Wireless Protocols : LoRa WAN, Ingenu, Satellite Communications, Short-range Wireless Protocols : ANT+, WiFi, ZigBee, WHART, EnOcean, Z-Wave, NFC communication technologies : Zigbee Wifi - Zwave.

UNIT 4 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 5 DOMAIN SPECIFIC APPLICATIONS OF IoT 9 Hrs.

Home automation, Industry applications, Surveillance applications, Other IoT applications - Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform case studies : Soil moisture monitoring, Weather monitoring, Air quality Monitoring, Movement Detection.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand general concepts of Internet of Things (IoT).
CO2 - Recognize various devices, sensors and applications.
CO3 - Apply design concept to IoT solutions.
CO4 - Analyze various M2M and IoT architectures.
CO5 - Evaluate design issues in IoT applications.
CO6 - Create IoT solutions using sensors, actuators and Devices.

TEXT / REFERENCE BOOKS

1. Boswarthick,Omar Elloumi., The Internet of Things: Applications and Protocols, Wiley publications., 2012.
2. Dieter Uckelmann, Mark Harrison, Florian Michahelles., Architecting the Internet of Things, Springer publications.2011.
3. Marco Schwatrz Internet of Things with Arduino Cookbook, Packt Publications.2016 .
4. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Kamouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
5. Vijay Madisetti, Arshdeep Bahga, "Internet of Things : A Hands on Approach", published by Vijay Madisetti 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**

SECB1102	FUNDAMENTALS OF DIGITAL SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand number systems and codes.
- To illustrate simplified Boolean expressions using Gates.
- To construct combinational logic circuits.
- To design sequential logic circuits.
- To analyze circuits and latches.

UNIT 1 NUMBER SYSTEMS,COMPLIMENTS AND CODES 9 Hrs.

Number Systems – Binary Numbers-Number base conversions-Octal and Hexa Decimal Numbers – Complements –Signed Binary Numbers-Binary Arithmetic –Binary Codes-Decimal Code-Error Detection code-Gray Code- Reflection and Self Complementary codes-BCD number representation – Alphanumeric codes ASCII/EBCDIC –Hamming Code- Generation, Error Correction.

UNIT 2 BOOLEAN ALGEBRA AND LOGIC GATES 9 Hrs.

Axiomatic definitions of Boolean Algebra – Basic Theorems and Properties of Boolean Algebra – Boolean Functions- Canonical and Standard forms-Digital Logic Gates– Simplification of Boolean Expressions:The map method- SOP and POS – NAND and NOR implementation-Don't Cares –The Tabulation Method-Determination and Selection of Prime Implicants.

UNIT 3 COMBINATIONAL LOGIC 9 Hrs.

Design Procedure-Adder – Subtracter – Code Conversion – Analysis Procedure –Multilevel NAND/NOR circuits-Exclusive OR functions – Binary adder and subtractor– Decimal adder – BCD adder – Magnitude Comparator – Decoders – Demultiplexer – Encoder – Multiplexers.

UNIT 4 SYNCHRONOUS SEQUENTIAL LOGIC 9 Hrs.

Flip Flops – Analysis of clocked sequential circuit –Reduction and Assignments–Flip flop excitation tables-Design Procedure-Design of counters-Registers-Shift registers-Synchronous Counters-Timing sequences-Algorithmic State Machines-ASM chart-timing considerations-control implementation.

UNIT 5 ASYNCHRONOUS SEQUENTIAL LOGIC AND MEMORY UNIT 9 Hrs.

Circuits with Latches-Analysis procedure and Design Procedure-Reduction of state and Flow tables-Race –Free State Assignment.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Perform conversions between number systems.
CO2 - Simplify Boolean expressions and model using gates.
CO3 - Discover the principles behind combinational logic circuits used in real time.
CO4 - Survey the flip-flops needed for sequential logic circuits design.
CO5 - Analyze the sequential logic circuits.
CO6 - Discuss about memory unit and arithmetic logic unit.

TEXT / REFERENCE BOOKS

1. Morris Mano, “Digital Logic & Computer Design”, Prentice Hall India, 2006.
2. Thomas L Floyd, "Digital Fundamentals", 10th Edition, Pearson Education, 2009.
3. Thomas.C.Bartee, “Computer Architecture & Logic Design”, McGraw-Hill, 1991.
4. A.P.Malvino and D.P.Leach, “Digital Principles and Applications”, 6th Edition, McGraw-Hill, 2006.
5. Thomas C. Bartee, "Computer Architecture Logic Design", 3rd Edition,2002.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PART A: 10 questions carrying 2 marks each – No choice **20 Marks**
PART B: 2 questions from each unit of internal choice, each carrying 16 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.

Practical:

- 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.

Practical:

- 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.

Practical:

- 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 File Not Found Error and print a message when a file is not found.
- Write a Python program that handles a Zero Division Error 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).

Practical:

- 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.

Practical:

- 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, 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 - Explain how to design GUI Applications in Python and evaluate different database operations.
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. Y. Daniel Liang, “Introduction to Programming Using Python”, Pearson,2013.
2. Python Notes for Professionals by Stack Overflow Documentation (https://books.goalkicker.com/PythonBook/)
3. Dr. Charles R. Severance, “Python for Everybody- Exploring Data Using Python 3”, 2016.
4. Paul Gries, Jennifer Campbell, Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3”, Pragmatic Bookshelf, 2nd Edition,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**

S731BLH22	DATA STRUCTURES AND ALGORITHM	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To impart the basic concepts of data structures and algorithms.
- To be familiar with writing recursive methods.
- To implement operations on Linked List,Stack and Queues.
- To implement traversal operations of trees and graphs.
- Tounderstandconceptsaboutvariousalgorithmdesigntechniques,searching and sorting techniques.

UNIT 1 INTRODUCTION TO ALGORITHMS 9 Hrs.

Introduction to Data vs Information - Data Structures - Classification – Abstraction - Abstract data types (ADT) - Array -characteristics - Storage Representations. Array Order Reversal- Recursion- Array operations, Algorithm- complexity – Time andSpacetradeoff.

Practical:

1. Python program to find the sum of all elements of an array.
2. Python program to find a series in an array consisting of characters.
3. Python program to find the occurrence of a particular number in an array.
4. Python program to find the largest element in an array.
5. Python program for array rotation.

UNIT 2 LINKED LIST 9 Hrs.

Array Vs Linked List –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 – Polynomial Manipulation using List - Advantages and disadvantages of singly linked list-Circular linked list-Doubly linked list-Circular Doubly Linked List.

Practical:

1. Program to implement operations on a Singly link edlist.
2. Program to implement operations on a doubly linked list.

UNIT 3 STACKS & QUEUES 9 Hrs.

Introduction–ArrayRepresentationofaStack–LinkedListRepresentationofaStack-StackOperations-AlgorithmforStackOperations - Stack Applications: Tower of Hanoi - Infix to postfix Transformation - Evaluating Arithmetic Expressions. Queue –Introduction – Array Representation of Queue – Linked List Representation of Queue - Queue Operations - Algorithm for QueueOperations-Queue Applications: Priority Queue.

Practical:

1. Program to implement a Stack using an array and Link edlist.
2. Program to implement Queue using an array and Link edlist.
3. Program to implement Circula rQueue.

UNIT 4 TREES AND GRAPHS 9 Hrs.

Preliminaries of Tree ADT - Binary Trees - The Search Tree ADT–Binary Search Trees - AVL Trees - Tree Traversals - B-Trees -Heap Tree – Preliminaries of Graph ADT - Representation of Graph – Graph Traversal - BFS – DFS – Applications of Graph –Shortest-PathAlgorithms–Dijkstra'sAlgorithm Minimum SpanningTree–Prims Algorithm.

Practical:
1. Program to convert an infix expression to postfix expression.
2. Program to implement BFS and DFS.
3. Program to implement N Queens problem.
4. Program to implement Binary Tree Traversal.
5. Program to implement Travelling Salesman Problem.

UNIT 5 ALGORITHM DESIGN TECHNIQUES & SEARCHING AND SORTING TECHNIQUES **9 Hrs.**

Divide and Conquer Strategy – Greedy Algorithm – Dynamic Programming – Backtracking Strategy - List Searches using Linear Search-Binary Search-Fibonacci Search-SortingTechniques-Insertion sort-Heapsort-Bubblesort-Quicksort-Mergesort-Analysis of sorting techniques.

Practical:
1. Program to sort the elements using insertion sort.
2. Program to sort the elements using quick sort.
3. Program to sort the elements using merge sort.
4. Program to find an element using Linear and Binary Search.

Max. 45 Hrs.

COURSEOUTCOMES

On completion of the course the student will be able to

CO1 - Understand the concept of recursive algorithms.
CO2 - Demonstrate the different types of datastructures.
CO3 - Able to understand the operations on linear datastructures.
CO4 - Summarize searching and sorting techniques.
CO5 - Choose appropriate datastructure as applied to specified problem definition.
CO6 - Understand and implement the various algorithm design techniques.

TEXT / REFERENCE BOOKS

1. Jean-Paul Tremblay, PaulG.Sorenson, 'An Introduction to Data Structures with Application',TMH,2017.
2. RichardF,Gilberg,Forouzan,"Data Structures",Cengage,2004,2nd Edition.
3. LarryR.Nyhoff,ADTs,Data Structures,and Problem Solving with C++,PrenticeHallEditin,2004.
4. ThomasH.Cormen,CharlesE.Leiserson,"Introduction to Algorithms",3rd Edition,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 carrying 16 marks **80 Marks**

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 OUTCOME

On completion of the course the 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 - ApplyPoiseuille'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.

SMTB1304	MATRICES AND LINEAR ALGEBRA (ONLY FOR CSE SPECIALIZATION)	L	T	P	EL	Credits	TOTAL MARKS
		3	1	0	0	3	100

COURSE OBJECTIVES

- To identify, reflect upon, evaluate and achieve conceptual understanding and knowledge of traditional Calculus to form independent judgements.
- To model the Engineering problems and obtain its solutions mathematically.
- To understand Science, Engineering and Computer Science analytically and attain logical thinking.

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 – Diagonalization of a matrix using orthogonal transformation – Quadratic forms – Nature of quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT 2 VECTOR SPACES 9 Hrs.

Vector Spaces – Definition – Simple properties – Examples – Sub spaces and algebra of subspaces – Quotient spaces –Internal direct sum – External direct sum.

UNIT 3 LINEAR INDEPENDENCE AND DIMENSION 9 Hrs.

Linear combination of vectors, linear span, linear independence – basis and dimension, dimension of subspaces – Dimension of Quotient spaces.

UNIT 4 INNER PRODUCT SPACE 9 Hrs.

Inner product spaces – Definition – Examples – Applications – Orthogonal complement of a sub space – Orthonormal Basis – Gram Schmidt Orthogonalization process.

UNIT 5 LINEAR TRANSFORMATION 9 Hrs.

Linear Transformation – The Algebra of linear transformations – null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation – Characteristic roots – Canonical forms – Triangular forms.

Max. 45 Hrs

COURSE OUTCOMES

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

CO1 - Define Eigen values and Eigen vectors.
CO2 - Use the Internal direct sum and External direct sum.
CO3 - Analyze the Linear combination of vectors, linear span, linear independence.
CO4 - Apply Orthogonal complement of a sub space – Orthonormal & Orthonormal Basis.
CO5 - Develop the Algebra of linear transformations.
CO6 - Create equations of spheres with various properties.

TEXT / REFERENCE BOOKS

1. I.N.Herstein, Topics in Algebra, 2nd Edition, John Wiely, NewYork, 2013.
2. Stephen H.Friedberg, Arnold J.Insel, Lawrence E.Spence, Linear Algebra, 4thEd., Prentice Hall of India Pvt. Ltd., New Delhi, 2004.
3. A.R. Vasistha, A first course in Modern Algebra, Krishna Prakasan, Meerut, 2019.
4. S. Lang, Introduction to Linear Algebra, 2nd Edition, Springer, 2005.

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 carrying 16 marks	**80 Marks**

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

COURSE OBJECTIVES

- To impart knowledge on understand ALU and its operations, types of memory organizations.
- To understand the types of memory organizations, interface and communication in I/O devices.
- To analyze about 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 9 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 9 Hrs.

Memory Hierarchy - Main memory - Auxiliary Memory - Associative Memory - Cache Memory - Virtual memory.

UNIT 4 INPUT - OUTPUT ORGANIZATION 9 Hrs.

Peripheral Devices - I/O Interface - Modes of transfer - Priority Interrupt - DMA - IOP - Serial Communication.

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, microinstructions and addressing modes.
CO2 - Explain Arithmetic Logic Unit and computer arithmetic operations.
CO3 - Infer 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, 2007.
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, 2012.
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 carrying 16 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 9 Hrs.

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 fulfillment 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! 9 Hrs.

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 tome. 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- HUMANRELATIONSHIP 9 Hrs.

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment 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 9 Hrs.

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and value 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 PROFESSIONALETHICS 9 Hrs.

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 at the conduct as an engineer or scientist etc.

COURSE OUTCOMES

On completion of the course, student will be able to

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 human relationships and human nature in mind
CO3 - They would have better critical ability
CO4 - They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society)
CO5 - It is hoped that they would be able 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
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: EkParichaya, 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
End Semester Examination	:	50 Marks

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 carrying 16 marks **80 Marks**

SECB7101	WIRELESS SENSOR NETWORK AND ARCHITECTURE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn basics of Sensor and Network technology.
- Learn key routing protocols for sensor networks and main design issues.
- Learn transport layer protocols for sensor networks, and design requirements.
- Understand the medium access control protocols and address physical layer issues.
- To learn the security features in WSN.

UNIT 1 INTRODUCTION AND OVERVIEW OF WIRELESS SENSOR NETWORKS 9 Hrs.

Introduction - Brief Historical Survey of Sensor Networks - and Background of Sensor Network Technology - Ah-Hoc Networks - Applications of Wireless Sensor Networks: Sensor and Robots - Reconfigurable Sensor Networks – Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation – Habitat Monitoring - Another Taxonomy of WSN Technology - Basic Sensor Network Architectural Elements - Home Control – Medical Applications.

UNIT 2 ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS 9 Hrs.

Designing issues - classification of routing protocols - table driven routing protocols - on demand routing protocol – Hybrid routing protocol - Hierarchical routing protocols. Multicast routing in Ad Hoc wireless networks: Operations and classification of multicast routing protocols - Tree based multicast routing protocol - Mesh based multicast routing protocol.

UNIT 3 SYSTEM ARCHITECTURE AND DESIGN ISSUES 9 Hrs.

Design Constraints for Routing in Wireless Sensor Networks - Classification of Routing Protocols in Wireless Sensor-Networks-Hierarchy Role of Nodes in the Network - Data Delivery Model - Optimization Techniques for Routing in Wireless Sensor Networks - Application of the Optimization Techniques: Routing Protocols.

UNIT 4 ROUTING PROTOCOLS FOR WIRELESS SENSOR NETWORKS 9 Hrs.

Introduction - Data Dissemination and Gathering - Routing Challenges and Design Issues in Wireless Sensor Networks -Network Scale and Time-Varying Characteristics - Resource Constraints - Sensor Applications Data Models – Routing Strategies in Wireless Sensor Networks: WSN Routing Techniques - Flooding and Its Variants - Sensor Protocols for Information via Negotiation - Low-Energy Adaptive Clustering Hierarchy - Power-Efficient Gathering in Sensor Information Systems - Directed Diffusion - Geographical Routing.

UNIT 5 TRANSPORT LAYER SECURITY PROTOCOLS FOR AD HOC WIRELESS NETWORK 9 Hrs.

Designing issues - classification of transport layer solutions - feedback based TCP - TCP bus - Ad Hoc TCP - Security in Ad hoc wireless networks - Issues and challenges in security provisioning - Key management - Secure routing in Ad hoc wireless networks. Quality of Service: Issues and challenges in providing QoS in Ad Hoc wireless networks - classification of QoS solutions.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

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

TEXT / REFERENCE BOOKS

1. Ibrahiem M.M. El Emary, Ramakrishnan.S, "Wireless Sensor Networks From Theory to Applications", CRC Press, 2013.
2. Fei Hu, Xiaojun Cao, "Wireless Sensor Networks Principles and Practice", CRC Press, 2010.
3. Mounir Frikha, "Ad hoc Networks Routing, Qos and Optimization", Wiley, 2011.
4. Raheem, Beyah, Janise McNair, Cherita Corbett, Security in Ad hoc and Sensor Networks", World Scientific, 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 carrying 16 marks	**80 Marks**

SCSB1321	IoT AND MULTIMEDIA TECHNOLOGY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand IoT and Multimedia communication.
- To learn guaranteed service model.
- To learn communication protocols that is frequently used in IoT ecosystems.
- To explore the study of Embedded internet.
- To study about application of realtime multimedia network applications.

UNIT 1 INTRODUCTION 9 Hrs.

Introduction to Multimedia Big Data Computing for IoT-Enery Conservation in Multimedia Big Data Computing and the Internet of Things-A Challenge-An Architecture for the Real time Data Stream Monitoring in IoT-Deep Learning for Multimedia Data in IoT.

UNIT 2 GUARANTEED SERVICE MODEL 9 Hrs.

Switched Networks and Shared media Networks - Circuit Switching, Packet Switching and Virtual Circuits - Flow Control and Congestion Control Best Effort Service Model and Its Limitations - Qos Metrics Diffserv and Intserv Networks - QueuingTechniques - WFQ and Its Variants – RED - Qos Aware Routing - Call Admission Control – RSVP - Policing and Traffic Shaping Algorithms – Multicast Routing - IGMP, Protocol Independent Multicast - PIM SM and PIM DM Variants.

UNIT 3 MULTIMEDIA TRANSPORT 9 Hrs.

End To End Solutions - Laissez Faire Approach - Multimedia over TCP – Significance of UDP – Multimedia Streaming - Audio and Video Streaming - Accessing Audio And Video from a Web Server And Media Server - Removing Jitter at the Receiver - Recovering from Packet Loss - Forward Error Correction and Interleaving - Interactive And Non-Interactive Multimedia - Transcoding – RTSP - RTP/RTCP.

UNIT 4 EVOLUTION OF EMBEDDED INTERNET 9 Hrs.

Introduction-Mobile Crowd sensing – Perspective Protocol stack for wireless – WSNs and IoT - M2M Communications and Embedded Internet-Nano networks and IoT – Principles for FI Architecture – Physical Layer – Aware Network Architecture – Information - Centric Networking -Streaming of Scalable video for FI Media Search and Retrieval in FI - FI Self-Management Scenarios.

UNIT 5 APPLICATION ENVIRONMENT 9 Hrs.

Recent advancements in multimedia big data computing for IoT applications in Precision Agriculture - Network based applications of multimedia big data computing in IoT Environment - H.322 Standard - Protocol Stack And Call Setup - Session Initiation Protocol - Components, Messages And Operation - Supporting Protocols For SIP - Media Gateway Access Protocol, Resource Reservation Protocol, Session Description Protocol - Hardware Standards - Scibus and S.100 - Case Study - Video Conferencing - Military Surveillance - Interactive TV - Video On Demand - Smart Phone.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the IoT technique.
CO2 - Deploy the right multimedia communication models.
CO3 - Apply QoS to multimedia network applications at the end system level with efficient scheduling and routing techniques.
CO4 - Understand Embedded Internet.
CO5 - Learn about different protocols used in multimedia in IoT.
CO6 - Develop the real-time multimedia network applications.

TEXT / REFERENCES BOOKS

1. Sudeep Tanwar, Tyagi, Neeraj Kumar, “Multimedia Big Data Computing for IoT Applications”.
2. Maria Marques da Silva, “Multimedia Communications and Networking”, CRC Press, 2012.
3. K.R.Rao, Zoron S.Bojkovic, BojanM. Bakmaz, “Wireless Multimedia Communications Systems: Design, Analysis and Implementation”, CRC Press, 2017.
4. Jim Kurose, Keith Ross, “Computer Networking: A Top Down Approach”, Pearson Education, 2017.
5. K.R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, “Introduction to Multimedia Communications Applications, Middleware, Networking”, John Wileyy and Sons, 2009.
6. Frred Halsal, “Multimedia Communications : Applications, Protocols and Standards”, Pearson Education, 2002.
7. William Stallings, “High speed networks and Internets :Performance and Quality of Service”, Pearson Education.

END SEMESTER EXAMQUESTION PAPER PATTERN

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

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

S731BLH32	MACHINE LEARNING ESSENTIALS	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	100

COURSE OBJECTIVES

- To build a comprehensive understanding of the principles, techniques, and applications of machine learning.
- To understand Data Preprocessing, Linear regression and predictive models.
- To analyze classification and clustering techniques.
- To interpret the need for ensembling models and its techniques.
- To apply reinforcement learning techniques.
- To provide practical knowledge through case studies on real world datasets.

UNIT 1 INTRODUCTION TO MACHINE LEARNING 9 Hrs.

What is machine learning – Examples of Machine Learning Applications -Types of Machine learning Techniques - Learning a class from Examples - Vapnik-Chervonenkis Dimension - Probably Approximately Correct Learning – Gradient Descent – Bias and Variance- Overfitting- Underfitting- Confusion Matrix.

Practical: Install necessary Library Files, Load Datasets, Load text file or CSV file and convert into Data Frame, Data Preprocessing-Handle missing values-separate dataset into features (X) and labels (y) - Split the dataset into training set and testing set using the train_test_split function from scikit-learn - Implement functions, Input confusion matrix, calculates sensitivity, specificity, and accuracy of various class -understanding Variance and Bias Difference.

UNIT 2 SUPERVISED LEARNING 9 Hrs.

Linear regression-with one variable-with multiple variables--Multiple Linear Regression-Nonlinear Regression-Regression Analysis-Predictive models - Prediction using Logistic Regression-Classification Models-KNN Classification- Naïve Bayes Classification- Decision Tree Classification-Support vector Machine- Random Forest- Classification vs Regression.

Practical: Build Linear Regression Model-Logistic Regression Model-Train Classification Models KNN, Naïve Bayes-Decision tree algorithm to classify a set of data point according to given depth of the tree-Train SVM Model with different Kernel Functions- Train Random Forest with different hyperparameters like the number of trees, maximum depth, minimum samples per leaf.

UNIT 3 UNSUPERVISED LEARNING 9 Hrs.

Clustering-Supervised Learning after Clustering-Density Based Clustering Methods-Hierarchical Based clustering methods-Partitioning methods- Grid based methods. Dimensionality Reduction: Linear Discriminant Analysis -Principal Component Analysis.

Practical: K-Means Clustering to determine optimal number of clusters using techniques like the elbow method or silhouette score-Dendrogram Generation via implementing hierarchical clustering agglomerative or divisive on the dataset-Density-based clustering algorithms DBSCAN, OPTICS-Apply dimensionality reduction techniques LDA, PCA to visualize high-dimensional data.

UNIT 4 ENSEMBLING MODELS 9 Hrs.

Need of Ensembling- Applications of Ensembling – Types of Ensembling: Basic Ensemble Techniques-Advanced Ensemble Techniques: Bagging, Boosting, Stacking, Blending - Techniques of Ensembling - AdaBoost.

Practical:Explore about ensemble learning methods– Different ensembling models for classification tasks– Bagging with Random Forest, Boosting with AdaBoost, Stacking and Blending with Logistic regression and KNN-Experiment with different hyperparameters and with different datasets.

UNIT 5 REINFORCEMENT LEARNING 9 Hrs.

Introduction- RL Framework- Temporal Difference Learning -Active Reinforcement Learning- Markov Decision Process Model - Learning Expectations-Learning Algorithms-Q learning Algorithm-Case Study: Implementation of Q learning in automotive games.

Practical:Case Study using Q learning in Automotive Games- Machine learning approaches to develop self-driving cars capable of navigating complex traffic scenarios and ensuring passenger safety- Machine learning model to analyze and classify sentiments in social media dataproviding valuable insights for businesses regarding customer opinions and preferences.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Reduce the dimension of the dataset with machine learning techniques.
CO2 - Implement the predictive analytics for any real-worldscenario.
CO3 - Implement applications with clustering and classification techniques.
CO4 - Implement the ensembling models.
CO5 - Learn and apply reinforcement techniques.
CO6 - Apply machine learning models to solve real-world problems, evaluate their performance and make informed decisions about selecting appropriate algorithms.

TEXT / REFERENCE BOOKS

1. Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Müller, Sarah Guido, First Edition,O'Reilly Media, Inc.
2. Zhi-Hua Zhou, "Ensemble Methods: Foundations and Algorithms", CRC Press, 2012.
3. Hands-on Machine Learning with Scikit-Learn, Keras&TensorFlow by AurélienGéron, Second Edition, O'Reilly Media, Inc.
4. Understanding machine learning: From theory to Algorithms - ShaiShalev-Shwartz, and Shai Ben-David,Published 2014, Cambridge University Press.
5. https://machinelearningmastery.com/stacking-ensemble-machine-learning-with-python.
6. https://sebastianraschka.com/blog/2018/model-evaluation-selection-part4.html.

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**

S732BLH24	Java Programming for IoT	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To identify the various OOPS properties with Java.
- To understand the various exceptions and multithreading used in Java.
- To analyse various events handling methods and layout models.
- To implement various socket programming methods to communicate with IoT devices.

UNIT1 JAVA BASICS & IoT 12 Hrs.

Concepts of OOP, Features of Java,How Java is different from C++,Environmental setup,Basic syntax,Objects and classes,Basic Data Types,Variable Types, ModifierTypes, Basic operators,Loop Control, Decision Making, Strings and Arrays,Methods,I/O.Java support with IoT.

Practical:

1. Write a Java program that takes two numbers as input and prints the sum (addition), multiply, subtract, divide, and the remainder of two numbers.
2. Write a Java program that finds numbers greater than the average of an array.
3. Write a Java program to display the pattern like a right-angle triangle with a number.
4. Write a Java program to insert an element at a specific location, deletea specific element from an array, find the maximum and minimum value of an array, and reverse an array of integer values.
5. Write a Java program using classes, functions, and objects.

UNIT 2 JAVA OBJECT ORIENTED 12 Hrs.

Inheritance, Overriding, Polymorphism, Abstraction, Encapsulation, Interfaces, Packages, Exploring java.util package.

Practical:

1. Write a Java program to create a class called "Employee" with a name, salary, and hire date attributes, and a method to calculate years of service.
2. Write a Java program to create a class called "Shape" with abstract methods for calculating area and perimeter, and subclasses for "Rectangle", "Circle", and "Triangle".
3. Write a Java programming to create a banking system with three classes - Bank, Account, Savings Account, and Current Account. The bank should have a list of accounts and methods for adding them. Accounts should be an interface with methods to deposit, withdraw, calculate interest, and view balances. Savings Account and Current Account should implement the Account interface and have their own unique methods.
4. Implement java packages.

UNIT 3 EXCEPTIONS HANDLING AND THREADING 12 Hrs.

Exception Hierarchy, Exception Methods, Catching Exceptions, Multiple catch Clauses, Uncaught Exceptions Java's Built-inException. Creating,Implementing and Extending thread, thread priorities, synchronizations us pending,resuming and stopping Threads, Multi-threading.

Practical:

1. Write a Java program to read input from the Java console.
2. Write a Java program to append text to an existing file.
3. Write a Java program to find the longest word in a text file.
4. Write a Java Program of Exception Handling showing that if the user enters the name "Rahul" and age "40" then show a message that "you are Rahul" else shows "there is an error" using the try, catch exception block.

5. Write a Java Program to Illustrate Priorities in Multithreading.

UNIT 4 JAVA DEVELOPMENT ENVIRONMENT FOR IOT 12 Hrs.

Introduction to JavaSE 8-Net BeansIDE and Raspberry Pi—Embedded Applications-JavaME 8 Platform Overview - JavaME Configurations – CDC and CLDC-. Building JavaMEI MIets Programs – IMIet - IMIets Components – Creating and Deploying IMIets - JavaME 8 Security - MIDP Architecture-Embedded Permissions Overview-QTAInstallation Status. CLDCO verview: CLDC8 Architecture: CLDC Library Updates-Vector Casting – Hashtable - Stack-Streams – Input Stream – Output Stream – Byte Array Stream – Data Streams – Character Streams – CLDC Thread Management – Controlling Timers.

Practical:

1. Write a Java program to demonstrate and implement ourown hash table with chaining for collision detection.
2. Write a Java program to find the duplicateelements in a Stream using Set.
3. Write a Java program to design a Calculator using J2ME.

UNIT 5 APPLICATION MANAGEMENTWITH IOT 12 Hrs.

Application Management System-Different ways of Using Java Runtime on Raspberry Pi Board-Command Line Interface to Raspberry Pi- AMS-CLI Commands Creating notifications with Push Registry: Push Registry-Registeringa Connection - Listing and Receiving Connections - Push registry Permissions – SMS – Based Activation – Alarm Registration.

Practical:

1. Configure GPIO input and Output pin.
2. Develop the application to read environment temperature using Temperature sensor and display it.
3. Write a program for reading sensor values from a Light sensor which is wired to Arduino board, and Arduino board connected via USB cable to Raspberry Pi.
4. Build an application to measure the distance between objects using the Ultrasonic sensor.
5. Building a Raspberry Pi Project Using Motion sensor or PIR sensor to identify the presence of object.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamentals of Javaprograms and its structure.
CO2 - Recognize the support of object oriented programming with Java language.
CO3 - Apply the concepts of Exceptions and multithreading for different applications.
CO4 - Analyze various IoT applicationusing Java Development Environment.
CO5 - Evaluate the working models of IoTapplication using Java ME.
CO6 - Create IoTsolutions using Java.

TEXT / REFERENCE BOOKS

1. Herbert Schildt,“ The complete Reference JAVA2”, 5th Edition, Tata MacGrawHill, 2017.
2. Bruce Eckel,” Thinking in Java”, Pearson Education, 4th Edition 2006.
3. CoreJava Volume-I Fundamentals, 9th Edition, Cay Horstman and Grazy Cornell, Prentice Hall, 2013.
4. Stephen Chin, Raspberry Pi with Java: Programming the Internet of Things (IoT) (Oracle Press) 1st Edition, McGraw-Hill Education 2015.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PARTA :10 Questions of 2 mark seach - No choice **20 Marks**
PARTB : 2 Questions from each unit with internal choice,each carrying 16 marks **80 Marks**

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

OBJECTIVE OF THE COURSE

- 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–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.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1 - Understand probability concepts and Baye's theorem problems. Explain functions of random variables and their probability 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 least squares.
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, Ninth Edition, 2015.
2. Miller I.and Freund J.E, Probability and Statistics for Engineers, Pearson Publishers, Ninth 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 EXAM QUESTION PAPER PATTERN

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

PARTA :10 Questions of 2 marks each-No choice	**20 Marks**
PARTB :2 Questions from each unit with internal choice,each carrying 16 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

UNIT 2 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.

UNIT 3 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 - 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.

5. Art of UNIX Programming, The 1st Edition, by Eric S. Raymond,2003.

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**

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 Modeling.
- To be 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 & 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 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.

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 carrying 16 marks **80 Marks**

SCSB1322	EMBEDDED SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize the technologies behind embedded systems.
- To acquire knowledge about microcontroller-embedded processors and embedded networking.
- To develop software programs for embedded systems.
- To design real-time operating systems with advanced controllers.
- To attain experience by integrating hardware and software for building specific applications.

UNIT 1 INTRODUCTION TO EMBEDDED SYSTEMS 9 Hrs.

Introduction to Embedded Systems, Structural units in Embedded processor, selection of processor and memory devices, Direct Memory Access (DMA), Memory management methods, Timer and Counting devices, Watchdog Timer, Real Time Clock, In-circuit emulator, Target Hardware Debugging.

UNIT 2 EMBEDDED NETWORKING 9 Hrs.

Embedded Networking: Introduction, I/O Device Ports and Buses, Serial Bus communication protocols, RS232 standard, RS422, RS 485, CAN Bus, Serial Peripheral Interface (SPI), Inter-Integrated Circuits (I2C), need for device drivers.

UNIT 3 RTOS-BASEDEMBEDDED SYSTEM DESIGN 9 Hrs.

Introduction to basic concepts of RTOS, Task, process, and threads, interrupt routines in RTOS, Multiprocessing and Multi-tasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing, Interprocess Communication, synchronization between processes, semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNIT 4 PROGRAMMING PRACTICE ON ASSEMBLER AND SIMULATOR TOOLS 9 Hrs.

Study of ARM processor, Interfacing ADC, and DAC, Interfacing LED, and PWM, Interfacing real-time clock and serial port, Interfacing keyboard, and LCD, Interfacing EPROM and interrupt, Mailbox, Interrupt performance characteristics of ARM and FPGA, Flashing of LEDS, Interfacing stepper motor and temperature sensor.

UNIT 5 EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9 Hrs.

Programming in Integrated Development Environment, ARM7-Cortex, Interfacing with Audio card, MEMS Sensor, and Accelerometer, Advanced Embedded Systems with Arduino, Case Study of Washing Machines, Automotive Applications, Smart card system applications, ATM machines, Digital camera.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1 - Realize the basic concepts of embedded systems.
CO2 - Study the elementary insights of embedded networking.
CO3 - Implement RTOS development toolsinbuildingreal-timeapplicationssystems.
CO4 - Develop both hardware and software forembedded system applications based on the type of processors.
CO5 - Design specificprocessmodels and build prototypes.
CO6 - Project embedded-based applications with advanced controllers.

TEXT / REFERENCE BOOKS

1. JosephYiu, 'The Definitive Guide to the ARM Cortex-M3'Second Edition, Elsevier Inc. 2010.
2. Andrew N Sloss, Dominic Symes, Chris Wright, 'ARM System Developer's Guide - Designing and Optimizing System Software', 2006, Elsevier.
3. Steve Furber, 'ARM System-on-Chip Architecture' 2nd Edition, Pearson Education.
4. Embedded/Real-Time Systems Concepts, Design, and Programming Black Book, Prasad, KVK.
5. Raj Kamal, "Microcontroller - Architecture Programming Interfacing and System Design" 1st Edition, Pearson Education.
6. Arnold. S. Berger, "Embedded Systems Design - An introduction to Processes, Tools and Techniques", Easwer Press.
7. P.S Manoharan, P.S. Kannan, "Microcontroller based System Design", 1st Edition, SciTech Publications.

END-SEMESTEREXAMQUESTIONPAPERPATTERN

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

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

SCSBDPROJ	DESIGN THINKING AND INNOVATIONS	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

COURSE OBJECTIVES

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

Activity 1:

Design thinking introduction:

- Phases of design thinking- a study approach.
- Group Discussion on Ideation- Users perspective.

Formation of team – Thinking skills- Brain storming

Activity 2:

Problem identification (phase I)

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

Activity 3:

Problem identification (Phase II)

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

Activity 4:

Design ideation and various stages

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

Activity 5:

Review and upgradation

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

Activity 6:

Implementation (Phase I)

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

Activity 7:

Implementation(Phase II)

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

Activity 8:

Testing

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

Activity 9:

IPR-Activity I

- To study various IPR activities.

- To prepare for IPR Process.
- To file an IPR.

Activity 10:

Start-ups Formation

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

COURSE OUTCOMES

On completion of the course, 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	

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

COURSE OBJECTIVES

- To classify different network architectures, transmission methods and switching techniques.
- To evaluate network errors, examine methods to detect and remove them.
- To 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 - Interpret the foundations of communication, network and transmission along with its devices, types, topologies and protocols.

CO2 - Compare 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 the working of advanced switching network, its protocol and architecture.

CO5 - Master the functioning behind the data transfer through different transmission mode in a network.

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

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 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**

S732BLH51	IoT Platform and Architecture	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the fundamentals of IoT protocols, standards and communication models.
- To analyze the different IoT platforms, with comparison and features.
- To analyze the Integration of IoT Devices.
- To analyze IoT Architecture.
- To understand the IoT Application Development.

UNIT 1 INTRODUCTION TO IoT 9 Hrs.

Definition and key concepts of IoT - Evolution and current state of IoT - IoT applications and use cases, IoT protocols and standards - IoT communication models - Cloud-based vs. edge-based architectures.

UNIT 2 INTRODUCTION TO IoT Platform 9 Hrs.

Introduction to IoT platforms - role in IoT deployments - AWS IoT, Microsoft Azure IoT, Google Cloud IoT – Comparison. Features IoT platforms and capabilities of IoT platforms.

UNIT 3 IoT Device Integration 9 Hrs.

Connecting IoT devices to the platform - device registration, authentication, and provisioning - Interfacing with different types of IoT devices - IoT security challenges and threats - Authentication and authorization mechanisms for IoT devices - Securing IoT communication and data integrity.

UNIT 4 IoT Architecture 9 Hrs.

IoT Architecture-State of the Art Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT 5 IoT Application Development 9 Hrs.

Building IoT applications using platform services and APIs - Integration of third-party services and APIs - Deploying and managing IoT applications on the platform.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the core principles and components of IoT platforms and architectures.
CO2 - Analyze and evaluate different IoT platforms and their features.
CO3 - Integrate IoT devices with cloud platforms and analyze the collected data.
CO4 - Design and implement IoT systems using appropriate hardware, software, and protocols.
CO5 - Discuss emerging trends and challenges in the field of IoT platforms and architecture.
CO6 - Build IoT applications using platform services.

TEXT / REFERENCE BOOKS

1. "Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry" by Maciej Kranz.
2. "Internet of Things: Principles and Paradigms" by Rajkumar Buyya, Amir Vahid Dastjerdi, and Syed A. Shahrestani.
3. "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things" by David Hanes, Gonzalo Salgueiro, Patrick Grossetete, and Robert Barton.
4. "Architecting the Internet of Things" by Dieter Uckelmann, Mark Harrison, and Florian Michahelles.
5. "IoT Platform Deployment in the Cloud" by Vlasios Tsiatsis, Stamatis Karnouskos, Jan Holler, and David Boyle.

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**

S732BLH52	IOT PROTOCOLS AND TECHNOLOGIES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the fundamentals of IoT.
- To understand the protocols in data link and network layers.
- To analyze the different transport and session layer protocols.
- To analyze various service layer protocols and security.
- To analyze various technologies used in IoT.

UNIT 1 INTRODUCTION TO IoT 9 Hrs.

Introduction - IoT and digitization IoT impact Convergence of Information Technology and Operational Technology Ancestors without IP IoT enabled applications - IoT challenges.

UNIT 2 IoT DATA LINK LAYER & NETWORK LAYER PROTOCOLS 9 Hrs.

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,ZWave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.

UNIT 3 TRANSPORT & SESSION LAYER PROTOCOLS 9 Hrs.

Transport Layer: TCP, MPTCP, UDP, DCCP, SCTP-TLS, DTLS Session Layer: HTTP, CoAP, XMPP, AMQP, MQTT

UNIT 4 SERVICE LAYER PROTOCOLS & SECURITY 9 Hrs.

Service Layer one M2M, ETSI M2M, OMA, BBF Security in IoT Protocols MAC 802.15.4 , 6LoWPAN, RPL, Application Layer.

UNIT 5 IOT TECHNOLOGIES AND DATA MANAGEMENT 9 Hrs.

Zigbee and Zigbee IP - Z-Wave - LoRaWAN - NB-IoT - Cellular networks (2G, 3G, 4G, and 5G) for IoT - Data collection, storage, and processing in IoT - Cloud-based IoT platforms -Edge computing and fog computing.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the need of digitization and IoT challenges.
CO2 - Analyze the data link and network layer protocols.
CO3 - Recognize the transport and session layer protocols required for IoT.
CO4 - Describe the service layer protocols and security.
CO5 - Understand the technologies and data management for IoT.

TEXT / REFERENCE BOOKS

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",1st Edition, Academic Press, 2014.
2. Cirani, Simone, Gianluigi Ferrari, Marco Picone, and Luca Veltri. Internet of Things: Architectures, Protocols and Standards. John Wiley & Sons, 2018.
3. Hassan, Qusay F., ed. Internet of Things A to Z: technologies and applications. John Wiley & Sons, 2018.
4. Holler, Jan, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, and David Boyle. Internet of Things. Academic Press, 2014.
5. Hersent, Olivier, David Boswarthick, and Omar Elloumi. The internet of things: Key applications and protocols. John Wiley & Sons, 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**

S732BLH53	ARDUINO PROGRAMMING FOR IoT BOARDS	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	100

COURSE OBJECTIVES

- To program Arduino to controllights,motors,and other devices.
- To learn Arduino's architecture,including inputs and connectors for add-ondevices.
- To add third-party components such as LCDs, accelerometers,gyroscopes,and GPStrackers to extend Arduino's functionality.
- To understand various options in programming languages,from C to drag and drop languages.
- To test,debug,and deploy the Arduino to solve real world problems.

UNIT 1 INTRODUCTION TO SENSORS 9 Hrs.

Transducers, Classification, Roles of sensors in IOT, Various types of sensors, Design of sensors, sensor architecture, special requirements for IOTsensors,Role of actuators,types of actuators.

Practical:

1. Demonstrate Ultrasonic distance sensor and its working in arduino board.
2. Demonstrate temperature / humidity sensor and its working in arduino board.
3. Demonstrate Proximity sensor and its working in arduino board.

UNIT 2 HARDWARE 9 Hrs.

Physical device Arduino Interfaces, Hardware requirement for Arduino, Connecting remotely over the network using VNC,GPIO Basics, Controlling GPIO Outputs Using a Web Interface,Programming, APIs / Packages- Quark SOC processor, programming, Arduino Boards using GPIO (LED, LCD, Keypad, Motor control and sensor).

Practical:

1. Create an application to learn to test the output & input of GPIO pins on Raspberry pi.
2. Make your Arduino board blink an LED.
3. Connect the LED to the Raspberry Pi using Python programming.
4. Controlling LED using Raspberry Pi webserver.

UNIT 3 PLATFORMS 9 Hrs.

History - Creative Coding Platforms - Open Source PlatformsPIC - Arduino, Sketch,Iterative coding methodologyPythonProgramming - Mobile phones and similar devices - Arm Devices - Basic Electronics (circuit theory, measurements, partsidentification) Sensors and Software: Understanding Processing Code Structure, variables and flow control, Interfacing to the Real World.

Practical:

1. Create an application to find Motion detection using arduino board.
2. Create an application to measure Temperature and Humidity using arduino board.
3. Write a program using iterative coding methodology to control multiple LED.
4. Write a program using While Statement to blink two LEDs for two different conditions.

UNIT 4 PROGRAMMING AN ARDUINO IOT DEVICE 9 Hrs.

Preparing the development environment (Arduino IDE), Exploring the Arduino language (C/C++) syntax, Coding, compiling,and uploading to the microcontroller, Working with Arduino Communication Modules: Bluetooth Modules, WiFi Modules andI2CandSPI,InterfacingarduinoandBlynkviaUSB: LED Blinking, Controlling a Servomotor.

Practical:

1. Using Arduino communication module control LED.
2. Using Arduino Bluetooth module control LED.
3. Using Arduino WiFi module control LED.

UNIT 5 PROGRAMMING ESP 8266 MODULE 9 Hrs.

ESP8266 WiFi 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 WiFi Module, and DHT-22 Sensor,Checking Your Data via Thing Speak,Connecting Your Arduino Set-upto Blynk via WiFi.

Practical:

1. Design an prototype which measures the amount the gas present inside the working environment using gas sensor in Raspberry pi.
2. Build the application to monitor the environment using temperature sensor in Raspberry pi board.
3. Implement smart cities Sensor Board v3.0 using Wasp mote platform for measuring temperature, humidity and pressure.
4. Measure the light intensity and pollution level using Wasp mote platform.

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1 - Recall the basics of sensors,its functioning.
CO2 - Execute basic and advanced assembly language programs.
CO3 - Learn the ways to interface I/O devices with processor for task sharing.
CO4 - Recall the basics of co-processor and its ways to handle float values by its instruction set.
CO5 - Recognize the functionality of microcontroller,latest version processors and its applications.
CO6 - Acquire design thinking capability , ability to design a component with realistic constraints, to solve real world engineering problems and analyze the results.

TEXT / REFERENCES BOOKS

1. “Practical electronics for Inventors, Third Edition,by Paul Scherzandsimon Monk.2016.
2. Intel FalileoDen2APIFeatures and Arduino Projects for Linix Programmers, Ramon, Manoel 2014 (Open Access).
3. Making Sense of Sensors: End-to-End Algorithms and Infrastructure Design by Omesh Tickoo, Ravi Iyer, 2016.
4. Marco Schwartz,” Internet of Things with the Arduino Yun “,: Packt Publishing,2014.
5. Programming Interactiity, Second Edition by JoshaNoble,2012.
6. Arshdeep Bahga, Vijay Madisetti, :Internet of Things-Ahands on Approach:, Universities 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**

S732BLH21	IMAGE PROCESSING	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	100

COURSE OUTCOMES

- To have the ability to describe the basic principles and fundamental concept of Image processing.
- To understandand analyze image processing problems and images in frequency domain using various transformation techniques.
- To solve image processing problems and meet design specifications by designing algorithms.
- To evaluate image enhancement, restoration, segmentation and representation techniques.
- To categories andi nterpret various image compression standards and techniques.

UNIT 1 INTRODUCTION AND FUNDAMENTALS OF IMAGE PROCESSING 9 Hrs.

Digital Image processing and its origin,Applications of Image Processing,Steps implied in Image processing, Image processing Components.Visual perspective elements,Image Acquisition, Image Sampling and Image Quantization,Pixels,Relationships between pixels, Color image fundamentals,Introduction toTools used in Image processing.

UNIT 2 TRANSFORMATION AND FILTERING INSPATIAL AND FREQUENCY DOMAIN 9 Hrs.

History,Basics of Transformation intensity function,Histogram Processing,Spatial Filtering and its types,Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters-Ideal, Butterworth and Gaussian filters, Homomorphic filtering,DFT of one variable,DFTof two variables and its properties.

UNIT 3 IMAGE RESTORATION,RECONSTRUCTION AND COLOR IMAGE PROCESSING 9 Hrs.

Image Degradation/RestorationProcessmodel,Nosiemodel, Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Image Reconstruction. Fundamental sand Models of Colors,Pseudo Colors,Transformation of Colors, Color Smooth eningand Sharping, Color based image segmentation,Colored Image Noise and Compressing.

UNIT 4 WAVELETS,MULTIRESOLUTION PROCESSING AND IMAGE COMPRESSION 9 Hrs.

Multiresolution Expansions, Wavelet Transforms in One Dimension and Two Dimension, Wavelet Packets. Image Compression, Need for data compression, image compression model, Lossy and Lossless compression,Image Watermarking.

UNIT 5 MORPHOLOGICAL IMAGE PROCESSING AND SEGMENTATION 9 Hrs.

Erosion and Dilation, Opening and Closing,Transformation, Morphological Algorithms, Morphology of Grey Scale Images.Point,Line, and Edge Detection, Region-Based Segmentation, Hough transform, Segmentation using Threshold,Region based segmentation – Region growing – Region splitting and merging.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understanding off undamental concepts & general terminologies in image processing.
CO2 - Analysing the various types of images, intensity transformations and spatial filtering.
CO3 - Image reconstruction and modelling using various filtering techniques.
CO4 - Transformation of Image in various dimensions and signature storage.
CO5 - Evaluation of methodologies for image segmentation, restoration etc.
CO6 - Apply image processing algorithms in practical applications.

TEXT / REFERENCE BOOKS

1. Digital Image Processing,S.Jayaraman,SE.sakkirajan,T.Veerakumar, Fifth Edition, TataMcGraw Hill Publication, 2015.
2. Digital Image Processing, Rafael C.Gonzalez and Richard E.Woods,Third Edition, Pearson Education, 2008.
3. Digital Image Processing,S.Sridhar,Oxford University Press, 2016.
4. Fundamentals of Digital Image Processing, A.K.Jain.Published by Prentice Hall,Upper Saddle River, NJ, 1998.
5. Digital Image Processing and Computer Vision, R.J.Schalkoff.Published by:John Wiley andSons,NY, 1992.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

SMTB1601	OPTIMIZATION TECHNIQUES FOR COMPUTING (CSE, CSE(SPL) & IT)	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To Understand importance of optimization of industrial process management.
- To solve problems in linear programming and Integer programming.
- To develop in a student efficient and effective deployment of an organization's resources when they are needed.
- To analyze and appreciate variety of performance measures for various optimization problems.

UNIT 1 INTRODUCTION TO LINEAR PROGRAMMING PROBLEM 9 Hrs.

Operations Research(OR)- Nature – Characteristics – Phases - Role of OR in Decision making – Outline of OR Models Linear Programming – Formulation of L.P .problems –Solution by graphical method, simplex method, Big M methods -Duality in LPP and Dual Simplex Method.

UNIT 2 LINEAR PROGRAMMING EXTENSIONS 9 Hrs.

Transportation problem – Initial Basic feasible solution- Northwest corner method, Least Cost method, Vogel's approximation method – Test for optimality-MODI. Assignment problems- Hungarian assignment models-Travelling salesman problems.

UNIT 3 RESOURCE SCHEDULING AND NETWORK ANALYSIS 9 Hrs.

Problem of Sequencing – Problem with N jobs and 2 machines N Jobs 3 machines N Jobs and m machines. Project Management -Basic concepts–Network construction and scheduling Critical Path Method (CPM) & Program evaluation review technique (PERT).

UNIT 4 INVENTORY MODELS, SIMULATION AND QUEUING THEORY 9 Hrs.

Inventory Control – Various Types of inventory models – Deterministic inventory models – Production model, Purchase model– with and without shortage- Economic Order Quantity (EOQ) – Buffer stock – Shortage quantity, Probabilistic inventory models Queuing theory – Poisson arrivals and exponential service times, Single channel models only. Monte – Carlo simulation.

UNIT 5 GAME THEORY AND REPLACEMENT MODELS 9 Hrs.

Game theory – the formulation of two-person, Saddle point, Maxmini and Minimax principle, Mixed strategies for 2×2 games, Dominance principle, Replacement policy for items whose maintenance cost increases with time- Consideration of time value of money - Replacement policy- Individual, Group replacement of items that fail completely and suddenly.

Max. 45 Hrs

COURSE OOUTCOMES

On completion of the course, student will be able to

CO1 - Formulate the linear programming problems.
CO2 - Analyze transportation and assignment problems.
CO3 - Develop the scheduling systems.
CO4 - Analyze CPM and PERT methods.
CO5 - Describe the different inventory models.
CO6 - Design the Game theory, Queuing theory and examine the replacement model.

TEXT / REFERENCE BOOKS

1. K. Malik, S. K. Yadav, S. R. Yadav, Optimization Techniques. I K International Publishing House Pvt. Ltd; First Edition edition, 2013.
2. PK Gupta, D.S Hira, Operations Research. S Chand, Seventh Rrevised edition, 2014.
3. Sharma S.D, Operation Research Theory, Methods and Application, 17th Edn.,KedarNath Ram Nath Publication, 2010.
4. Nita H Shah, Ravi M Gor&HardikSoni, Operation Research, 4th Edn., PHI, 2010.
5. Edwin K. P. Chong & Stanislaw H. Zak, An Introduction to Optimization, Wiley India, 2017.
6. Mohan, Kusum Deep, Optimization Techniques, New Age Science, 2009.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PARTA :10 Questions of 2 marks each-No choice **20 Marks**
PARTB : 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

COURSE OBJECTIVES

To learn the concepts and applications of data mining.
To understand and prepare the data.
To study the model development techniques.
To explore the Automated Models for Categorical and Continuous targets.
To analyze the performance in different models.

UNIT 1 INTRODUCTION TO DATA MINING INTRODUCTION 9 Hrs.

What is Data Mining? Concepts of Data mining, Technologies Used, Data Mining Process, KDD Process Model, CRISP – DM, Mining on various kinds of data, Applications of Data Mining, Challenges of Data Mining.

UNIT 2 DATA UNDERSTANDING AND PREPARATION 9 Hrs.

Introduction, Reading data from various sources, Data visualization, Distributions and summary statistics, Relationships among variables, 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 & 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, MetaLevel Modeling.

UNIT 5 DEPLOYING MODEL 9 Hrs.

sessing 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. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the process of formulating business objectives, data selection/collection.
CO2 - Successfully design, build, evaluate models.
CO3 - Implement predictivemodels 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. Predictive & Advanced Analytics (IBM ICE Publication)
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. L.Wasserman-All of statistics.

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**

S732BLH61	IOT APPLICATION DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To Understand the Architectural Overview of IoT.
- To Understand the IoT Reference Architecture and Real World.
- Design Constraints To Understand the various IoT Protocols.

UNIT 1 OVERVIEW 9 Hrs.

IoT-An Architectural Overview₩Building an architecture, Main design principles and needed capabilities, An IoTarchitectureoutline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide areanetworking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoTAnalytics,Knowledge Management.

Practical:

1. Develop an application to perform arithmetic operations.

UNIT 2 BASIC DESIGN 9 Hrs.

Introduction - Basics of embedded systems design-Embedded OS Design constraints for mobile applications, both hardware and software related-Architecting mobile applications user interfaces for mobile application stouch events and gestures Achieving quality constraints performance,usability, security,availability and modifiability.

Practical:

1. Create a mobile application for (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
2. Develop an application that uses touch events and gestures.

UNIT3 IoT MOBILE APPS 9 Hrs.

IoT Mobile App Development Trends In 2020 - Role of Mobile Apps in revolutionizing the world of IoT - UX / UI design for IoTMobile apps - challenges of UX/UI design for IoT applications - Practical tips on design for IoT mobile appsIoT App DesignSolutions.

Practical:

1. By using UX/UI design principles create your own mobile App.
2. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
3. Build an android app for measuring temperature, pressure and humidity using Raspberry pi.

UNIT 4 TECHNOLOGY AND ROID 9 Hrs.

Introduction-Establishing the development environment – Android architecture-Activities and views Interacting with UI Persisting data using SQLite Packaging and deployment Interaction with server side applications Using Google Maps,GPS and Wifi Integration with social media applications.

Practical:

1. Create an android for Temperature and Humidity Logger Using Raspberry Pi with mySQL.
2. Build an app for simple Led Control With Blynk and NodeMCU Esp8266 12E.
3. Create an app for home Automation using ESP8266 &Blynk App – IoT.
4. Build an app using NodeMCU for GPS Tracker Blynk App In IOT Platform.

UNIT 5 TECHNOLOGY IIANDROID THINGS 9 Hrs.

Android things Installation of Android thingsVerification of Android things installation A PI in Android IoT Setting up the Android things-Building your first IOT-Android application with Android Things.

Practical:

1. Build an app using NodeMCU to DHT Interface in Blynk app.
2. Create an app for finding movement detection in Blynk app.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Able to understand the application areas of IOT.
CO2 - Able to realize the revolution of Internet in Mobile Devices,Cloud & Sensor Networks.
CO3 - Able to understand building blocks of Internet of Things and characteristics.
CO4 - Understand the concepts of mobile apps used in internet of things.
CO5 - Learn about android application development.
CO6 - Implement mobile application using Android things.

TEXT / REFERENCES BOOKS

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a new Age of Intelligence”, 1st Edition, Academic Press,2014.
2. BerndScholZ-Reiter, Florian Michahelles,” Architecting the Internet of Things’, ISBN 978-3-642-19157-2,Spinger.
3. JeffMcWherter and ScottGowell,” Professional Mobile Application Development’, Wrox,20124.Charliw Collins, Michael Galpin ad Matthias Kappler, “ android in Practice”, Dream Tech,2012.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

S732BLH62	IoT IN BIG DATA ANALYTICS	L	T	P	EL	Credits	TotalMarks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand data analytics for IoTapplications.
- To discuss the classification algorithms for big data analytics.
- To elaborate various prediction and clustering algorithms.
- To analyse real time IoT applications.

UNIT1 INTRODUCTION 9 Hrs.

Introduction to data analytics for IoT, IoT Applications, Type of sensor, Attributes and Data types, Data pre-processing, Statistical descriptions of Data,Handling missing Data, Datasampling

UNIT 2 INTRODUCTION TO BIG DATA 9 Hrs.

Big Data and its Importance – Four V's of Big Data- Drivers for Big Data – Big Data Technologies Hadoop's Parallel World - Data discovery - Open source technology for Big Data Analytics - cloud and Big Data - Predictive Analytics - Mobile Business Intelligence and Big Data - Crowd Sourcing Analytics - Inter-andTrans Firewall Analytics - Information Management.

UNIT 3 CLASSIFICATION 9 Hrs.

Definition of Classification, Decision tree Induction, Attribute Selection measures, Issues: Over-fitting, tree pruning methods,missing values, continuous classes, Classification and Regression Trees (CART), Bayesian Classification: Bayes Theorem,Naïve Bayes classifier, Bayesian Networks, Linear classifiers, Least squares, SVM classifiers, Lazy Learners (or LearningfromYourNeighbors).

UNIT 4 PREDICTION AND CLUSTERING 9 Hrs.

Prediction: Definition of Prediction Linear regression, Non-linear regression, Logistic regression Clustering: Clustering types: Partitioning Methods, Hierarchical Methods, Distance Measures in Algorithmic Methods, Density Based Clustering.

UNIT 5 PERFORMANCE EVALUATION 9 Hrs.

Performance Measures: Precision, recall, F-measure,confusion matrix, cross-validation,bootstrap. Case Studies: Health Care Analytics, Tele medicine, Smart Campus, Intelligent Gym, Weather Prediction, time series modelling.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analyse various data produced by IoT Applications.
CO2 - Describe big data technologies.
CO3 - Develop classification algorithms for data analysis.
CO4 - Implement prediction and classification algorithms.
CO5 - Evaluate algorithms using measures.
CO6 - Design solutions for the real time problems.

TEXT / REFERENCE BOOKS

1. Michael Minelli, Michehe Chambers, “Big Data, Big Analytics: Emerging Business Intelligence and Trends for Today’s Business”, 1st Edition, Ambiga Dhiraj, Weily CIO Series, 2013.
2. Arvind Sathi,”Big data Analytics:Disruptive Technologies for Changing the Game”, 1st Edition, IBM Corporation,2012.
3. Ian H.Witten,EibeFrank Data Mining:Practical Machine Learning Tools and Techniques, Elsevier/(MorganKauffman), ISBN:9789380501864.
4. Introduction to Data Mining (2005) By Pang-NingTan,Michael Steinbach,Vipin Kumar Addison Wesley ISBN:0-321-32136-7.
5. [Research-Papers]:Some of the relevant research papers that contain recent results and developments in data analytics field.

END SEMESTEREXAMQUESTIONPAPERPATTERN

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

PARTA :10 Questions of 2 marks each-Nochoice **20 Marks**
PARTB : 2 Questions from each unit with internal choice,each carrying 16 marks **80 Marks**

S732BLH63	IoT IN BIG DATA ANALYTICS Lab	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

COURSE OBJECTIVES

- To understand data analytics for IoTapplications.
- To discuss the classification algorithms for big data analytics.
- To elaborate various prediction algorithms.
- To analyse real time IoT applications.

SUGGESTED LIST OF EXPERIMENTS

1. Write a Python program for sampling the data using a systematic sampling method.
2. Write a Python program to check for missing data and fill the missing data with constant data using pre-defined functions.
3. Implement word count/ frequency programs using MapReduce.
4. Implement a MapReduceprogramthat processes a weather dataset and analyzes the hot and cold days in a month.
5. Implement a MapReduce program to find the average age of male and female from a given dataset.
6. Collect sensor data and Implement Decision tree cl.
7. assification technique.
8. Collect sensor data and Implement Support Vector Machine.
9. Collect sensor data and do Prediction using linear regression.
10. Collect sensor data and do Prediction using linear regression.
11. Collect sensor data and Implement Support Vector Machine.
12. Collect sensor data and Implement clustering algorithm.
13. Visualize data using visualization techniques.
14. Model Time series data.
15. Implement an application that stores big data in Hbase/ MongoDB/ Pig.
16. Implement an application for predicting air pollution level using gas sensors.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analyse various data produced by IoT Applications.
CO2 - Describe big data technologies.
CO3 - Develop classification algorithms for data analysis.
CO4 - Implement prediction and classification algorithms.
CO5 - Evaluate algorithms using measures.
CO6 - Design solutions for the real time problems.

TEXT / REFERENCE BOOKS

1. Michael Minelli, Michehe Chambers, “Big Data, Big Analytics: Emerging Business Intelligence and Trends for Today’s Business”, 1st Edition, Ambiga Dhiraj, Weily CIO Series, 2013.
2. Arvind Sathi,”Big data Analytics:Disruptive Technologies for Changing the Game”, 1st Edition, IBM Corporation,2012.

SCSB1712	COMPUTER VISION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- This course helps in learning the basic principles of image formation and image processing algorithms.
- Discuss on different algorithms for 3D reconstruction and recognition.
- Emphasizes the core vision tasks of scene understanding and recognition.
- 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 – foreground background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, 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", 2nd 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 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**

SCSB2752	COMPUTER VISION LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

COURSE OBJECTIVES

- To introduce techniques of computer vision and pattern recognition.
- To understand the design issues of computer vision and object recognition systems.
- To provide the programming experience from implementing computer vision and object. recognition applications.

SUGGESTED LIST OF EXPERIMENTS

1. Basic Image Handling and Processing video using OpenCV
2. Creating a 3D Model From 2D Images
3. Basic motion detection and tracking
4. Image captioning
5. Build your own Vehicle Detection Model
6. Contour based Segmentation
7. Region based Segmentation
8. Developing Social Distancing application
9. Implementation of Shape Detection using Hough Transform
10. Perform Face Detection on Your Family Photos
11. Scene Text Detection
12. Road Lane Detection in Autonomous Vehicles
13. Emotion Recognition through Facial Expressions
14. Build a People Counting Solution
15. Count Vehicles in Images and Video
16. Build a QR Code Scanner

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Recognize and describe both the theoretical and practical aspects of computing with images.
CO2 - Describe the foundation of image formation and image analysis. Understand the basics of 2D and 3D Computer Vision.
CO3 - Become familiar with the major technical approaches involved in computer vision.
CO4 - Gain exposures to advanced concepts leading to object categorization and segmentation in images. ‘
CO5 - Build computer vision applications.
CO6 - Apply 3D modeling techniques to real time applications.

SCSB3421	PERVASIVE COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To make student to understand the challenges for low-resourced computing and the schemes to overcome these.
- To study about creating a ubiquitous environment. To learn WAP and voice technology.
- To learn PDA operating systems.
- To learn about device connectivity in ubiquitous environment.

UNIT 1 OVERVIEW 9 Hrs.

IoT-An Architectural Overview Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals-Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.

UNIT 2 BASIC DESIGN 9 Hrs.

Introduction Basics of embedded systems design Embedded OS - Design constraints for mobile applications, both hardware and software related Architecting mobile applications user interfaces for mobile applications touch events and gestures Achieving quality constraints performance, usability, security, availability and modifiability.

Unit 3 IoT MOBILE APPS 9 Hrs.

IoT Mobile App Development Trends In 2020 -Role of Mobile Apps in revolutionizing the world of IoT - UX / UI design for IoT Mobile apps - challenges of UX/UI design for IoT applications - p̄ractice tips on design for IoT mobile apps IoT App Design Solutions.

UNIT 4 TECHNOLOGY I ANDROID 9 Hrs.

Introduction Establishing the development environment Android‒architecture Activities and views Interacting with UI Persisting data using SQLite Packaging and deployment Interaction with serverside applications Using Google Maps, GPS and Wifi Integration with social media applications.

UNIT 5 TECHNOLOGY II ANDROID THINGS 9 Hrs.

Android things Installation of Android things Verification of Android things installation API in Android IoT Setting up the Android things - Building your first IOT-Android application with Android Things.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Apply the pervasive computing concepts in real time applications.
CO2 - Explore the protocols of Pervasive Computing Environments.
CO3 - Analyse the device connectivity and the technologies used in pervasive computing.
CO4 - Implement WAP and voice technology.
CO5 - Design applications in PDA.
CO6 - Create applications in ubiquitous environment.

TEXT / REFERENCE BOOKS

1. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaech & Klaus Rindtorff, “Pervasive Computing, Technol ogy and Architecture of Mobile Internet Applications”, Pearson Education, 2012. ISBN-13:978-0201722154.
2. UweHansman, Lothat Merk, Martin S Nicklous & Thomas Stober, “Principles of Mobile Computing (Springer Professional Computing)”, Second Edition, Springer-Verlag, New Delhi, 2003.
3. Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, “Fundamentals of Mobile and Pervasive Computing”, McGraw Hill 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**

SCSB3411	AI FOR GAMING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide an in-depth introduction to technologies and techniques used in the game industry.
- To Understand the issues and role of AI in the design of games.
- To understand tactical and strategic AI for games.

UNIT 1 INTRODUCTION TO GAME AI 9 Hrs.

Introduction – Nature of Game AI – Models of game AI – AI Engine structure – representations, complexity, and constraints – Analytical Geometry 1.

UNIT 2 MOVEMENT ALGORITHMS AND STEERING BEHAVIOUR 9 Hrs.

Simple State Machines – Computational Geometry – Kinetic and Dynamic Movement – Steering and combining steering – Analytical Geometry 2.

UNIT 3 COORDINATED MOVEMENT, MOTOR CONTROL AND PATHFINDING 9 Hrs.

Interaction with Physics engine – Jumping – Coordinated movement – Motor Control – Pathfinding: pathfinding graphs – Dijkstra A* – hierarchical pathfinding – motion planning.

UNIT 4 DECISION MAKING, TACTICS AND LEARNING 9 Hrs.

Decision Making: Decision tree – State Machines – Fuzzy Logic Markov Systems – Goal-oriented behavior – Rule-based systems – black board architectures – Tactics and Strategy: waypoint tactics, tactical analyses, tactical pathfinding, coordinated action.

UNIT 5 LEARNING AND GAME PLAYING 9 Hrs.

Learning: Decision tree learning, Naive Bayes, Reinforcement learning, Artificial Neural Networks – Game Playing: game theory, minimax, transposition tables, opening books and set plays, turn-based strategy games.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Identify tasks that can be tackled using AI techniques.
CO2 - Select the appropriate AI technique for the problem under investigation.
CO3 - Design and implement efficient and robust AI algorithms for game tasks.
CO4 - Develop AI game engines.
CO5 - Evaluate performance and test the implemented algorithms.
CO6 - Apply learning solutions to real world gaming techniques.

TEXT / REFERENCE BOOKS

1. Artificial Intelligence for Games, 2nd edition, by Ian Millington and Morgan Kaufmann, 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 carrying 16 marks **80 Marks**

SCSB1431	DATA MINING AND DATA WAREHOUSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand various Tools of Data Mining and their Techniques to solve the real time problems.
- To learn how to analyze the data, identify the problems, and choose the relevant algorithms to apply.
- To assess the Pros and Cons of various algorithms and analyze their behavior on real datasets.

UNIT 1 DATA MINING 9 Hrs.

Introduction – Steps in KDD – System Architecture – Types of data -Data mining functionalities – Classification of data mining systems – Integration of a data mining system with a data warehouse – Issues – Data Preprocessing – Data Mining Application.

UNIT 2 DATA WAREHOUSING 9 Hrs.

Data warehousing components – Building a data warehouse – Multi Dimensional Data Model – OLAP Operation in the Multi- Dimensional Model – Three Tier Data Warehouse Architecture – Schemas for Multi- dimensional data Model – Online Analytical Processing (OLAP) – OLAP Vs OLTP Integrated OLAM and OLAP Architecture.

UNIT 3 ASSOCIATION RULE MINING 9 Hrs.

Mining frequent patterns – Associations and correlations – Mining methods – Finding Frequent itemset using Candidate Generation – Generating Association Rules from Frequent Item sets – Mining Frequent Item set without Candidate Generation – Mining various kinds of association rules – Mining Multi-Level Association Rule-Mining Multidimensional Association Rule- Mining Correlation analysis – Constraint based association mining.

UNIT 4 CLASSIFICATION AND PREDICTION 9 Hrs.

Classification and prediction – Issues Regarding Classification and Prediction – Classification by Decision Tree Induction -Bayesian classification – Baye's Theorem – Naïve Bayesian Classification – Bayesian Belief Network – Rule based classification – Classification by Back propagation – Support vector machines – Prediction – Linear Regression.

UNIT 5 CLUSTERING, APPLICATIONS AND TRENDS IN DATA MINING 9 Hrs.

Cluster analysis – Types of data in Cluster Analysis – Categorization of major clustering methods - Partitioning methods – Hierarchical methods – Density-based methods – Grid-based methods – Model based clustering methods -Constraint Based cluster analysis – Outlier analysis – Social Impacts of Data Mining- Case Studies: Mining WWW- Mining Text Database- Mining Spatial Databases.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Assess Raw Input Data and process it to provide suitable input for a range of data mining algorithm.

CO2 - Design and Modelling of Data Warehouse.

CO3 - Discover interesting pattern from large amount of data.

CO4 - Design and Deploy appropriate Classification Techniques.
CO5 - Able to cluster high dimensional Data.
CO6 - Apply suitable data mining techniques for various real time applications

TEXT / REFERENCE BOOKS

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 2nd Edition, Elsevier, 2007.
2. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw Hill, 2007.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction To Data Mining", Person Education, 2007.
4. K.P. Soman, Shyam Diwakar and V. Ajay, "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India,2006.
5. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
6. Daniel T.Larose, "Data Mining Methods and Models", Wile-Interscience, 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**

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.
CO5 - Implement Java,J2EE Applications using Spring Framework.

CO6 - Develop enterprise java applications thereby meeting the industrial requirements.

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-Struts,"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 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 carrying 16 marks **80 Marks**

SCSB3423	QUALITY ENGINEERING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To define quality assurance plans.
- To apply quality assurance tools & techniques.
- To understand the Clean Room Software Engineering activities.
- To implement the tools for quality.
- To learn quality assurance models.

UNIT 1 SOFTWARE QUALITY 9 Hrs.

Definition of Software Quality, Quality Planning, Quality system – Quality Control Vs QualityAssurance – Product life cycle – Project life cycle models. The Software Quality Challenge - Software Quality Factors - Components of the Software Quality Assurance System.Pre-Project Software Quality Components - Contract Review - Development and Quality Plans.

UNIT 2 SOFTWARE ENGINEERING ACTIVITIES 9 Hrs.

Estimation, Software requirements gathering, Analysis, Architecture, Design, development,Testing and Maintenance.

UNIT 3 SUPPORTING QUALITY ACTIVITIES 9 Hrs.

Metrics, Reviews –SCM – Software quality assurance and risk management

UNIT 4 SOFTWARE QUALITY ENGINEERING TOOLS AND TECHNIQUES 9 Hrs.

Seven basic Quality tools – Checklist – Pareto diagram – Cause and effect diagram – Run chart –Histogram – Control chart – Scatter diagram – Poka Yoke – Statistical process control – Failure Mode and Effect Analysis – Quality Function deployment – Continuous improvement tools – Case study.

UNIT 5 QUALITY ASSURANCE MODELS 9 Hrs.

Software Quality Standards, ISO 9000 series – CMM, CMMI – P-CMM – Six Sigma – Malcolm Baldrige Quality - Case study.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

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

TEXT / REFERENCE BOOKS

1. Software Engineering: A Practitioners Approach, 5th Edition Roger S. Pressman McGraw – HillInternational Edition, 6th Edition, 2006.
2. Ramesh Gopalswamy, Managing global Projects ; Tata McGraw Hill, 2002.
3. Norman E – Fenton and Share Lawrence P flieger, Software metrics , International ThomsonComputer press , 1997.
4. Gordan Schulmeyer. G. and James .L. Mc Hanus , Total Quality management for

software,International Thomson Computer press , USA , 1990.
5. Dunn Robert M., Software Quality: Concepts and Plans, Englewood clifts, Prentice Hall Inc.,1990.
6. Metrics and Models in Software Quality Engineering, Stephen, Stephen H. Kan, Pearson education, 2006, Low price edition.

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

- To introduce topics related to computer networks and internet operating system together with knowledge on how to develop products over them.
- To introduce basics of Linux Kernel Architecture where the network devices based on and its interface with various products developed for these devices.
- To understand basics of Linux kernel architecture where the network devices based on and its interface with various products developed for these devices.

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, 3 rd edition, Addison Wesley, 2010, ISBN: 8131758184.
2. Andrew S.Tanenbaum, David J.Wetherall, Computer Networks, 5th Edition, Pearson, ISBN-13: 978-0-13-212695-3
3. M J Bach, The Design of the Unix Operating System, 1st edition, Pearson Education,2015, ISBN: 9332549575.
4. J Cooperstein, Writing Linux Device Drivers - A Guide with Exercises, Createspace, 2009, ISBN: 1448672384.

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**

SCSB3521	USER INTERFACE DESIGN AND IMPLEMENTATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To explain hypertext and style sheet languages.
- To apply Responsive Web Design Framework and features.
- To illustrate the basics of JavaScript, jQuerry and allied scripting languages for Web design.
- To build Server side JS frameworks.
- To design client side JS frameworks.

UNIT 1 UI DESIGN 9 Hrs.

HTML5: What is HTML5 - Features of HTML5 – Semantic Tags – New Input Elements and tags - Media tags (audio and video tags) – Designing Graphics using Canvas API - Drag and Drop features – Geolocation API - Web storage (Session and local storage).

CSS3: What is CSS3 – Features of CSS3 – Implementation of border radius, box shadow, image border, custom web font, backgrounds - Advanced text effects(shadow) - 2D and 3D Transformations - Transitions to elements - Animations to text and elements.

UNIT 2 RESPONSIVE WEB DESIGN (RWD) 9 Hrs.

Responsive Design: What is RWD – Introduction to RWD Techniques – Fluid Layout, Fluid Images and Media queries - Introduction to RWD Framework.

Twitter Bootstrap – Bootstrap Background and Features - Getting Started with Bootstrap - Demystifying Grids – OffCanvas - Bootstrap Components - JS Plugins – Customization.

UNIT 3 INTRODUCTION TO JAVASCRIPT AND JQUERY 9 Hrs.

Introduction - Core features - Data types and Variables - Operators, Expressions and Statements - Functions & Scope - Objects - Array, Date and Math related Objects - Document Object Model - Event Handling – Browser Object Model - Windows and Documents - Form handling and validations. Object-Oriented Techniques in JavaScript - Classes – Constructors and Prototyping (Sub classes and Super classes) – JSON – Introduction to AJAX. Introduction – jQuery Selectors – jQuery HTML - Animations – Effects – Event Handling – DOM – jQuery DOM Traversing, DOM Manipulation – jQuery AJAX.

UNIT 4 INTRODUCTION TO SERVER-SIDE JS FRAMEWORK – NODE.JS 9 Hrs.

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 – Implementation of CRUD operations.

UNIT 5 INTRODUCTION TO CLIENT-SIDE JS FRAMEWORK 9 Hrs.

Introduction to Angular 4.0 - Needs & Evolution – Features – Setup and Configuration – Components and Modules – Templates – Change Detection – Directives – Data Binding - Pipes – Nested Components. Template - Model Driven Forms or Reactive Forms - Custom Valuators. Introduction to ReactJS - React Components- Build a simple React component- React internals - Component inter communication- Component composition- Component styling.

Max. 45 Hrs.

COURSE OUTCOMES

On Completion of course the student will be able to

CO1 - Develop web pages and style sheets using HTML and CSS3 respectively.
CO2 - Design responsive websites with RWD techniques.
CO3 - Apply JavaScript and allied scripting languages for implementing object models and functions.
CO4 - Demonstrate Serve Side JS Framework for application development.
CO5 - Use Client Side JS Framework for redefining the application development.
CO6 - Develop User Interface Designs using the frameworks.

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 Atul Kahate, “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. David Flanagan, “JavaScript: The Definitive Guide, Sixth Edition”, O'Reilly Media, 2011
5. Bear Bibeault and Yehuda Katz, “jQuery in Action”, January 2008
6. Web link for Responsive Web Design - https://bradfrost.github.io/this-is-responsive/
7. Ebook link for JavaScript - https://github.com/jasonzhuang/tech_books/tree/master/js
8. Krasimir Tsonev, “Node.js by Example Paperback”, May 2015
9. Web link for Node.js : https://nodejs.org/en/
10. Artemij Fedosejev “React.js Essentials” (http://pepa.holla.cz/wp-content/uploads/2016/12/React.js-Essentials.pdf.

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	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 xplore 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 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 carrying 16 marks **80 Marks**

SCSB3522	HEALTH INFORMATICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To Introduce the students the problems and challenges that confront the field of health informatics.
- To Introduce the students about the research avenues and salient features in the practice of health informatics.
- To Provide the students with the basic skills and knowledge in health informatics to apply in a career related to health care.
- To Lead students in the discussion around ethical and diversity issues in health informatics.
- To Provide additional direction to those interested towards the study in the field.

UNIT 1 INTRODUCTION & OVERVIEW: HEALTH INFORMATION TECHNOLOGY & HEALTH INFORMATICS 9 Hrs.

Define information management, information technology and informatics - Various ways in which HIT has evolvd to improve quality or enhance patient safety - Informatics drivers and trends - Standards development organizations: Health Level 7 (HL-7), Healthcare Information Technology Standards Panel (HITSP), and Office of the National Coordinator for Health Information Technology (ONC) Health IT Standards Committee-Health informatics – Needs, objectives and limitations - Medical Terminology for Health Informatics Professionals.

UNIT 2 CLINICAL DECISION SUPPORT SYSTEMS (CDSS) AND WORKFLOW 9 Hrs.

Fundamental requirements of an effective Clinical Decision Support System-principles of health care data exchange and health care data standards relate to patient care, productivity and data analysis-common controlled vocabularies in use today: ICD, CPT, NDC, RxNorm, LOINC and SNOMED CT-advantages and disadvantages (unintended consequences) of Clinical Decision Support Systems (CDSS) in terms of cognitive support.

UNIT 3 HEALTHCARE DATABASE MANAGEMENT SYSTEM 9 Hrs.

Health information systems – design, architecture and interoperability - Electronic health records (EHRs) - Electronic medical record (EMR) with electronic health record (EHR)- emergence of Personal Health Records and their implications for patients, health care providers and Decision Aids and health systems- EHR access agreement.

UNIT 4 COMPUTER APPLICATIONS IN HEALTH CARE AND BIOMEDICINE 9 Hrs.

The language of biomedical informatics: data, information & knowledge; standards and vocabularies - Evidence based practice (EVP) and clinical practice guidelines (CPG) - Evaluation methods for health informatics - Machine learning for extraction of medical knowledge - MATLAB programming for health informatics.

UNIT 5 CASE STUDIES AND ETHICAL ISSUES 9 Hrs.

Modeling, simulation and visualisation in health informatics - Ethical Issues in Health Informatics - Fundamentals of data science in medicine - Genomic and Systems Medicine -Advanced data analysis in medicine - Data driven decision making and evaluation in medicine - Legal Aspects of Health Information Systems - E-Healthcare & Ethics - E-Medicine Business Models - Case Studies in Health Information Management.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Develop knowledge about problems and challenges that health addressed by informatics and apply the knowledge to the research and practice in health informatics.

CO2 - Demonstrate basic skills and knowledge in health informatics for application in future health-related careers.

CO3 - Demonstrate ability to ask, search for information and answer health-related questions.

CO4 - To identify genomic variants associated with a disease phenotype and communicate this association.

CO5 - Perform visualization and simple analysis of a data set to assess difficulty of predicting disease (cardiovascular and other) risk in a synthetic patient dataset.

CO6 - Apply communication skills through an interview with an informatics professional and development of a written summary and analyse ethical and diversity issues in health informatics.

TEXT / REFERENCE BOOKS

1. Hoyt,RE and Yoshihashi, A, Eds. (2014). Health Informatics: Practical Guide for Health care and Information Technology Professionals, Sixth Edition. Pensacola, FL,Lulu.com.
2. Wager KA, Lee FW, Glaser JP. Health Care Information Systems: A Practical Approach for Health Care Management. San Francisco, California: Jossey-Bass 2009.
3. Shortliffe EH, Cimino JJ. Biomedical Informatics: Computer Applications in Health Care and Biomedicine, Fourth Edition. New York, New York: Springer Science +Business Media, LLC 2014.
4. Uri Alon. An Introduction to Systems Biology: Design Principles of Biological Circuits (Chapman & Hall/CRC Mathematical and Computational Biology) Jul 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**

SCSB3523	UNIX INTERNALS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the design of the UNIX operating system.
- To become familiar with the system architecture.
- To learn the various low-level algorithms used in UNIX.
- To learn process control.
- To learn memory management.

UNIT 1 SYSTEM ARCHITECTURE AND ADMINISTRATION 9 Hrs.

General review of the system - History - System structure - User perspective - Operating system services - Assumptions about hardware - Introduction to the kernel -Architecture of the UNIX operating syste - System administration.

UNIT 2 BUFFER CACHE AND DISK BLOCKS 9 Hrs.

The buffer cache - Headers - Buffer pool - Buffer retrieval - Reading and writing disk blocks - Advantages and disadvantagesof the buffer cache - Internal representation of files - Inodes– Structureof the buffer pool - Directories - Path name to Inode - Super block - Inode assignment - Allocation of disk blocks - Other file types.

UNIT 3 FILE SYSTEMS 9 Hrs.

System calls for the file system - Open - Read - Write - Lseek - Close - Create - Special files creation - Change rectory and change root - Change owner and change mode - Stat - Fstat - Pipes - Dup - Mount – Un-mount - Link - Unlink - File system abstraction - Maintenance.

UNIT 4 PROCESS CONTROL 9 Hrs.

The system representation of processes - States - Transitions - System memory - Context of a process -Saving the context - Manipulation of a process address space - Sleep process control - signals - Process termination -Awaiting - Invoking other programs - The Shell - system Boot and the INIT process – process scheduling.

UNIT 5 MEMORY MANAGEMENT 9 Hrs.

Memory management policies - Swapping - Demand paging - A Hybrid System - I/O subsystem - Driver interfaces - Disk drivers - Terminal drivers-Inter Process Communication.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the basic functions of UNIX operating systems.
CO2 - Analyze the buffers and kernel representation.
CO3 - Understand the UNIX system structure and system calls.
CO4 - Demonstrate the UNIX segmentation, scheduling and paging.
CO5 - Apply the concept of memory management and Inter process communication.
CO6 - Explore various file systems.

TEXT / REFERENCE BOOKS

1. Maurice J. Bach, "The Design of the Unix Operating System", Pearson Education, 2002.
2. UreshVahalia, "UNIX Internals: The New Frontiers", Pearson Education Inc, 2003.
3. John Lion, "Lion‟s Commentary on UNIX", 6th edition, Peer-to-Peer Communications, 2004.
4. Daniel P. Bovet & Marco Cesati, “Understanding the Linux Kernel”, O‟REILLY, Shroff Publishers & Distributors Pvt. Ltd, 2000.
5. M. Beck et al, “Linux Kernel Programming”, Pearson Education Asia, 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**

SCSB3524	GREEN COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the fundamentals of Green Computing.
- To analyze the Green computing Grid Framework.
- To understand the issues related with Green compliance.
- To study and develop various case studies.

UNIT 1 GREEN COMPUTING FUNDAMENTALS 9 Hrs.

Information Technology and Environment - Green Enterprise Characteristics- Green Vision-Green Value-Green IT Opportunity- Environmental Intelligence--Envisioning the Green Future.

UNIT 2 GREEN IT STRATEGIES AND ASSETS 9 Hrs.

Introducing Green IT Strategies-Green ITDrivers-GreenITBusinessDimensions-GreenITMetrics and Measurements- Green IT Readiness and CMM-Green Assets–Buildings-Green IT Hardware- Green Data Centers- Networking and Communication Infrastructure-Managing Devices for Central Green Services.

UNIT 3 SOCIO CULTURAL ASPECTS OF GREEN IT 9 Hrs.

GreenIT‟sSocialImpact-GreenSocialstakeholders-RolebasedviewofGreenIT-GreenUserpractices-GreenITEthicsandCodeConduct- PrivacyandsecurityofgreenInformation -Green IT project - Green Virtual Communities.

UNIT 4 EMERGENT CARBON ISSUES – TECHNOLOGIES AND FUTURE 9 Hrs.

Future Carbon Landscape - Green ICT and Technology Trends - Nanotechnologies-QuantumComputing–Ecodesign– NewRenewableEnergies-GreenICT- Business and Economic Trends.

UNIT 5 CASE STUDIES 9 Hrs.

Applying Green IT Strategies and Application to a Hospital -Packing Industry and Industrial Sector.

Max. 45 Hrs.

COURSE OUTCOMES

On Completion of course the student will be able to

CO1 - Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
CO2 - Enhance the skill in energy saving practices in their use of hardware.
CO3 - Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders.
CO4 - Understand the ways to minimize equipment disposal requirements.
CO5 - Satisfy societal requirements.
CO6 - Apply green computing concepts in real time.

TEXT / REFERENCE BOOKS

1. Bhuvan Unhelkar, —Green IT Strategies and Applications-Using Environmental Intelligence, CRC Press, June 2014.
2. Woody Leonhard, Katherine Murray, —Green Home computing for dummies, August 2012.
3. Alin Gales, Michael Schaefer, Mike Ebbers, —Green Data Center: steps for the Journey, Shroff/IBM rebook, 2011.
4. John Lamb, —The Greening of IT, Pearson Education, 2009.
5. Jason Harris, —Green Computing and Green IT- Best Practices on regulations & industry, Lulu.com, 2008.
6. Carl speshocky, —Empowering Green Initiatives with IT, John Wiley & Sons, 2010.
7. Wu Chun Feng (editor), —Green computing: Large Scale energy efficiency, CRC 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**

SCSB3525	INTRODUCTION TO VISUAL COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain in depth knowledge of fundamentals of Visual Computing.
- Modeling and solving image and video processing and analysis problems.
- Exploiting high level knowledge about human visual perception.
- To contribute state-of-the-art solutions for multimedia applications.
- To learn the field of visualisation,determining how best to turn data into information.

UNIT 1 VISUAL COMPUTING INTRODUCTION 9 Hrs.

Physiological Foundations-Representation of Light and Color-Image and Noise Models- Basics of Fourier series, Sampling Theorem-Vector Quantization- k-Means Clustering- Mixture Models- Gray Level and Color Quantization-Relationships between Pixels- Camera Geometry- 2D and 3DTransforms, Projections.

UNIT 2 DIGITAL IMAGE PROCESSING 9 Hrs.

Digital Image Filtering-Image Transforms-Image Enhancement and Restoration, Wiener Filters, Nonlinear Image Processing (Median filtering)-Nonlinear Diffusion, Gauss-Laplace Pyramid, Wavelets-Scale Space, (Image and Video Compression Image Segmentation-Optical Flow-Stereo Vision-Template Matching, Point Matching.

UNIT 3 DIGITAL IMAGE GENERATION 9 Hrs.

The Graphics Pipeline- Lighting and Reflection Models- Shading-Texture Analysis and Texture Mapping-Aliasing- Global Illumination-Radiosity-Ray Tracing-Graphics Systems- APIs-3D Graphics Hardware.

UNIT 4 REPRESENTATION OF GEOMETRY 9 Hrs.

Parametric Curves-Bézier Curves-B-Splines-NURBS- Tensor Product Surfaces, Triangle Meshes-Subdivision Methods-Shape Models, linear (Gaussian) Diffusion.

UNIT 5 LEARNING METHODS IN VISION 9 Hrs.

Classifier Learning-Support Vector Machines-Radial Basis Function Networks-Dimension Reduction: PCA, ICA- Linear Discriminant Analysis-Graphical Models- Markov Random Fields-Maximum Entropy Inference and Bayesian Image Analysis.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Acquaint students with core knowledge in visual information processing and learning.
CO2 - Implement Digital Image Processing Mechanisms.
CO3 - Analyze and design Digital Image Generation Mechanisms.
CO4 - Representation of geometry and subdivision methods.
CO5 - Describe the Learning Methods in Vision.
CO6 - Comprehend the concepts related three dimensional object representations.

TEXT / REFERENCE BOOKS

1. Donald D Hearn, M. Pauline Baker, Computer Graphics C version, Pearson Education.
2. Dave Shreiner, Mason Woo, Jackie Neider, Tom Davis, OpenGL Programming Guide: The Official Guide to Learning OpenGL, (2013).
3. James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics: Principles & Practice in C, Addison Wesley Longman
4. Zhigang Xiang, Roy A Plastock, Computer Graphics, Schaums Outline, TMH.

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**

SCSB3621	DISTRIBUTED DATABASE AND INFORMATION SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the role of databases and database management systems in managing organizational data and information.
- To understand the techniques used for data fragmentation, replication and allocation during the distributed database design process.
- To discuss the issues involved in resource management and process.
- To Perceive the building blocks and design of information systems.
- To acquire knowledge of information systems on Business operations.

UNIT 1 INTRODUCTORY CONCEPTS AND DESIGN OF (DDBMS) 9 Hrs.

Data Fragmentation - Replication and allocation techniques for DDBMS - Methods for designing and implementing DDBMS - designing a distributed relational database - Architectures for DDBMS - Cluster federated - parallel databases and client server architecture - Overview of query processing.

UNIT 2 DISTRIBUTED SECURITY AND DISTRIBUTED DATABASE APPLICATION TECHNOLOGIES 9 Hrs.

Overview of security techniques - Cryptographic algorithms - Digital signatures - Distributed Concurrency Control - Serializability theory - Taxonomy of concurrency control mechanisms - Distributed deadlocks – Distributed Database Recovery - Distributed Data Security - Web data management - Database Interoperability.

UNIT 3 ADVANCED IN DISTRIBUTED SYSTEMS 9 Hrs.

Authentication in distributed systems - Protocols based on symmetric cryptosystems - Protocols based on asymmetric cryptosystems - Password-based authentication - Unstructured overlays - Chord distributed hash table - Content addressable networks (CAN) - Tapestry - Some other challenges in P2P system design - Tradeoffs between table storage and route lengths - Graph structures of complex networks - Internet graphs - Generalized random graph networks.

UNIT 4 FUNDAMENTALS OF INFORMATION SYSTEMS 9 Hrs.

Defining information – Classification of information – Presentation of information systems – Basics of Information systems – Functions of information systems – Components of Information systems- Limitations of Information systems – Information System Design.

UNIT 5 ENTERPRISE COLLOBRATION SYSTEMS 9 Hrs.

Groupware – Types of groupware – Enterprise Communication tools – Enterprise Conferencing tools – Collaborative work management tools – Information System for Business operations – transaction processing systems – functional Information Systems – Decision Support systems – Executive Information systems – Online Analytical processing.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify the introductory distributed database concepts and its structures.
CO2 - Produce the transaction management and query processing techniques in DDBMS..
CO3 - To develop in-depth understanding of relational databases and skills to optimize database performance in practice.
CO4 - Critiques on each type of databases.
CO5 - Analyse, Design and present the information systems.

CO6 - Designing of decision support system and tools for Business operations.

TEXT / REFERENCE BOOKS

1. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education Asia, 2012.
2. Ajay D. Kshemkalyani, MukeshSinghal, "Distributed Computing: Principles, Algorithms, and Systems", Cambridge University Press, 2008.
3. Distributed Databases - Principles and Systems; Stefano Ceri; Guiseppe Pelagatti; Tata McGraw Hill; 2006.
4. Ralph Stair and George Reynolds. , “Principles of Information Systems” Course Technology, Inc.,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**

SCSB3616	SOFT COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the various types of soft computing frameworks.
- To understand the knowledge about Genetic Algorithms.
- To design various types of neural networks.
- To understand the concepts of neuro fuzzy.
- To gain knowledge on Fuzzy Logic.

UNIT 1 NEURAL NETWORKS 9 Hrs.

Introduction to ANS - Adaline - Back propagation network - Hopfield network - Boltzman machine - Self organizing maps- Support Vector Machines-Spike Neuron Models.

UNIT 2 FUZZY LOGIC 9 Hrs.

Fuzzy sets - Fuzzy rules and fuzzy reasoning –Defuzzification- Fuzzy inference system - Mamdani fuzzy model - Sugenofuzzy model - Tsukamoto fuzzy model.

UNIT 3 NEURO FUZZY 9 Hrs.

Adaptive Neuro Fuzzy Inference System - Coactive neuro-fuzzy modelling - Classification and regression trees - Data Clustering Algorithm - Rule based structure - Neuro - Fuzzy control I - Neuro - Fuzzy control II - Fuzzy decision making.

UNIT 4 GENETIC ALGORITHM 9 Hrs.

Introduction - Implementation of GA - Reproduction - Crossover - Mutation - Coding - Fitness scaling - Application of GA.

UNIT 5 ARTIFICIAL INTELLIGENCE 9 Hrs.

Introduction - Searching techniques - First order Logic - Forward reasoning - Backward reasoning - Semantic – Frames.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe human intelligence and how intelligent system works.
CO2 - Apply basics of Fuzzy logic and neural networks.
CO3 - Discuss the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
CO4 - Discuss about Neuro Fuzzy concepts.
CO5 - Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self- learning situations.
CO6 - Develop some familiarity with current research problems and research methods in Soft Computing Techniques.

TEXT / REFERENCE BOOKS

1. James A. Freeman and David M. Skapura, ―Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.
2. S.R.Jang, C.T. Sun And E.Mizutani, “Neuro-Fuzzy And Soft Computing”, PHI / Pearson Education 2004.
3. David E. Goldberg, “Genetic Algorithm In Search Optimization And Machine Learning” Pearson Education India, 2013.

4. Stuart J. Russel, Peter Norvig, “Artificial Intelligence A Modern Approach”, 2nd Edition, Pearson Education, 2003.
5. S.N.Sivanandam , S.N.Deepa, “Principles of Soft Computing”, Wiley India Pvt. Ltd., 2nd Edition, 2011.
6. S.Rajasekaran, G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications “, PHI Learning Pvt. Ltd., 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**

SCSB3613	AI IN SPEECH PROCESSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand acoustic theory behind the human speech production and speech perception systems.
- To analyze and estimate the acoustic features from a speech signal.
- To understand the AI based algorithms used for speech modeling enable the students to develop various speech systems.
- To understand text to speech conversion and its application.

UNIT 1 SPEECH PROCESSING BASICS 9 Hrs.

Basic Concepts:Speech Fundamentals: Articulatory Phonetics–Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

UNIT 2 SPEECH ANALYSIS 9 Hrs.

Speech Analysis: Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

UNIT 3 SPEECH MODELS 9 Hrs.

Speech Modeling: Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

UNIT 4 SPEECH RECOGNITION 9 Hrs.

Speech Recognition:Large Vocabulary Continuous Speech Recognition:Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n- grams, context dependent sub-word units; Applications and present status.

UNIT 5 SPEECH SYNTHESIS 9 Hrs.

Speech Synthesis: Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Infer knowledge about acoustics of speech production and perception.
CO2 - Analyzing efficient speech features used for modelling.
CO3 - Evaluate different Speech modeling mechanism.
CO4 - Analyze various algorithms on AI based Speech modelling.
CO5 - Compare various speech synthesis methods.
CO6 - Develop real time application based on speech to text conversion.

TEXT / REFERENCE BOOKS

1. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language.
2. Processing, Computational Linguistics, and Speech Recognition”, Pearson Education. 2008.
3. Speech and Language Processing (3rd edition),Dan Jurafsky and James H. Martin, October 16, 2019.
4. Lawrence RabinerandBiing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2008.
5. Steven W. Smith, “The Scientist and Engineer’s GuidetoDigitalSignalProcessing”, California Technical Publishing. 2011.
6. Thomas FQuatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education.2002.
7. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.
8. Ben gold and Nelson Morgan, “Speech and audio signal processing”, processing and perception of speech and music,Wiley-IndiaEdition,2006 Edition.
9. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press,1998.
10. Himanshu Mohan, Megha Yadav, " Speech Recognition System and its Application”, LAP LAMBERT Academic Publishing, 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**

SCSB3422	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 understand of the knowledge management system life cycle.
- To acquire the Knowledge Capturing Techniques
- To learn the coding tools and procedures
- To explore the faster decision making with knowledge transfer systems.

UNIT 1 KNOWLEDGEMANAGEMENT 9 Hrs.

KMMyths–KMLifeCycle–UnderstandingKnowledge–Knowledge,intelligence –Experience – Common Sense – Cognition and KM – Types of Knowledge – Expert Knowledge – Human Thinking and Learning.

UNIT 2 KNOWLEDGE MANAGEMENTSYSTEM LIFE CYCLE 9 Hrs.

Challenges in Building KM Systems– Conventional Vrs KM System Life Cycle (KMSLS) – Knowledge Creation and Knowledge Architecture – Nonaka's Model of Knowledge Creation and Transformation. Knowledge Architecture.

UNIT 3 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 – ConsensusDecisionMaking–RepertoryGrid-ConceptMapping–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–Post implementation.

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.Award&HassanM.Ghaziri–"KnowledgeManagement"PearsonEducation2000
2. GuusSchreiber,HansAkkermans,AnjoAnjewierden,RobertdeHoog,NigelShadbolt,WalterVande VeldeandBobWielinga,"KnowledgeEngineeringandManagement",UniversitiesPress,2001.
3. C.W.Holsapple,"HandbooksonKnowledgeManagement",InternationalHandbooks on Information Systems,Vol1and2,2003
4. 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**

		L	T	P	EL	Credits	Total Marks

SCSB3621	**SYSTEM MODELING AND SIMULATION**	**3**	**0**	**0**	**0**	**3**	**100**

COURSE OBJECTIVES

- To introduce various system modelling and simulation techniques and highlight their applications in different areas.
- To discuss about modelling, design, simulation, planning, verification and validation.
- To understand various mathematical models.
- To validate and verify the simulated model.
- To understand simulation programming.

UNIT1 INTRODUCTION TO SIMULATION 9 Hrs.

Introduction – Simulation Terminologies - Application areas - Model Classification - Types of Simulation - Steps in a Simulation study - Concepts in Discrete Event Simulation - Simulation Examples .

UNIT2 MATHEMATICAL MODELS 9 Hrs.

Statistical Models - Concepts – Discrete Distribution- Continuous Distribution - Poisson Process- Empirical Distributions - Queuing Models – Characteristics- Notation– Queuing Systems - Markovian Models - Generation of Pseudo Random numbers- Properties of random numbers - Techniques for generating random numbers - Testing random number generators - -Generating Random-Variates- Inverse Transform technique– Acceptance- Rejection technique - Composition & Convolution Method.

UNIT3 ANALYSIS OF SIMULATION DATA 9 Hrs.

Input Modeling - Data collection - Assessing sample independence- -Hypothesizing distribution family with data - Parameter Estimation – Goodness-of-fit tests - Selecting input models in absence of data - Output analysis for a Single system - Terminating Simulations– Steady state simulations.

UNIT 4 VERIFICATION AND VALIDATION 9 Hrs.

Model Building – Verification of Simulation Models - Calibration and Validation of Models - Validation of Model Assumptions – Validating Input – Output Transformations.

UNIT 5 SIMULATION OF COMPUTER SYSTEMS AND CASE STUDIES 9 Hrs.

Simulation Tools - Model Input - High level computer system simulation - CPU Memory Simulation - Comparison of systems via simulation - Simulation Programming techniques - Development of Simulation models .

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe the components of continuous and discrete systems and simulate them.
CO2 - Explain the need for the development process to initiate the real problem.
CO3 - Simulate any discrete system using queuing systems.
CO4 - Implementnumerical algorithm to meet simple requirements.
CO5 - Discuss the simulation methods and select the suitable technique on the problems.
CO6 - Model any system from different fields.

TEXT / REFERENCE BOOKS

1. Jerry Banks and John Carson, “Discrete Event System Simulation”, Fourth Edition, PHI, 2005.
2. Geoffrey Gordon, “System Simulation”, Second Edition, PHI, 2006.
3. Frank L. Severance, “System Modeling and Simulation”, Wiley, 2001.
4. Averill M. Law and W. David Kelton, “Simulation Modeling and Analysis, Third Edition, McGraw Hill, 2006.
5. Sheldon M. Ross: Introduction to Probability Models 7th Edition, Academic Press, 2002.
6. Donald E. Knuth: The Art of Computer Programming - Volume 2: Semi Numerical Algorithms, 2nd Edition, PEARSON Education, Reading MA, USA 2000.
7. Sheldon M. Ross: Simulation 3rd Edition, Academic 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**

SCSB3716	OPEN SOURCE SYSTEMS	L	T	P	EL	Credits	Total Marks

		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand open source licenses and learn the implications for users, developers and the software community.
- To Understand the motivation, theory, strengths and weakness of open source software.
- To become familiar with and become adapt using the tools of open source development.
- To learn GNU.
- To practice open source programming techniques.

UNIT 1 OVERVIEW OF FREE/OPEN SOURCE SOFTWARE 9 Hrs.

Overview of Free/Open Source Software - Definition of FOSS &GNU - History of GNU/Linux and the free software movement - Advantages of free software and GNU/Linux –Licensing - Types of licensing , Intellectual Proprietary Right, Commercial License vs. Open source license- Open Source Licensing, Contract and Copyright Law: Basic principles of copyright law, contract and copyright, open source software licensing, Issues with copyrights and patents, warranties . The FOSS Philosophy, usage - Trends and potential -global and Indian –. FOSS Licenses – GPL- AGPL- LGPL – FDL – Implications – FOSS examples . Review of common programming practicies and guidelines for GNU/Linux and FOSS.

UNIT 2 LINUX 9 Hrs.

Linux OS Installation and Hardware Configuration - Configure disk partitions & file systems and install a GNU/Linux distribution - Basic shell commands - Logging in, Listing files, editing files, copying/moving files, viewing file contents, changing file modes and permissions, process management User and group management -File ownerships and permissions -PAM authentication - Introduction to common system configuration files & log files -Configuring networking -Basics of TCP/IP networking and routing - Connecting to the Internet ,System Administration – Backup and Restore Procedures- Strategies for keeping a Secure Server.

UNIT 3 OPEN SOURCE TOOLS AND TECHNOLOGIES FOR HARDWARE AND E-MAIL SERVER 9 Hrs.

Configuring additional hardware -Sound cards -Displays & display cards-Network cards -Modems -USB drives -CD writers -The OS boot up process -Performing every day tasks using GNU /Linux - Accessing the Internet -Playing music -Editing documents and spreadsheets -Sending and receiving email -Copy files from disks and over the network -Playing games - Writing CDs -X Window system configuration and utilities -Configure X windows -Detect display devices -Installing software - From source code as well as using binary packages -Setting up email servers-Using postfix -(SMTP services) -Courier (IMAP & POP3 services) -Squirrel mail (web mail services) -Setting up web servers - Using apache (HTTP services) -PHP (server-side scripting) -Perl (CGI support) -Setting up file services -Using samba (file and authentication services for windows networks) –Using NFS (file services for gnu/Linux / Unix networks) -Setting up proxy services -Using squid (http / ftp / https proxy services) – Printer Installation.

UNIT 4 UNDERSTANDING GNU LIBC LIBRARIES, COMPILERS AND LINKER 9 Hrs.

GNU compiler tools - The C compiler (gcc) and the C++ compiler (g++) - Linking against object archives (.a libraries) and dynamic shared object libraries (.so libraries) -Generating statically linked binaries and libraries -Generating dynamically linked libraries -Using the GNU debugging tools -Gdb to debug programs -Graphical debuggers like ddd -Memory debugging/profiling libraries mpatrol and valgrind - Introduction to Bash, sed & awk scripting.

UNIT 5 OPEN SOURCE PROGRAMMING TECHNIQUES 9 Hrs.

Application Programming -Basics of the X Windows server architecture -Qt programming -Gtk+ programming -Python programming - Execution Environment - Programming GUI applications with localisation support, Open Source Equivalent of existing commercial software.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understands the importance of open source and how it can be used in efficient manure.
CO2 - Understands the importance of licensing, legal impacts.
CO3 - Configured Hardware using OPEN SOURCE TOOLS AND TECHNOLOGIES.
CO4 - Get experiences with python programming language.
CO5 - Understand various system software tools.
CO6 - Implement various applications using open source software.

TEXT / REFERENCE BOOKS

1. N. B. Venkateshwarlu (Ed), “Introduction to Linux: Installation and Programming”, B S Publishers; 2005. (NRCFOSS Publication.
2. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, “Linux in a Nutshell”, Sixth Edition, OReilly Media, 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**

SCSB3711	ML TOOLS AND TECHNIQUES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand and gain complete knowledge Representation.
- To understand input preprocessing and combining output from different methods.
- To provide data analytic skills by processing and visualization of data.
- To understand performance improvement techniques.
- To design and develop engineering applications using tool.

UNIT 1 INTRODUCTION TO DATA MINING AND MACHINE LANGUAGE 9 Hrs.

Fielded Applications, The Data Mining Process, Machine Learning and Statistics, Generalization as Search, Data Mining and Ethics, Input: concepts, instances, attributes, Preparing the Input, output: Knowledge representation- Tables, Linear Models, Trees , Rules, Instance-Based Representation, Clusters.

UNIT 2 KNOWLEDGE REPRESENTATION 9 Hrs.

Tables, Linear Models, Trees, Rules, Instance-Based Representation, Clusters, and Algorithms: the basic Methods, Inferring Rudimentary Rules, Simple Probabilistic Modeling, Divide-and-Conquer: Constructing Decision Trees, Covering Algorithms: Constructing Rules, Mining Association Rules, Linear Models, Instance-Based Learning, Clustering, Multi-Instance Learning.

UNIT 3 CREDIBILITY 9 Hrs.

Training and Testing, Predicting Performance,Cross-Validation, Other Estimates, Hyperparameter Selection, Comparing Data Mining Schemes Predicting Probabilities, Counting the Cost, Evaluating Numeric Prediction, The Minimum Description Length Principle, Applying MDL to Clustering, using a Validation Set for Model Selection.

UNIT 4 TREES AND RULES 9 Hrs.

Decision Trees, Classification Rules, Association Rules, extending instance-based and linear models-Instance-Based Learning, Extending Linear Models, Numeric Prediction with Local Linear Models, WEKA Implementations. Data transformations- Attribute Selection, Discretizing Numeric Attributes, Projections, Sampling, Cleansing, Transforming Multiple Classes to Binary Ones, Calibrating Class Probabilities.

UNIT 5 MACHINE LEARNING TOOLS 9 Hrs.

Knime, Accord. net, Scikit- Learn, Tensor Flow, Pytorch, Rapid Miner, Google Cloud AutoML, Jupyter Notebook, Apache Mahout, Azure Machine Learning studio, MLLIB, Orange3, IBM Watson, Pylearn2.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Able to represent the knowledge using tools.
CO2 - Compare different output models and their applications.
CO3 - analyze on how to improve the performance.
CO4 - To implement the models using WEKA tools.
CO5 - To work with learning workbench and links to algorithm implementations in the software.
CO6 - Design and implement applications-based Tools.

TEXT / REFERENCE BOOKS

1. Data mining machine learning tools and techniques, Chris Pal, Ian Witten, Eibe Frank, Mark Hall, 2011.
2. Machine Learning the art of science and algorithms that make sense of data, peter, flach,2012.
3. Machine Learning for Absolute Beginners, Oliver Theobald,2021.
4. Interpretable Machine Learning, Christoph Molnar,2020.
5. Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, Mark A. Hall, 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**

SCSB3721	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 describe a flow process for data science problems.
- To introduce basic data science algorithms and data visualization.
- To learn machine tools and techniques.
- To learn the ideas and tools for data visualization.

UNIT1 LINEAR ALGEBRA 9 Hrs.

Algebraic view – vectors 2D, 3D and nD, matrices, product of matrix & vector, rank, null space, solution of over determined set of equations and pseudo-inverse.Geometric view - vectors, distance, projections, eigenvalue decomposition, Equations of line, plane, hyperplane, circle, sphere, Hypersphere.

UNIT 2 PROBABILITY AND STATISTICS 9 Hrs.

Introduction to probability and statistics, Population and sample, Normal and Gaussian distributions, Probability Density Function, Descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates.

UNIT 3 EXPLORATORY DATA ANALYSIS AND THE DATA SCIENCE PROCESS 9 Hrs.

Exploratory Data Analysis and the Data Science Process - 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.

UNIT4 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 INTRODUCTION TO PYTHON 9 Hrs.

Data structures-Functions-Numpy-Matplotlib-Pandas- problems based on computational complexity-Simple case studies based on python (Binary search, common elements in list), Hash tables, Dictionary.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Explain the basic terms of Linear Algebra and Statistical Inference.
CO2 - Describe the Data Science process and its components interaction.
CO3 - Apply EDA and the Data Science process in a case study.
CO4 - Classify Data Science problems.
CO5 - Analyse and correlate the results to the solutions.
CO6 - Simulate Data Visualization in exciting projects.

TEXT / REFERENCE BOOKS

1. Cathy O"Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O"Reilly. 2014.
2. Introduction To Linear Algebra - By Gilbert Strang, Wellesley-Cambridge Press, Fifth Edition.2016.
3. Applied Statistics And Probability For Engineers – By Douglas Montgomery.2016.
4. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online).
5. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.
6. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.
7. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online).
8. LEARN PYTHON 3 THE HARD WAY, Third Edition, Zed A. Shaw.
9. Python for Data Analysis Oreilly, Wes McKinney.

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**

SCSB3814	ROBOTICS AND AUTOMATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce basic concepts of various dynamics processes.
- To educate on the effect of various power sources and sensors..
- To impart knowledge on the manipulators , grippers and robot dynamics.

UNIT 1 BASIC CONCEPTS 9 Hrs.

Origin & various generation of Robots - Robot definition - Robotics system components - Robot classification Coordinate frames - Asimov‟s laws of robotics - degree of freedom - dynamic stabilization of robots.- work volume. Need for Automation - types of automation - fixed, programmable and flexible automation.

UNIT 2 POWER SOURCES AND SENSORS 9 Hrs.

Hydraulic, pneumatic and electric drives - determination of HP of motor and gearing ratio - variable speed arrangements - path determination - micro machines in robotics - machine vision - ranging - laser - acoustic - magnetic, fiber optic and tactile sensors.

UNIT 3 MANIPULATORS, ACTUATORS, GRIPPERS and ROBOT DYNAMICS 9 Hrs.

Construction of manipulators - manipulator dynamics and force control - electronic and pneumatic manipulator control circuits - end effectors - various types of grippers - design considerations. Introduction to Robot Dynamics - Lagrange formulation - Newton Euler formulation - Properties of robot dynamic equations.

UNIT 4 KINEMATICS AND PATH PLANNING 9 Hrs.

Forward Kinematics – Denavit Hartenberg Representation. multiple solution jacobian work envelop, Inverse Kinematics - Geometric approach. Hill climbing techniques.

UNIT 5 PROGRAMMING LANGUAGES AND APPLICATIONS 9 Hrs.

Robot programming - Fixed instruction, sequence control, General programming language, Specific programming languages.Robots for welding, painting and assembly - Remote Controlled robots - robots in manufacturing and non- manufacturing applications - Robots for nuclear and chemical plants.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the concepts of Robotics automation process.
CO2 - Criticize the laws of robotics and identify the types.
CO3 - Integrate different types of sensors for industrial applications.
CO4 - Apply the AI techniques in Automation process to make the Robot as intellegent.
CO5 - Simulate Real time Automated Robot for Industrial applications.
CO6 - Create an AI based Robot for any real time applications.

TEXT / REFERENCE BOOKS

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., “Industrial Robotics”, McGraw-Hill Singapore, 2011.
2. Ghosh, “Control in Robotics and Automation: Sensor Based Integration”, Allied Publishers, Chennai, 1998.
3. Deb.S.R., “Robotics technology and flexible Automation”, John Wiley, USA 2017.
4. Asfahl C.R., “Robots and Manufacturing Automation”, John Wiley, USA 2013.
5. Bruno Siciliano, Oussama Khatib, Springer Handbook of Robotics, Springer publishing company, 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 of 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 identify types of digital twin and data IoT technologies.
- To make a twin Modelling.
- To understand about Modelling, Risk Management and Twin Constructions.
- To make students aware of security concerns while implementing Cyber Digital Twin Technology.

UNIT 2 DATA MODELING ENVIRONMENT 9 Hrs.

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

UNIT 3 DIGITAL TWIN OPTMIZATION 9 Hrs.

Cyber range vs digital twin-human behavior modeling 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, BibinPattel and Affan Siddiqui – Elsevier 2020.
3. Hacking Exposed Industrial Control Systems: ICS and SCADA Security Secrets & Solutions (1st Edition), by Clint Bodungen, Bryan Singer, Aaron Shbeeb, Kyle Wilhoit, and Stephen Hilt, ISBN: 978-1259589713.

4. Applied Cyber Security and the Smart Grid: Implementing Security Controls into the Modern Power Infrastructure (1st Edition), by Eric D. Knapp and Raj Samani.
5. The Art of Invisibility - Kevin Mitnick,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**

SCSB3752	ADVANCED NEURAL NETWORKS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To explain different network architectures and how these are used in current applications
- To introduce major learning algorithms, the problem settings, and their applications to solve real world problems.
- To understand the concept behind neural networks for learning non-linear functions
- To understand the role of neural networks in engineering, artificial intelligence, and cognitive modeling.

UNIT 1 NEURAL NETWORKS 9 Hrs.

Gradient Descent, Stochastic gradient descent and ADAM (adaptive methods), Loss function The Construction of Deep Neural Networks, CNNs, Back propagation and Chain Rule, Hyper Parameters, The world of Machine learning.

UNIT 2 BOLTZMANN MACHINES 9 Hrs.

Introduction to Boltzmann, Machines, Restricted Boltzmann Machines, Collaborative filtering using Boltzmann Machine.

UNIT 3 RECURRENT NEURAL NETWORK 9 Hrs.

Mini-Batch gradient descent, Recurrent Neural Network, Predicting the next character using RNN, Introduction to Deep Learning, Introduction to Tensor flow, Creating a Deep Learning Network using Tensor flow.

UNIT 4 BELIEF NETWORKS 9 Hrs.

Introduction to Deep Belief Networks, Stacking RBMs to make Deep Belief Nets, The wake-sleep algorithm.

UNIT 5 MODERN STATISTICAL CONCEPT 9 Hrs.

Model free confidence interval, Jackknife regression, Hidden decision trees, Bayesian networks, Better goodness of fit and yield metrics.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify the learning algorithms which are more appropriate for various types of learning tasks in various domains.
CO2 - Implement, train, and evaluate neural networks using existing software libraries.
CO3 - Present and critically assess current research on neural networks and their applications.
CO4 - Analyze and Predict various classification problem.
CO5 - Apply neural networks to particular applications to know what steps to take to improve performance.
CO6 - Select appropriate Learning Networks in modelling real world systems.

TEXT / REFERENCE BOOKS

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
2. Phil Kim, “Matlab Deep Learning with Machine Learning, Neural Networks and Artificial Intelligence”, Apress, 2017.
3. Daniel Graupe,”Principles of Artificial Neural Networks”, World Scientific Publishing Company; 2013.
4. Yoav Goldberg,” Neural Network Models in Natural Language Processin”,. Morgan & Claypool, 2017.
5 Simon O. Haykin ,”Neural Networks and Learning Machines”, 3rd Edition. Prentice Hall, 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**

SCSB3816	QUANTUM COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce the basics of Quantum Computing.
- To understand Quantum state transformation and classical computation versions.
- To know various Quantum Computation Algorithms.
- To have knowledge on Generalizations and advanced quantum computation algorithms.
- To be proficient on the concepts of robust computation and error correction.

UNIT 1 QUANTUM BUILDING BLOCKS-I 9 Hrs.

Introduction - Single Qubit Quantum Systems - Multiple Qubit Systems.

UNIT 2 QUANTUM BULDING BLOCKS-2 9 Hrs.

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

UNIT 3 BASIC ALGEBRA FOR QUANTUM ALGORITHMS 9 Hrs.

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

UNIT 4 QUANTUM ALGORITHMS 9 Hrs.

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

UNIT 5 ENTANGLED SUBSYSTEMS AND ROBUST QUANTUM COMPUTATIONS 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - An ability to identify, analyze the building Blocks.
CO2 - Know Quantum state transitions.
CO3 - Identify the advantages and limitations of Quantum Computational Algorithms.
CO4 - Apply advanced quantum computation algorithms.
CO5 - Investigate the concepts of robust computation and error corrections.
CO6 - Analyze error correction mechanisms.

TEXT / REFERENCE BOOKS

1. Quantum computing A Gentle Introduction, Eleanor Rieffel and Wolfgang Polak, The MIT Press Cambridge, Massachusetts London.
2. Quantum algorithms via linear algebra, Richard J. Lipton, Kenneth W. Regan, The MIT Press Cambridge, Massachusetts London, England, 2014.
3. Quantum computing devices: principles, designs and analysis, Goong Chen, David A. Church , Berthold-Georg Englert , Carsten Henkel, Bernd Rohwedder , Marlan O. Scully, M. Suhail Zubairy, Hapman and Hall/CRC.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PART A: 10 question of 2 marks each – No choice **20 Marks**

PART B: 2 questions from each unit of 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 modelling.
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**

SCSB3825	PARALLEL SYSTEM PROGRAMMING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of parallel computing and Algorithm Design.
- To learn the popular parallel programming paradigms SIMD, MIMD (Message passing and Shared memory).
- To understand major performance issues for parallel systems and programs.
- To reiterate hot topics in research on parallel Programming.
- To learn CUDA architectures.

UNIT 1 INTRODUCTION TO PARALLEL COMPUTING 9 Hrs.

Motivating Parallelism- Scope of Parallel Computing- The von Neumann architecture- 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- Shared- Distributed-memory - Programming hybrid systems.

UNIT 2 PRINCIPLES OF PARALLEL ALGORITHM DESIGN 9 Hrs.

Preliminaries - Decomposition techniques - Characteristics of tasks and interactions - Mapping techniques for load balancing - Methods for containing interaction overheads - Parallel algorithm models – Basic communication operations.

UNIT 3 PROGRAMMING USING MESSAGE PASSING 9 Hrs.

Principles of Message-Passing Programming - The Building Blocks: Send and Receive Operations-MPI: the Message Passing Interface -Topologies and Embedding Section - Overlapping Communication with Computation - Collective Communication and Computation Operations - Groups and Communicators.

UNIT 4 PROGRAMMING USING SHARED MEMORY 9 Hrs.

Shared Memory Programming with Pthreads: Processes, Threads, and Pthreads - Matrix-Vector Multiplication – Critical Sections- Producer-Consumer Synchronization and Semaphores- Barriers and Condition Variables-Read-Write Locks-Caches, Cache Coherence, and False Sharing.

Shared Memory Programming with OpenMP: Compiling and running OpenMP programs-The Trapezoidal Rule-Scope of Variables-The Reduction Clause-The parallel for Directive-Scheduling Loops-Producers and Consumers.

UNIT 5 PROGRAMMING PARALLEL PROCESSORS 9 Hrs.

Introduction to CUDA – CUDA Threads – CUDA Memories – Performance and Floating Point Considerations-Parallel Programming and Computational Thinking- Introduction to OPENCL.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Recognize various parallel computing requirements.
CO2 - Describe the basic concepts of Shared Memory and Message Passing.
CO3 - Design solutions for Parallel Processor based Architectures.
CO4 - Analyse a problem, design a solution and test their implementation.
CO5 - Design and implement large scale machine as well as applications.
CO6 - Implement parallel computing to a variety of applications in Mathematics and Engineering.

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. Michael J Quinn, “Parallel programming in C with MPI and OpenMP”, Tata McGraw Hill, 2003.
4. David B. Kirk and Wen-mei W. Hwu, “Programming Massively Parallel Processors”, Morgan Kaufmann, 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**

SCSB3412	AUGMENTED REALITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To make students to know the basic concepts and framework Augmented reality.
- To teach students the principles and multidisciplinary features in Augmented reality.
- To teach students the technology for multimodal user interaction and perception in AR.
- To teach students the technology for managing large scale AR environment in real time.
- To provide students with an introduction to the AR system framework and development

UNIT 1 INTRODUCTION TO AR 9 Hrs.

Digital enhancement, physical enhancement, Registration with the Physical World, Person in the Physical World, e Spectrum Between Real and Virtual Worlds- Process of Augmented Reality Applications, Sensor(s), processors, display - Computer Graphics, Dimensionality, Depth Cues, Registration and Latency -Ingredients of an Augmented Reality.

UNIT 2 AUGMENTED REALITY HARDWARE 9 Hrs.

Components for Augmented Reality Systems – roles of sensors – tracking, optical tracking, Acoustical, Electromagnetic, Mechanical Tracking, Multiple Sensors, Role of processors – Architecture, handled, desktop, web applications, graphic accelerators, network bandwidth, displays - Visual, Audio, Haptic, sensory, Stereo display.

UNIT 3 AUGMENTED REALITY SOFTWARE 9 Hrs.

Environmental acquisition, Sensor integration, Application engine, rendering software, Augmented reality libraries- cross platform, creating and editing three-dimensional graphics, two-dimensional graphics, creating and editing sound, Precompute Sounds Using Software Outside the AR Application

UNIT 4 AUGMENTED REALITY CONTENT 9 Hrs.

Attributes, physical, conceptual representation, telling stories, AR games, Conveying Information, visual content, three dimensional objects, two dimensional images, animation, audio content, content for touch, taste and smell, representation of senses, sight, hearing.

UNIT 5 INTERACTION WITH AUGMENTED REALITY 9 Hrs.

Real world interaction, Manipulation, Navigation, Communication, Projected Augmented Reality Environments, Subjective vs Objective. Mobile augmented reality- advantage and disadvantages, Architecture, Augmented Reality Applications, Magic Books, Magic Mirrors.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

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

TEXT / REFERENCE BOOKS

1. Understanding Augmented Reality, Alan B. Craig, 2013.
2. Augmented Reality: Principles and Practice, Tobias Höllerer, Dieter Schmalstieg, 2016.
3. Augmented Reality: Where We Will All Live, Jon Peddie, 2017.
4. Augmented Reality: An Emerging Technologies, Joseph Rampolla, Gregory Kipper,2012.
5 Augmented Reality, Günter Abel and James Conant, 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 carrying 16 marks **80 Marks**

SCSB3827	BLOCK CHAIN TECHNOLOGIES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce Bit coin and other crypto currencies.
- To study the algorithms and techniques in block chain.
- To understand the practical aspects in the design of crypto currency.
- To understand the function of Block chains as a method of securing distributed ledgers.
- To design, code, deploy and execute a smart contract.

UNIT 1 INTRODUCTION TO BLOCKCHAIN 9 Hrs.

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

UNIT 2 ARCHITECTURE AND CONCEPTUALIZATION OF BLOCK CHAIN, CRYPTO CURRENCIES 9 Hrs.

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

UNIT 3 CRYPTO PRIMITIVES, SECURING AND INTERCONNECTING PUBLIC AND PRIVATE BLOCK CHAINS 9 Hrs.

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

UNIT 4 MINING AND CRYPTO CURRENCIES - HOW TO USE AND INTERACT 9 Hrs.

Mining-Pools-Impact of CPU and GPU- Transaction in Bit Coin Network- Block Mining-Block propagation and block relay.

UNIT 5 USE CASES-APPLICATIONS IN DIFFERENT AREAS 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Explain the structure of a block chain.
CO2 - Analyze the incentive structure in a block chain based system.
CO3 - Judge the scenario where “smart” contract is most appropriate.
CO4 - Identify Basic knowledge of Bitcoin, Ethereum.
CO5 - Apply Blockchain in future use cases for security.
CO6 - Understand the various Block Chain applications.

TEXT / REFERENCE BOOKS

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos O‟Reilly, First Edition, 2014.
2. Blockchain by Melanie Swa, O‟Reilly Media 2015.
3. Zero to Block chain - An IBM Redbooks course, by Bob Dill, David Smits.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

SCSB3811	REINFORCEMENT AND ENSEMBLE LEARNING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- The course will lay down the basic concepts and techniques of reinforcement and ensemble learning.
- Understanding the basics behind deep reinforcement learning and implementing the code for the same.
- Exploring the core challenges and opportunities in the field of deep reinforcement learning
- Implement and apply different reinforcement learning algorithms and ensembling model techniques.

UNIT 1 INTRODUCTION 9 Hrs.

Introduction to Deep Reinforcement Learning – Approximate Solution Methods: On-policy Prediction with Approximation – On- policy Control with Approximation – Off-policy Methods with Approximation.

UNIT 2 NEURAL NETWORK: RECURRENT AND RECURSIVE 9 Hrs.

Tree Recursive Neural Networks and Constituency Parsing, Recurrent neural networks for language modeling Dynamic Neural Networks for Question Answering.

UNIT 3 NEURAL NETWORK: CNN 9 Hrs.

Convolutional neural networks, recurrent and recursive neural networks, backpropagation algorithms, regularization and optimization techniques for training such networks.

UNIT 4 REINFORCEMENT LEARNING ALGORITHMS 9 Hrs.

dynamic programming, Monte Carlo, and temporal difference, and function approximation reinforcement learning algorithms, and applications of deep and reinforcement learning – Value function methods, Deep RL with Q-learning – Multi agent RL - Eligibility Traces – Policy Gradient Methods – Applications and Case studies.

UNIT 5 ENSEMBLING MODELS 9 Hrs.

Ensemble models –Applications of Ensembling– Types and techniques of Ensembling–Graphical models –Evaluation measures –Hypothesis testing –Cross-validation and Hyperparameter optimization–Bootstrapping and Uncertainties.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - To understand the basics of deep reinforcement learning.
CO2 - To implement in code deep reinforcement learning algorithms.
CO3 - To explore the core challenges and opportunities in the field of deep reinforcement learning.
CO4 - Implement and apply Monte Carlo reinforcement learning algorithms.
CO5 - Implement and apply temporal-difference reinforcement learning algorithms.
CO6 - Understand the ensembling models and its techniques.

TEXT / REFERENCE BOOKS

1. Deb, K.: Optimization for Engineering Design, PHI, India, 2000.
2. Deb, K.: Multi-objective Optimization using Evolutionary Algorithms, Wiley, Uk, 2001.
3. Relf, Christopher G.,"Image acquisition and processing with LabVIEW", CRC press.

4. Aner ozdemi R, "Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms", John Wiley & Sons.
5. Chris Solomon, Toby Breckon,"Fundamentals of Digital Image Processing A Practical Approach with Examples in Matlab", John Wiley & Sons.

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 carrying 16 marks **80 Marks**

SCSB3814	EXPLORATORY DATA ANALYSIS AND TIME SERIES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basic statistical tools for analysis & interpretation of qualitative & quantitative data.
- To introduce basic concepts of Statistics and to provide Statistical techniques for data analysis.
- To understand various components of time series.

UNIT 1 INTRODUCTION TO DATA ANALYSIS 9 Hrs.

Introduction – collection, classification and tabulation of data – Concept of primary and secondary data – Data - quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio – Data visualization - Bar diagram, pie chart, histogram, frequency curve and frequency polygon – Ogives.

UNIT 2 DESCRIPTIVE STATISTICS 9 Hrs.

Data summarization – Mean, Median and Mode – Measures of dispersion – Range, Quartile deviation and standard deviation – coefficient of variation – skewness and kurtosis.

UNIT 3 BIVARIATE DATA 9 Hrs.

Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponential curves.

UNIT 4 INTRODUCTION TO TIME SERIES 9 Hrs.

Introduction to times series data - application of time series in various fields - Components of a times series, Decomposition of time series - Trend - types of Trends.

UNIT 5 ANALYSIS OF TIME SERIES 9 Hrs.

Measure of trend – Graphical method, Semi Average method, Moving Average method and Least Square method – Measurement of Seasonal Variation – Simple Average method, Ratio Trend method and Ratio Moving Average method.

Max. 45 Hrs.

COURSE OUTCOMES

CO1 - Identify, classify and tabulate the data. Construct various frequency charts.
CO2 - Evaluate the various measures of central tendency and measures of variation.
CO3 - Evaluate the Karl Pearson's correlation coefficient, Spearman's correlation coefficient and Regression Equations. Explore the relationship between correlation and regression. Fitting of straight line by least squares.
CO4 - Empathize the students about the importance of Time series and components of Time series.
CO5 - Explain the various methods to measure the trend.
CO6 - Explore the methods designed to measure the seasonal variation.

TEXT / REFERENCE BOOKS

1. Veerarajan.T, Probability, Statistics and Random Process, Tata McGraw Hill,3rdedition, TataMcGrawHill,2017.
2. David S. Moore, George P. McCabe, Bruce A. Craig. Introduction to the practice of statistics, 7th edition, W.H. Freeman and Company, New York 2011.
3. J. N. Kapur and H. C. Saxena, Treatment and Content as in Mathematical Statistics, 20th Edition, S. Chand & Co. Ltd., New Delhi, 2010.
4. Stephen Bernstein Schaum's Outline of Elements of Statistics I: Descriptive Statistics and Probability, McGraw-Hill, 1998.
5. P. R. Vittal, Mathematical Statistics, Margham Publications, 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**

SCSB3828	SMARTER CITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Have a deep understanding of the digital technologies, infrastructure and the technology that underpins it.
- Understanding how urban analysis and governance can lead to sustainable and high-performing cities.
- Understanding of road map for Planning Smart Cities and benchmarking their performance.
- Develop innovative concepts and prototypes for a sustainable smart city.

UNIT 1 INTRODUCTION TO SMART URBAN INFRASTRUCTURES AND SMART CITIES 9 Hrs.

Introduction to the Smart Cities – Digitalization – General implications on cities – Perspectives on smart cities, Global standards and performance bench marks, Practice codes. India 100 smart cities policy and mission, Smart city planning and development, Financing smart cities development, Governance of smart cities.

UNIT 2 SMART URBAN ENERGY SYSTEMS 9 Hrs.

Green projects in smart cities, sustainability – green building – Rating system – Energy efficient building – energy saving systems.The infrastructure layer of smart urban energy systems - The services layer of smart urban energy systems - The data/digital layer of smart urban energy systems

UNIT 3 SMART URBAN TRANSPORTATION SYSTEMS 9 Hrs.

Elements of Infrastructure (Physical, Social, Utilities and services), Basic definitions, concepts, significance and importance; Data required for provision and planning of urban networks and services;Resource analysis, Provision of infrastructure. Role of transport, types of transport systems, evolution of transport modes, transport problems and mobility issues. Urban form and Transport patterns, land use – transport cycle, concept of accessibility. Hierarchy, capacity and geometric design elements of roads and intersections. Basic principles of Transport infrastructure design. Urban transport planning process –Transport, environment and safety issues. Principles and approaches of Traffic Management, Transport System Management.

UNIT 4 SMARTER CITY MANAGEMENT AND SMARTER HUMAN SERVICES 9 Hrs.

Smarter operations, Facilitate cross – agency integration, Smarter Water, Smarter Public Safety, Smarter Buildings. Smarter Human Services -Smarter Education Smarter Healthcare, Smarter Social Services.

UNIT 5 SMARTER CITY AND IOT 9 Hrs.

IoT fundamentals: What is IoT, IoT impact, IoT Challenges, IoT Buliding block, IoT Connectivity, IoT Network architecture and Design, IoT Access Technologies, IoT standards and protocols, An IoT Strategy for Smarter Cities , Smart City IoT Architecture, Smart City Security Architecture design and development, Smart City Use-Case Examples: Connected Street Lighting, Smart Traffic Control, Connected Environment.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1 - Build a deep understanding of the Smart City concept and the technology that underpins it.
CO2 - Understand the importance and practicing the concept of inclusive urban planning.
CO3 - Define smart energy technologies.
CO4 - Describe different approaches to smart city design and delivery.
CO5 - Develop innovative concepts and prototypes for a sustainable smart city.
CO6 - Generate innovative solutions for smart city as projects.

TEXT / REFERENCE BOOKS

1. Allen G.Noble, (Eds), „Regional Development and Planning for the 21st Century: New Priorities and New Philosophies", Aldershot, USA, 1988.
2. Andy Pike, Andres Rodriguez-Pose, John Tomaney, „Handbook of Local and Regional Development", Taylor & Francis, 2010.
3. Smarter City (IBM ICE Publication).
4. https://learning.oreilly.com/library/view/iot-fundamentals-networking/9780134307091/ Daniel G. Parolek, AIA, Karen Parolek, Paul C. Crawford, FAICP, Form Based Codes: A Guide for Planners, Urban Designers, Municipalities, and Developers, John Wiley & Sons, 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**

SCSB3829	DESCRIPTIVE ANALYTICS FOR IOT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn about fundamentals of data analytics.
- To Know about machine learning concepts used in IoT.
- To explore predictive analysis for IoT.

UNIT 1 INTRODUCTION TO DATA ANALYTICS 9 Hrs.

Introduction to Data Analysis -Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting -Modern data analytic tools. Descriptive analytics, Predictive analytics.

UNIT 2 INTRODUCTION TO MACHINE LEARNING FOR IOT 9 Hrs.

Python Introduction-Examining Machine Learning for IoT - Getting Started with Azure Machine Learning -Exploring Code-First Machine Learning with Python.

UNIT 3 DATA PREPARATION FOR PREDICTIVE MAINTENANCE MODELING 9 Hrs.

Exploring IoT Data with Python- Cleaning and Standardizing IoT Data- Applying Advanced Data Exploration Techniques.

UNIT 4 FEATURE ENGINEERING FOR PREDICTIVE MAINTENANCE MODELING 9 Hrs.

Exploring Feature Engineering - how to explore and gain insights from a dataset- the basics of feature engineering with knowledge gained from data exploration. Applying Feature Selection Techniques.

UNIT 5 FAULT PREDICTION 9 Hrs.

Training a Predictive Model- Descriptive Analytics- Diagnostic Analytics Predictive Analytics. Analyzing Model Performance.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analyse data using either predictive or descriptive manner.
CO2 - Implement machine learning using python.
CO3 - Implement data preparation and prediction.
CO4 - Design and train dataset using feature engineering.
CO5 - Predict the fault tolerance.
CO6 - Predict model performance.

TEXT / REFERENCE BOOKS

1. Andrew Minteer, Analytics for Internet of Things (IOT).Packet Publishing,2017.
2. Hwaiyu Geng, P.E,Internet of Things and Data Analytics Handbook,Wiley 2017.
3. John Soldatos Building Blocks for IoT AnalyticsInternet-of-Things Analytics,River Publishers, 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**

SCSB3830	COGNITIVE IoT	L	T	P	EL	Credit	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand cognitive science and various mathematical models.
- To identify the various models of neural networks.
- To learn the various machine learning algorithms.
- To understand different types data analytics methods and tools.
- To identify different platforms for artificial intelligence in cognitive science.
- To implement hands on experiments in cognitive technology.

UNIT 1 INTRODUCTIONTOCOGNITIVE SCIENCE 9 Hrs.

IoT definition & characteristics, impact of IoT, cognitive computing and applications, Introduction to the study of cognitive sciences. A brief history of cognitive science. Methodological concerns in philosophy, artificial intelligence and psychology. Structure and constituents of the brain, Brief history of neuroscience, Mathematical models.

UNIT 2 NEURAL NETWORKS MODELS 9 Hrs.

Neural Network Models, Processing of sensory information in the brain, motor and sensory areas, Brain Imaging, fMRI, MEG, PET, EEG, Multisensory integration in cortex, information fusion, from sensation to cognition, cybernetics.

UNIT 3 MACHINE LEARNING 9 Hrs.

Machine learning, Constructing memories, Explicit vs. implicit memory, Information processing (three-boxes) model of memory, Sensory memory, Short term memory, Long term memory, Rationality, Bounded rationality, Prospect theory , Heuristics and biases, Reasoning in computers, Key points in social cognition.

UNIT 4 DATA ANALYTICS 9 Hrs.

Introduction to TensorFlow & PyTorch and Background Knowledge of ML Data Analytics for IoT Basics Data Analytics for IoT Regression & ANN-based Classification Data Analytics for IoT Regression & ANN-based Classification Data Analytics for IoT Modern DNNs and their Programming in TF.

UNIT 5 ARTIFICIAL INTELLIGENCE 9 Hrs.

Introduction to Artificial Intelligence , Overview of various cognitive and AI framework , Predictive Analytics using AI platforms, Building Sensor/IoT Based Intelligent System , Advance Machine Learning, Building Knowledge-enabled apps and service , AI and Cognitive Technology in Modern Business with hands on Azure, Keras and TensorFlow Labs , Computer Vision.

Max. 45 Hrs.

COURSE OUTCOME

On completion of the course, student will be able to

CO1 - Learn and understand current trends in Internet of things and cognitive science.
CO2 - Understand the various models of neural networks.
CO3 - Learn the machine learning algorithms for cognitive science.
CO4 - Implement the data analytics concepts for cognitive science using different tools.
CO5 - Build intelligent and cognitive applications in AI framework.

CO6 - Implement hands-on projects in TensorFlow and Keras for various cognitive and AI framework.

TEXT / REFERENCE BOOKS

1. Bermúdez, José Luis. Cognitive science: An introduction to the science of the mind. Cambridge University Press, 2014.
2. Kai Hwang, Min Chen, Big-Data Analytics for Cloud, IoT and Cognitive Computing,Willey Publications,2017.
3. Mohammad Abdul Matin , Towards Cognitive IoT Networks, Springer,2020.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

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

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

SCSB3821	MOBILE APPLICATION DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand basic concepts of mobile technologies, different operating systems and how to work with Android.
- To develop applications for current and emerging mobile computing devices, performing tasks at all stages of the software dev elopment life-cycle.
- To learn how to cope with objective C programming.
- To design, implement and deploy mobile applications for iOS.
- To design, implement and deploy mobile applications for 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 DATABASES 9 Hrs.

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

UNIT 3 OBJECTIVE C PROGRAMMING 9 Hrs.

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

UNIT 4 INTRODUCTION TO IOS 9 Hrs.

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

UNIT 5 WINDOWS MOBILE APP DEVELOPMENT 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - 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. Reto Meier, “Professional Android Application Development”, Wrox, 2010.
2. http://www.tutorialspoint.com/android/index.html.
3. http://developer.android.com/training/index.html.
4. Stephen G. Kochan, “Programming in Objective C”, Dorling Kindersley India Pvt. Ltd, 2012.
5. David Mark, Jack Nutting and Jeff LaMarche, “Beginning iOS 6 Development Exploring the iOS SDK”, Apress, 2013.
6. Henry Lee, Eugene Chuvyrov, “, Beginning Windows Phone App Development”, Apress 2012.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

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

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

SCSB3819	EVENT PROCESSING AND CORRELATION SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To study the basic rudiments of event processing.
- To understand of the event management system life cycle.
- To acquire the Knowledge of Event processing network.
- To learn the engineering implementation procedures.
- To explore the Event correlation with different use cases.

UNIT 1 INTRODUCTION TO EVENT PROCESSING 9 Hrs.

Introduction to event processing: Principles of event processing-Event-driven behavior, computerized event processing, event processing need, processing platform, Effectiveness issues, Efficiency issues, connection to related concepts-business process management- BAM, BI, BRM systems, Network Principle of event processing-event based programming, modeling event processing networks.

UNIT 2 EVENT TYPES AND ATTRIBUTES 9 Hrs.

Event types- attributes- header, payload, relation types, event representation, event producers – hardware, software, human interaction, interface patterns, queriable events. Consuming the events – event consumer, consumer relationships, types of event consumers, interfacing with event consumers. Interaction pattern, interfacing patterns.

UNIT 3 EVENT PROCESSING NETWORK 9 Hrs.

Event processing agents – functions, types, filters, transformation, patterns, processing agents- event channels- global state elements –network in proactive –context: temporal context, spatial context, static, segment oriented, state oriented, composite context- filtering and transformation – detecting event patterns.

UNIT 4 EVENT ENGINEERING AND IMPLEMENTATION 9 Hrs.

Engineering and implementation: event processing, nonfunctional properties, performance objectives, optimization types, validation and auditing - event processing challenges – temporal semantics, inexact, retraction and casuality- emerging directions of event processing –event processing trends –event processing technology.

UNIT 5 EVENT USE CASE AND TECHNIQUES 9 Hrs.

Event Correlation Use Cases and Techniques - Data intelligence, Operations support, Root cause analysis, Fraud Detection- Benefits of Event Correlation-Real time threat visibility, Vigilance of network safety, continuous compliance reports, reduces operational costs., Improves time management.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - To understand the basic rudiments of event processing.
CO2 - To implement the event management system life cycle.
CO3 - To acquire the Knowledge about the Event processing network.
CO4 - To learn the engineering implementation procedures.
CO5 - To analyze the Event correlation with different use cases.
CO6 - Ability to design an Event correlation system.

TEXT / REFERENCE BOOKS

1. Event processing in action, Opher Etzion, Peter Niblett, 2011.
2. Architecting Complex event Processing Solutions, Paul C. Brown, 2013.
3. Complex Event Processing: A Complete Guide, by Gerard Blokdyk, 2018.
4. Strongly Correlated Systems: Numerical Methods, Adolfo Avella, Ferdinando Mancini, 2013.
5. Event Processing with CICS, Marianne Mena Heltborg et.al.,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 carrying 16 marks **80 Marks**

SCSB3032	IoT FOR HEALTHCARE	L	T	P	EL	Credit	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Understand the significance of the Internet of Things in IoT.
- Understanding of wearable technology devices and it‟s application.
- To impart knowledge about data aggregation techniques in healthcare IoT.
- To demonstrate security issues and solutions.
- To demonstrate routing mechanism for healthcare IoT.

UNIT 1 INTRODUCTION TO IoMT 9 Hrs.

Evolution of cybermedicine – Future of IoT in Healthcare–Internet of Medical Things (IoMT) Components- Architecture of IoMTSystem - Benefitsand impact of Internet of Medical Things (IoMT)–Applications of IoMT.

UNIT 2 WEARABLE DEVICES 9 Hrs.

Bio-sensors: Introduction- Working Principle- Different Types- Applications. Wearable Devices - Introduction- Evoluation- Portable devices- Attachable devices- Implantable and Ingestible devices.

UNIT 3 DATA AGGRECATION TECHNIQUES 9 Hrs.

Network Communications for health sensor data- Challenges of health care data sharing - health data aggregation techniques in IoT- design and implementation of interoperable IoT healthcare system.

UNIT 4 ROUTING AND SECURITY 9 Hrs.

Routing Protocols for IoT healthcare- Routing for intrabody communications–Routing for extra-body communications- MAEB Routing- QoS. Security and Privacy issues with IoT in healthcare- cyber security solutions for healthcare IoT – IoTdiscovery and Risk analysis –IoT policy management- IoT Threat Prevention.

UNIT 5 CASE STUDIES AND APPLICATIONS 9 Hrs.

Smart continuous glucose monitoring (CGM) and insulin pens - Connected contact lenses - Connected inhalers – GPS Smart Sole - Remote Patient Monitoring – Efficient Drug Management - Medical Waste Management – IoT Heart Rate Monitoring - Epileptic Seizure Detection and Monitoring.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Demonstrate knowledge and understanding of Internet of Medical Things.
CO2 - Investigate various wearable devices in healthcare IoT.
CO3 - Conceptually describe sensor data aggregation techniques for IoT healthcare system.
CO4 - Compare and analyse various security solutions for healthcareIoT
CO5 - Conceptually analyse routing requirements for healthcare IoT.
CO6 - Evaluate various routing mechanisms for healthcare IoT.

TEXT / REFERENCES BOOKS

1. Krishna P. Venkata, Sasikumar Gurumoorthy, Mohammad S.Obaidat, Internet of Things and Personalized Healthcare Systems , Springer-2019.
2. Pattnaik, Prasant Kumar, Mohanty, Suneeta, Mohanty, Satarupa, Smart Healthcare Analytics in IoT Enabled Environment, Springer-2020.
3. Avijit Mathur, Thomas Newe, Walid Elgenaidi, Muzaffar Rao, Elfed Lewis and Daniel Toal, Medical IoT systems: architecture and security by Wearable Sensors, 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 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. 45 Hrs.

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 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 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 & 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.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

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.
CO6 - To apply design thinking principles and processes to real-world problems, generate creative ideas and develop a problem pitch for potential solutions.

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 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 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 Environments, 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

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 carrying 16 marks **80 Marks**

SCSB1714	SMART PRODUCT DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	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 CITY- CASE STUDY 9 Hrs.

Smart Adaptive advertising - Customized Digital experience, Disaster Prevention, Smart Agriculture, Smart Health, Smart Security & Surveillance, Smart Virtual Assistance – Leadership & Policy Makers, Challenges & Solutions in Building AI, IoT, case study: IoT Application for Water & Waste Management.

Max. 45 Hrs.

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 Node MCU and Location Tracker etc..,: New model technology development, Anbazhagan k, 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 carrying 16 marks	**80 Marks**