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

COURSE OBJECTIVES

- To understand specialized subject areas and skills included for their study.
- To comprehend and react in oral and written forms to the specialized texts.
- To respond to listening, 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 by reading content
Writing : Writing compare/ contrast paragraphs, process description, E-Mail Writing
Vocabulary : Verbal phrases, Prepositions and Prepositional phrases, Concord, Discourse Markers
Language Focus : Clauses, Conjunctions, Sentence Types - Simple, Compound & Complex
Language Lab : Digital literacy: Responding to quiz using Kahoot application

UNIT 3 **9 Hrs.**

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

UNIT 4 **9 Hrs.**

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

UNIT 5 **9 Hrs.**

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

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

PRESCRIBED TEXT

1. Technical English [2019], Department of English, Sathyabama Institute of Science & Technology.

TEXT / REFERENCE BOOKS

1. Beer, David F., and David McMurrey. *A Guide to Writing as an Engineer*. 4th ed., Wiley, 2013
2. Alred, Gerald J., et al. *Handbook of Technical Writing*. 11th ed., Bedford/St. Martin's, 2019.
3. Pearsall, Thomas Edward. *Technical Writing: A Practical Guide for Engineers, Scientists, and Nontechnical Professionals*. McGraw-Hill Education, 2017.
4. Straus, Jane. *The Blue Book of Grammar and Punctuation.* John Wiley & Sons, 2014.
5. 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

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

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: Regula Falsi Method, Newton Raphson Method – Solution of simultaneous linear algebraic equations: Gauss Elimination Method, Gauss Jacobi & Gauss Seidel Method.

UNIT 5 NUMERICAL INTERPOLATION, DIFFERENTATION AND INTEGRATION 9 Hrs.

Interpolation-Newton forward and backward interpolation formula, Lagrange's formula for unequal intervals – Numerical differentiation: Newton's forward and backward differences to compute first and second derivatives – Numerical integration: Trapezoidal rule, Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ 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 l inear 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 9 Hrs.

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

UNIT 2 PROPERTIES OF MATTER 9 Hrs.

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

UNIT 3 CRYSTAL PHYSICS 9 Hrs.

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

UNIT 4 SEMICONDUCTOR PHYSICS 9 Hrs.

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

UNIT 5 LASER AND ITS APPLICATIONS 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

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

CO2 - Understand the dual nature of radiation and matter

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

CO4 - Recognize sound level descriptors and how they are used in architectural acoustics 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 s ame 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 Practice Problems:

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

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

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

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

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

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

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

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

TEXT / REFERENCE BOOKS

1. Yashavant Kanetkar, “Let us C”, BPB Publications, Fourteenth Edition
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.

SPHB2101	PHYSICS LAB	L	T	P	EL	Credits	Total Marks
		3	0	2	0	1	100

COURSE OBJECTIVE

- To introduce experiments in optics, semiconductors, magnetism, thermal physics and quantum mechanics in order to acquire the first hand information and to realize the basic physics concepts.

LIST OF EXPERIMENTS

1. Determine the Rigidity modulus of a given wire by Torsional pendulum
2. To determine the angle of Minimum Deviation by I - D curve method.
3. Determine V-I characteristics of a photodiode
4. To determine the Numerical aperture of an optical fiber
5. To find the Energy gap of a semiconductor
6. Determination of Young's modulus- Non-uniform bending
7. Determination of Young's modulus- Uniform bending
8. Determination of the wave length of the laser using grating- Laser.
9. Determination of thickness of a thin sheet/wire- Air wedge.
10. Determination of Numerical Aperture and acceptance angle- Optical 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.
C04 - Measure the band gap of the given semiconductor.
CO5 - Measure the young's modulus of bar by uniform bending method

SMTB1203	DISCRETE STRUCTURES	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 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 5 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 pigeonhole 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. Narasingh Deo, Graph Theory with application to Engineering and Computer Science, Prentice Hall India, 2010.
4. Steven C .Chapra, Raymond P. Canale, Numerical Methods for Engineers, Tata McGraw Hill Publishing Co., NewDelhi, 2003.
5. 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**

SCYB 1101	CHEMISTRY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

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

UNIT 1 ATOMIC AND MOLECULAR STRUCTURE 9 Hrs.

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

UNIT 2 MOLECULAR SPECTROSCOPY 9 Hrs.

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

UNIT 3 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/$SOCl_2$ cell - Li/I_2 cell - Lithium ion batteries. Mechanism of Fuel Cells: Hydrogen-oxygen fuel cells - Solid oxide fuel cell (SOFC).

UNIT 4 CORROSION SCIENCE 9 Hrs.

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

UNIT 5 CHEMISTRY OF MATERIAL SCIENCES 9 Hrs.

Phase equilibria: Gibbs phase rule – Terms involved in Phase rule – Phase diagram of water system – Thermal method of analysis – Construction of simple eutectic system (Lead-Silver alloy system).

Fuels– Classification of fuels – Determination of calorific values of solid fuels by bomb calorimeter– Manufacture of synthetic petrol by Fischer-Tropsch method – Knocking in IC engines – Chemical structure – Octane and cetane rating of fuels.

Nanomaterials: Size dependent properties of nanomaterials – Synthesis of gold and silver nanoparticles by Chemical reduction method–Applications of nanoparticles in medicine.

Max. 45 Hrs

COURSE OUTCOMES

On completion of the course the student will be able to

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

TEXT / REFERENCE BOOKS

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

END SEMESTER 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**

SMEB1104	ENGINEERING GRAPHICS USING CAD	L	T	P	EL	Credits	Total Marks
		1	0	4	0	3	100

COURSE OBJECTIVES

- To know the basics of Engineering Graphics and make the student to possess the efficient drafting skill.
- To make the students to understand the importance of sectioning and concept of development.
- To learn about the orthographic and pictorial projections.
- Identify engineering graphics. Draw objects like points, lines, planes, and solids in perspective & orthographic projections

UNIT 1 DRAWING STANDARDS AND CONSTRUCTION OF BASIC SHAPES 9 Hrs.

Drawing standards: BIS – Lettering - Two systems of dimensioning - Drawing tools. Construction of the basic shapes: Points – Lines – Circle –Circular arc - Polygons – Ellipse – Parabola - Hyperbola – Spline Curves. Introduction to CAD packages: Setting up a new drawing template - Drawing Commands - Modifying Commands - Formatting commands - Dimensioning styles – Texts - Basic Function keys - Shortcuts. Features and applications of CAD.

UNIT 2 PROJECTION OF POINTS AND LINES 9 Hrs.

Projections - Types of projections –projection of points – Change of position method - Sketching the orthographic projection of points lying in four quadrants using a CAD package - Orthographic projection of lines (First angle projection only) - Sketching the orthographic projection of lines using a CAD package (Projection of lines parallel to one plane and inclined to another).

UNIT 3 ORTHOGRAPHIC PROJECTION OF SOLIDS 9 Hrs.

Types of solids – Orthographic projection of simple solids like prisms, pyramids, cylinder and cone (Change of position method) – Sketching of the front view and top view of solids in simple vertical position or the inclined position (inclined to one plane and perpendicular to another plane) using a CAD package.

UNIT 4 SECTION OF SOLIDS 9 Hrs.

Types of sectional views - Hatching - Section plane perpendicular to one plane and parallel to other plane– Sketching of the front view, top view and true shape of the solids with cutting plane parallel to one plane or inclined to one plane and perpendicular to another using a CAD package.

UNIT 5 DEVELOPMENT OF SURFACES AND ORTHOGRAPHIC PROJECTION 9 Hrs.

Need for development of surfaces - Types of development of surfaces - Development of pentagonal and hexagonal prisms - Development of cylinders - Development of pentagonal and hexagonal pyramids - Development of cones - Sketching of the development drawings of surfaces of solids in simple vertical position with or without sectioning using a CAD package.

Orthographic Projection- Drawing front view, top view and side view of objects from the given pictorial views using CAD package.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

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

CO2 - Draw the projections of points, lines.

CO3 - Draw projection of solid objects like prisms, cylinders, pyramids and cones used in various engineering objects.

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

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

CO6 - Draw the 2D and 3D surfaces of engineering components using modeling software.

TEXT / REFERENCE BOOKS

1. Venugopal, K. and Prabhu Raja, V., Engineering Drawing and Graphics + AutoCAD, New Age International, 2021.
2. Trymbaka Murthy, S., Computer Aided Engineering Drawing, I.K. International Publishing House, 2017.
3. SP 46: Engineering Drawing Practice for schools and colleges, Bureau of Indian Standards.
4. AutoCAD – 2D CAD Reference Guide
5. Luzzader, Warren J., Duff John M., Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Prentice Hall of India Pvt. Ltd,, 2016.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

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

SMRB1102	FUNDAMENTALS OF ROBOTICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of robotics and automation.
- To learn the basic configurations and performance of robot.
- To familiarize with the sensors, drive system, and control systems of a robot.
- To design a robot work cell for an industrial application.
- To understand the various applications of robots, justification, implementation and safety of robot.
- To write programming for various robotic application.

UNIT1 BASICS OF ROBOTICS 9 Hrs.

Introduction - Anatomy of Robot - Laws of robotics - Links and Joints of robot - Robot wrist - Configurations of robot - work volume - Spatial resolution - Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity–Drive Systems of Robot - Control system of Robot - Types of robot control - Robot motions Rotary to rotary motion, Rotary to linear motion, Harmonics drives.

UNIT 2 ROBOT SENSORS AND END EFFECTORS 9 Hrs.

Robotic sensors and actuators - Robot actuation and feedback components - Power transmission system – Robot joint control design - Robot End effectors Types of End effectors - Requirements and challenges of end effectors- Mechanical gripper- types of gripper mechanism - gripper force analysis – other types of gripper - special purpose grippers - Tools – Degrees of Freedom - Selection and design of Grippers.

UNIT 3 ROBOT KINEMATICS 9 Hrs.

Robot kinematics: Introduction - Position representation - 2 DOF Arm in 2D - 3 DOF Arm in 2D - 4 DOF Arm in 3D - rigid motion & homogeneous transformation forward & inverse kinematics - trajectory planning - Wrist Orientation - Manipulator path control - Robot Dynamics: Robot Arm dynamics - configuration of a robot controller.

UNIT 4 WORK CELL DESIGN AND MACHINE VISION SYSTEM 9 Hrs.

Robot work cell design - Work cell types – Work cell Control - Factors to be considered for work cell design - Interlocks - Machine vision: - Sensing and Digitizing - Imaging Devices - Lighting Techniques - AD Converter - Image Processing - Date reduction - Segmentation - Thresholding - Region Growing- Edge Detection - Feature extraction - Object recognition - Applications Inspection - Identification - Visual servicing and navigation - Training the vision.

UNIT 5 ROBOT PROGRAMMING METHODS 9 Hrs.

Robot programming Methods - Methods of Defining Position - Motion Interpolation - Commands - Branching - Robot Languages Classification of robot language - Computer control and robot software - Val system and Languages - Application of robots - Process Applications - Material Loading and Unloading - Material handling - spot and continuous arc welding & spray painting -Robots for Assembly and Inspection

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the basics of robotics and to choose the appropriate type of drive and sensor system

CO2 - To select the appropriate type of tools and grippers for various applications

CO3 - To design a robotic arm and to bring a controlled movement in the end effectors

CO4 - Understand the concept of Computer vision system and to develop a machine vision system for inspection

CO5 - Ability to design robot work cell and develop robots for real life situational problems and think creatively for solutions

CO6 - Ability to write various robot programs for various applications

TEXT / REFERENCE BOOKS

1. Mikell P. Groover, Mitchel Weiss, Roger N. Nagel, Nicholas G. Odrey , Ashish Dutta, Industrial Robotics - Technology, Programming and Applications McGraw Hill (SIE) | 2nd Edition 2012
2. John J. Craig, Introduction to Robotics: Mechanics and Control, third edition, Pearson Prentice Hall 2004
3. Harry H. Poole, Fundamentals of Robotics Engineering Van Nostrand Reinhold, Springer 2012
4. Frank L. Lewis, Darren M.Dawson, Chaouki T.Abdallah, Robot Manipulator Control Theory and Practice Second Edition, Revised and Expanded 2004
5. R.D.Klafter, T.A.Chimielewski and M.Negin, Robotic Engineering–An Integrated Approach, Prentice Hall of India, New Delhi, 1994.
6. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis ‘, Oxford University Press, Sixth impression, 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**

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 the student will able to

CO1 - Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.
CO2 - Do the decision making and write functions in Python.
CO3 - 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.

S731BLH22	DATA STRUCTURES AND ALGORITHMS	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	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.
- To understand concepts about various algorithm design techniques, searching and sorting techniques

UNIT 1 INTRODUCTION TO ALGORITHMS 12 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 and Space trade off.

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 12 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 linked list.
2. Program to implement operations on a doubly linked list

UNIT 3 STACKS & QUEUES 12 Hrs.

Introduction – Array Representation of a Stack – Linked List Representation of a Stack - Stack Operations - Algorithm for Stack Operations - 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 Queue Operations -. Queue Applications: Priority Queue.

Practical:

1. Program to implement a Stack using an array and Linked list.
2. Program to implement Queue using an array and Linked list.
3. Program to implement Circular Queue.

UNIT 4 TREES AND GRAPHS 12 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 - Path Algorithms – Dijkstra's Algorithm Minimum Spanning Tree – 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 12 Hrs.

Divide and Conquer Strategy – Greedy Algorithm – Dynamic Programming – Backtracking Strategy - List Searches using Linear Search - Binary Search - Fibonacci Search - Sorting Techniques - Insertion sort - Heap sort - Bubble sort - Quick sort - Merge sort - Analysis of sorting techniques.

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. 60 Hrs

COURSE OUTCOMES

On completion of the course the student will be able to

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

TEXT / REFERENCE BOOKS

1. Jean-Paul Tremblay, Paul G. Sorenson,'An Introduction to Data Structures with Application', TMH, 2017.
2. Richard F, Gilberg, Forouzan, "Data Structures", Cengage, 2004, 2nd Edition.
3. Larry R. Nyhoff, ADTs, Data Structures, and Problem Solving with C++, Prentice Hall Editin, 2004.
4. Thomas H. Cormen, Charles E. Leiserson, "Introduction to Algorithms", 3rd Edition, 2010.

SCYB 2101	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.

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, student will be able to

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

TEXT / REFERENCE BOOKS

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

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 50 **Exam Duration: 2 Hrs.**

CAE	Evaluation of Regular Lab class	**15 Marks**	**25 Marks**
	Model practical exam	**10 Marks**	
ESE	University Practical exam		**25 Marks**

SMTB1304	MATRICES AND LINEAR ALGEBRA	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 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.

COURSEOUTCOMES

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 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**

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 analyse 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 10 Hrs.

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

UNIT 3 MEMORY ORGANIZATION 8 Hrs.

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 inter processor 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 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**

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.
- To develop commitment and courage to act.

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

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I.
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self- exploration.
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations.
4. Right understanding, Relationship and Physical Facility- the basic requirements for 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!

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 HUMAN- HUMANRELATIONSHIP

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

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

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 theat the conduct as an engineer or scientist etc.

COURSE OUTCOMES

On completion of the course the 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.

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)

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**

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

COURSE OBJECTIVES

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

UNIT 1 FINITE AUTOMATA AND REGULAR LANGUAGES 9 Hrs.

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

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

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

UNIT 3 PUSH DOWN AUTOMATA 9 Hrs.

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

UNIT 4 TURING MACHINES 9 Hrs.

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

UNIT 5 RECURSIVE LANGUAGES AND UNDECIDABILITY 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

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

TEXT / REFERENCE BOOKS

1. Introduction to Languages and the Theory of Computation, John. C. Martin, Tata McGraw-Hill, 2003.
2. Introduction to Automata Theory, Languages and Computation, Hopcroft, Motwani, and Ullman, Pearson Publishers, Third Edition, 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**

SCSB1311	FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the various characteristics of intelligent agents
- To learn the different search strategies in AI.
- To understand the knowledge in solving AI problems.
- To learn the concepts of learning and communication in AI.
- To know about the various applications of AI.

UNIT 1 INTRODUCTION AND PROBLEM SOLVING 9 Hrs.

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

UNIT 2 INFORMED SEARCH AND GAME PLAYING 9 Hrs.

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

UNIT 3 KNOWLEDGE AND REASONING 9 Hrs.

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

UNIT 4 ACTING LOGICALLY 9 Hrs.

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

UNIT 5 APPLICATIONS 9 Hrs.

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

Max. 45 Hrs

COURSE OUTCOMES

On completion of the course the student will be able to

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

TEXT / REFERENCE BOOKS

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

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

S19BLH32	ROBOT ACTUATORS	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	100

COURSE OBJECTIVES

- To understand functions of the fluid power systems and its applications.
- To learn how the hydraulic actuators works and its types with its applications.
- To learn how the Pneumatic actuators works and its types with its applications.
- To learn how the Electric actuators works and its types with its applications.
- To learn how to use exception handling in Python applications for error handling.
- To design and program Python applications.

UNIT 1 INTRODUCTION TO FLUID POWER SYSTEMS 12 Hrs.

Introduction to Fluid power, types of Fluid power systems, components, advantages and applications of Fluid power systems. Transmission of power at static and dynamic states. Pascal's law and its applications.

Practical:

1. Study of Hydraulic and Pneumatic circuits and its components for industrial Robots
2. Design and simulate a circuit using single acting cylinder in fluidsim software at inlet and outlet

UNIT 2 HYDRAULIC ACTUATORS 12 Hrs.

Introduction to Hydraulic systems, working principle and types of Linear and Rotary hydraulic actuators, Hydraulic Control valves, its components, advantages and applications, Design of hydraulic circuit.

Practical:

1. Design & simulate single and double acting cylinder using hydraulic actuator.
2. Design & simulate cylinder sequencing operation of A+A-

UNIT 3 PNEUMATIC ACTUATORS 12 Hrs.

Introduction to Pneumatic systems, working principle and types of Pneumatic actuators, Pneumatic Control Valves, its components, advantages and applications; Design of Pneumatic circuit Circuits.

Practical:

1. Design and Simulate cylinder sequencing operation for A+B+A-B-
2. Design a pneumatic circuit with simulation for A+B+C+A-B-C-

UNIT 4 ELECTRIC ACTUATORS 12 Hrs.

Introduction, Types of electrical drives; Working principle and types of DC electric motor, AC electric motor, stepper motors, Servo motors.

Practical:

1. Design and simulate a stepper motor feedback system using Multisim
2. Design and simulate A/D convetor using Multisim.

UNIT 5 ACTUATOR MECHANISMS 12 Hrs.

Objectives, motivation, open loop control, closed loop control, Types and Functions of drive; Lead Screws, Ball Screws, Chain & linkage drives, Belt drives, Gear drives.

Practical:

1 Design a V belt and pulley assembly in solidworks.

2. Design a sketch chain and sprocket mechanism in solidworks

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Identify and analyse the functional requirements of a fluid power transmission system for a given application.
CO2 - Design an appropriate hydraulic actuator for a given application.
CO3 - Design an appropriate pneumatic actuator for a given application.
CO4 - Design an appropriate pneumatic actuator for a given application.
CO5 - Summarize the Open loop and Closed loop for actuator Controls.
CO6 - Summarize the types and functions of the actuator Mechanism.

TEXT / REFERENCE BOOKS

1. Francis N-Nagy Andras Siegler, Engineering foundation of Robotics, Prentice Hall Inc., 1987
2. Richard D. Klafter, Thomas. A, Chmielewski, Michael Negin, Robotics Engineering an Integrated Approach, Prentice Hall of India Pvt. Ltd., 1989
3. Bernard Hodges, Industrial Robotics, Second Edition, Jaico Publishing house, 1993
4. Robert J. Schilling, Fundamentals of Robotics Analysis and Control, Prentice Hall of India Pvt. Ltd., 2000
5. Tsuneo Yohikwa, Foundations of Robotics Analysis and Control, Prentice Hall of India Pvt. Ltd., 2001
6. John J. Craig, Introduction to Robotics Mechanics and Control, Second Edition, Addison Wesly Longman Inc. International Student edition, 1999.

S13BLH32	SENSORS AND INTELLIGENT INSTRUMENTATION	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	100

COURSE OBJECTIVES

- To learn the basic knowledge about sensors and instrumentation.
- To understand the different sensors used to measure various physical parameters.
- To understand the concepts of measurement technology.
- To learn the construction and working principles of different types of sensors.
- To analyze the sensor, instrument and measurement situation.
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

UNIT 1 INTRODUCTION 12 Hrs.

Basics of Measurement Sensors: Definition, Classification of Sensors, Selection of Sensors, Performance Measures of Sensors, Sensor Calibration Techniques, Sensor Output Signal Types, Static and Dynamic Characteristics of Transducers.

Practical:

1. Simulate a ultrasonic sensor HC SR04 with arduino in Proteus.
2. Simulate a Soil Moisture Sensor in Proteus

UNIT 2 MOTION, PROXIMITY, RANGING, FORCE, MAGNETIC SENSORS 12 Hrs.

Motion Sensors, Potentiometers, Resolver, Encoders, Optical, Magnetic, Inductive, Capacitive, LVDT, RVDT, Accelerometer, GPS, Bluetooth, Range sensors, RF Beacons , Ultrasonic Ranging,Reflective beacons, Laser Range Sensor, Strain-Gage, Load Cell, Magnetic Sensors, Magneto Resistive, Hall Effect, Current Sensor. Light, Speech or Voice recognition Systems, Tele- presence and related technologies

Practical:

1. Simulate a permanent magnet in solidworks
2. Discuss the hall effect in virtual lab.

UNIT 3 OPTICAL, PRESSURE, TEMPERATURE SENSORS, HEADING SENSORS 12 Hrs.

Photo Conductive Cell, Photo Voltaic, Photo Resistive, LDR, Fiber Optic Sensors, Pressure Sensors, Diaphragm, Piezoelectric, Tactile Sensors, Temperature – IC, Thermistor, Acoustic Sensors, Flow and Level Measurement, Radiation Sensors, Nano Sensors, Laser Sensors, Heading Sensor, Compass, Gyroscope, Inclinometers.

Practical**:**

1. Measure the level in a tank using capacitive type level probe in virtual lab
2. Design and measure the nozzle velocity and pressure in solidworks

UNIT 4 VIRTUAL INSTRUMENTATION 12 Hrs.

Graphical Programming Techniques, Data Types, Advantage of Virtual Instrumentation Techniques, Concept of while, for Loops, Arrays, Clusters and Graphs, Structures, Need of Software-Based Instruments for Industrial Automation.

Practical:

1. Design and develop a model using 3D printing
2. Design and develop a paper based sensor

UNIT 5 INTELLIGENT SENSORS 12 Hrs.

Structure of smart sensors, Application of smart sensors, Components of smart sensors, Characteristics of smart sensors, Self-testing, self-communicating, Self-calibration, Automatic robot control and automobile engine control.

Practical:

1. Design and simulate transient sensor using solidworks
2. Design and simulate proximity sensor for motion study in solidworks

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Identify the different types of sensors used in real-life applications.
CO2 - Evaluate the performance characteristics of different types of Sensors.
CO3 - Use the sensors for converting a physical parameter into an electrical quantity.
CO4 - Comprehend intelligent instrumentation in industrial automation.
CO5 - Apply the various sensors for measurement of pressure, force and displacement.
CO6 - Deploy sensors in the industry for the measurement of temperature, flow level, vibration and accelerometer.

TEXT / REFERENCE BOOKS

1. Ernest O Doebelin, “Measurement Systems – Applications and Design”, Tata McGraw-Hill, 2009
2. Ian Sinclair, “Sensors and Transducers”, Newnes, 2001.
3. Gary Johnson, “Lab VIEW Graphical Programming”, II Edition, McGraw Hill 1997.
4. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
5. John Turner and Martyn Hill, “Instrumentation for Engineers and Scientists”, Oxford Science Publications, 1999

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

COURSE OBJECTIVE

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

UNIT 1 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.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand probability concepts and Baye's theorem problems. Explain functions of random variables and 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.**

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**

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**

S11BLH 41	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 familiar with normalization.
- To explain the 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 - Explain the basic concept and role of DBMS in an organization.
CO2 - Illustrate the design principles for database design, ER model and normalization.
CO3 - Demonstrate the basics of query evaluation and heuristic query optimization techniques.
CO4 - Apply Concurrency control and recovery mechanisms for the desirable database problem.
CO5 - Compare the basic database storage structure and access techniques including B Tree, B+Tress & hashing.
CO6 - Design and implement the database system with the fundamental concepts of DBMS.

TEXT / REFERENCE BOOKS

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

S13BLH43	SOFTWARE ROBOT DESIGN	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To introduce students to programming robot sensors and actuators, as well as the principles of the Robot Operating System (ROS) and its application in softbots.
- To provide a fundamental understanding of ROS, Ubuntu Linux, and programming languages like C++ and Python for robotic applications and chat bot development.
- To familiarize students with ROS workspaces and packages, enabling them to interface embedded boards (e.g., Arduino, Raspberry Pi) with ROS.
- To facilitate the creation and programming of wheeled robots, including hardware design, assembly, and firmware development, utilizing ROS.
- To develop expertise in ROS navigation, covering topics like robot localization, navigation stacks, and motion planning, with practical applications in simulations, including drones.

UNIT 1 PROGRAMMING THE ROBOT'S SENSORS AND ROBOT OPERATING SYSTEM (ROS) 12 Hrs.

A Review on Sensors, Programming the Robot's Sensors, Programming the Actuators, Building Robot's Softbot. ROS Basics-ROS Equation, History of ROS, Sensors and Robots Supporting ROS, ROS Architecture and Concepts, ROS File system Level, ROS Computation Graph Level, ROS Community Level Robotic

Practical:

ARM design and simulation using Matlab.

UNIT 2 ROS FUNDAMENTALS 12 Hrs.

Ubuntu Linux for Robotics-Ubuntu Graphical User Interface, Shell Commands, C++ and Python for Robotic Programming- Basic Concepts with Examples.

Practical:

Design and development of Interactive-Chat Bots.

UNIT 3 ROS PROGRAMMING 12 Hrs.

Creating ROS Workspace and Package, Using ROS Client Libraries, Programming Embedded Board using ROS-Interfacing Arduino with ROS, ROS on a Raspberry Pi

Practical:

Finding IP address of a machine using ROS, road map path planning

UNIT 4 ROBOTIC PROJECTS USING ROS 12 Hrs.

Introduction to Wheeled Robots, Building Robot Hardware-Block Diagram and Assembling Robot Hardware, Programming Robot Firmware

Practical:

Application of robot1- Firefighting robot simulation.

UNIT 5 ROS NAVIGATION 12 Hrs.

Localizing the robot in a map, ROS Navigation Stack-hardware requirement-navigation packages, path planning, motion planning of robot – software requirement and configuration.

Practical:

Application of robot2- Drones simulation

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Demonstrate proficiency in programming robot sensors and actuators using the Robot Operating System (ROS), and design softbots with effective sensor-based interactions.

CO2 - Apply the principles and concepts of ROS, Ubuntu Linux, and programming languages (C++ and Python) to develop interactive chat bots and simulation projects.

CO3 - Create and manage ROS workspaces and packages, and effectively interface embedded boards (e.g., Arduino, Raspberry Pi) with ROS for robotic applications.

CO4 - Design and implement robotic projects using ROS, including hardware assembly, firmware programming, and building wheeled robots with practical applications.

CO5 - Apply ROS navigation techniques, including robot localization in maps, utilizing navigation stacks, and planning motion paths, with simulations involving drones.

CO6 - Develop problem-solving skills in robotics by integrating the knowledge of sensors, actuators, ROS programming, and navigation, to address real-world challenges in various robotic applications.

TEXT / REFERENCE BOOKS

1. Lentin Joseph, Robot Operating System (ROS) for Absolute Beginners: Robotics Programming Made Easy, 1 st Edition, APress, 2018.
2. Jonathan Cacace; Lentin Joseph, Mastering ROS for Robotics Programming: Design, build, and simulate complex robots using the Robot Operating System, 2nd Edition, Packt Publishing, 2018.
3. Hughes, C. and Hughes, T., Robot programming: a guide to controlling autonomous robots. Que Publishing, 2016
4. Quigley, M., Gerkey, B. and Smart, W.D., Programming Robots with ROS: a practical introduction to the Robot Operating System. “O’Reilly Media, Inc.", 2015
5. Anil Mahtani, Luis Sanchez, Enrique Fernandez, Aaron Martinez, Lentin Joseph. ROS Programming: Building Powerful Robots. Packet Publishing, 2018.

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, student 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

WEIGHTAGES

Assessment Method	Rubrics	Marks allotted	Assessment Type
Review 1	1	30	CAE
Internal Guide	2	10	CAE
IPR Process and Registration	5	10	ESE
Total – Internal		**50**	
Final Review	3	30	ESE
Report Submission	4	20	ESE
Total –External		**50**	

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

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

COURSE OBJECTIVES

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

UNIT 1 INTRODUCTION 9 Hrs.

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

UNIT 2 TRANSMISSION MEDIA AND SWITCHING 9 Hrs.

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

UNIT 3 ERROR DETECTION, CORRECTION AND COMMUNICATION 9 Hrs.

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

UNIT 4 ISDN AND ATM 9 Hrs.

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

UNIT 5 REFERENCE MODELS AND PROTOCOLS 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

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

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

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

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

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

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

TEXT / REFERENCE BOOKS

1. Behrouz and Forouzan, “Data Communications and Networking”, 2nd Edition, Tata McGraw Hill, 2007.
2. Andrew.S.Tenenbaum, ”Computer Networks” , 4th Edition, Prentice Hall of India, 2008
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**

SECB1503	MACHINE LEARNING FOR ROBOTICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSEOBJECTIVES

- Understand and implement the most popular learning algorithms.
- Perform feature selection and experimental set up on real tasks.
- Analyze in detail about unsupervised learning, dimensionality concepts and neural networks.
- Evaluate multiple learning algorithms across several Robotic tasks.

UNIT 1 INTRODUCTION 9 Hrs.

Machine learning– Applications- Learning Input-Output functions: Types of learning–Input Vectors– Outputs– Supervised- Learning class from Examples – PAC- Unsupervised– Noise -BIAS AND VARIANCE - OCCAM'S RAZOR PRINCIPLE–Performance Evaluation.

UNIT 2 SUPERVISED LEARNING 9 Hrs.

Introduction-Discriminative and Generative Models -Linear Regression - Least Squares -Under-fitting / Overfitting -Cross-Validation – Lasso Regression- Classification - Logistic Regression- Gradient Linear Models -Support Vector Machines –Kernel Methods -Instance based Methods - K-Nearest Neighbours - Tree based Methods –- Evaluation of Classification Algorithms.

UNIT 3 ADVANCED SUPERVISED LEARNING 9 Hrs.

Linear models and gradient descent–Support Vector machines–Naïve Bayes models and probabilistic modeling– Model selection and feature selection–Model Complexity and Regularization - Probability Density Estimation - Sequence Models – Markov Models – Hidden Markov Model.

UNIT4 UNSUPERVISED LEARNING 9 Hrs.

Curse of dimensionality, Dimensionality Reduction, PCA, Clustering–K-means–Expectation Maximization Algorithm –Mixtures of latent variable models – Supervised learning after clustering – Hierarchical clustering-Autonomous learning.

UNIT5 NEURAL NETWORKS AND REINFORCEMENT LEARNING 9 Hrs.

Neural Networks – Biological Motivation- Perceptron – Multi-layer Perceptron – Feed Forward Network – Back Propagation-Activation and Loss Functions- Limitations of Machine Learning – Deep Learning– Convolution Neural Networks – Recurrent Neural Networks – Use cases.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Define a model for your data and make the model learn.
CO2 - Build regression models to predict an unknown output from a given set of inputs.
CO3 - Create Machine Learning techniques to teach a robotic manipulator to move.
CO4 - Develop unsupervised and reinforcement models for various robotics tasks.
CO5 - Determine hidden parameters in data to improve the accuracy of your model's predictions.
CO6 - Create probabilistic data models to predict a range of possible outcomes that account for real-world robotic operation risks and uncertainties.

TEXT / REFERENCEBOOKS

1. Michalski, Carbonell, TomMitchell, 'Machine Learning', Springer, 2014.
2. Ethem Alpaydin,'Introduction to Machine Learning', The MIT Press, 2004.
3. Peter Flach, 'Machine Learning: The Art and Science of Algorithms that make sense of data', Cambridge, 2014.
4. HalDaumeIII, 'A Course in Machine Learning', Todo, 2015.
5. BrunoApolloni, AshishGhosh, FerdaAlpasian, "Machine Learning and Robot Perception", Springer, 2005.
6. Judy Franklin, Tom Mitchell, Sebastin Thrun, "Recent Advances in Robot Learning: Machine Learning", Springer, 2012.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

SCSB1611	COMPUTATIONAL INTELLIGENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To study the basic principles of fuzzy logic and fuzzy operators.
- To understand the concept of fuzzy logic controller and its applications.
- To comprehend the concepts of swarm intelligence algorithms.
- To study and analyse various methodologies for training multi-layer network.
- To acquire knowledge about SOM and special networks.
- To illustrate the concepts of Genetic Algorithms& Evolutionary strategies.

UNIT 1 FUZZY LOGIC INTELLIGENCE 9 Hrs.

Classical set- operations and properties -Fuzzy Set-operations and properties-problems, Classical Relations-Operations and Properties, Fuzzy Relations-Operations and Properties -Compositions-Max-min, Max-Product-Problems, Membership function- features of membership functions-types, α cuts, Linguistic Hedges.

UNIT 2 FUZZY LOGIC CONTROL SYSTEM 9 Hrs.

FLCS- Fuzzy logic control system-Need for FLCS-Assumptions in FLC design. Fuzzification – Defuzzification. Fuzzy decision making, Fuzzy Rule Based System- Knowledge Base System. Mamdani and sugeno FLC architectures, Introduction to ANFIS- Architecture. Fuzzy cognitive maps. Applications - speed control of induction motor, automatic train control.

UNIT 3 SWARM INTELLIGENC 9 Hrs.

Introduction – Particle swarm optimization algorithm – Bat algorithm and its variants – Artificial Fish swarm optimization algorithm – Cockoo search algorithm and its variants – Firefly algorithm and its variants – Flower pollination algorithm – Artificial Bee colony optimization algorithm – real world applications of swarm intelligence algorithms.

UNIT 4 MULTILAYER AND ADAPTIVE ARCHITECTURES 9 Hrs.

BPN-Algorithm, Application, CPN-Training, Applications, Mexican Hat, Kohonan SOM, vector quantization, - Associate memory - Bidirectional Associative Memory (BAM) - Architecture – Hopfield – Discrete & Continuous types, Algorithm- Energy function, Adaptive Resonance Theory - ART1, ART2-training. Probabilistic neural network, Applications - Fault diagnosis, Motion control in robotics. Pattern Recognition.

UNIT 5 GENETIC ALGORITHMS AND EVOLUTIONARY STRATEGIES 9 Hrs.

Introduction – Robustness of Traditional Optimization and Search Techniques – The goals of optimization - Evolutionary computation versus Classical optimization –Fitness function, Reproduction Selection - Selective pressure, Random selection, Proportional, Tournament, Rank based, Boltzmann, Elitism, Hall of Fame – Stopping conditions - Cross over – Binary & Floating- point representation, Mutation - Binary & Floating-point representation & headless chicken method. Generic Evolution Strategy Algorithm, Strategy Parameters and Self-Adaptation, Evolution Strategy Variants, Applications of Evolution Strategies.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Recall and recollect the concepts of Fuzzy logic properties and operations
CO2 - Understands design and development of various fuzzy based control applications
CO3 - Evaluate different artificial neural network techniques.
CO4 - Analyze different multilayer and adaptive networks
CO5 - Identify the need for evolutionary computation.
CO6 - Formulate algorithms based on Evolutionary computational strategies.

TEXT / REFERENCE BOOKS

1. James A Freeman and Davis Skapura, "Neural Networks", Pearson, 2017 reprint.
2. Jacek M. Zuarda, "Introduction to Artificial Neural Systems", Jaico Publishing House, 2012 reprint.
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", MacGraw Hill. 3rd Edition, 2010.
4. Jang J.S.R., Sun C.T., Mizutani E., "Neuro-Fuzzy and Soft Computing", PHI, 2017 reprint.
5. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, reprint 2017.
6. Rajasekharan and Rai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2nd Edition 2017.
7. Andries P. Engelbrecht, "Computational intelligence An Introduction", 2nd Edition, 2010.
8. Aboul Ella Hassanien, Eid Emary, “Swarm Intelligence Principles, Advances, Applications”, 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**

S731BLH51	BIG DATA ANALYTICS FOR AI	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	100

COURSE OBJECTIVES

- To introduce the concepts and phases of big data analytics.
- To study the tools required to manage and analyze big data.
- To explore the concept of knowledge representation
- To learn the ability of planning strategies
- To study the learning techniques and logistic regression

UNIT 1 INTRODUCTION TO BIG DATA 12 Hrs.

Introduction - Challenges of Conventional Systems, What is Business Analytics, Business Analytics lifecycle, Why Big Data Analytics, Defining Big data, Characteristics of Big Data (V's), Business Analytics phases: Data Acquisition- Data Cleaning - Data Manipulation - Data Analysis (Statistical and Analytical methods) to make sense of data - Data Visualization.

Practical:

1. Data Pre-Processing: Building Good Training Sets
2. Manipulate the Twitter Data Set.

UNIT 2 HADOOP MAPREDUCE 12 Hrs.

Introduction to HADOOP - Hadoop ecosystem components and uses, Hadoop Storage: HDFS, Concept of Hadoop Distributed file system, Design of HDFS, Configuration of HDFS. Hadoop Data Types, large-scale deep belief nets with mapreduce - Functional Concept of Mappers, Functional-Concept of Reducers, MapReduce Execution Framework, Partitioners and Combiners, Hadoop Clusters component : NameNode, Secondary NameNode, and DataNode, Data flow (Anatomy of File Write and Read) - detecting malicious domain using deep Learning at scale.

Practical:

1. Hadoop – Map Reduce Programs / Commands / Job Scheduling
2. HDFS
3. YARN
4. Working with Pig and Hive

UNIT 3 KNOWLEDGE REPRESENTATION 12 Hrs.

Issues, predicate logic, resolution, representing knowledge using rules, forward versus backward reasoning, matching, control knowledge, weak slot and filler structure-semantic nets, frames, strong slot - learning curve analysis by logistic regression.

Practical:

1. Evaluating the results of machine learning algorithms
2. Implement Regression and Correlation Techniques

UNIT 4 GAME PLAYING 12 Hrs.

Mini-max search, alpha-beta cutoffs, planning system, goal stack planning, hierarchical planning, understanding as constraint satisfaction, waltz algorithm, natural language processing, syntactic processing - scalable multi-dimensional prediction model.

Practical:

1. Implement Classification Algorithms

2. Implement Naïve Bayes Classifier
3.

UNIT 5 LEARNING 12 Hrs.

Rote learning, learning by taking advice, learning in problem solving, learning from examples, Winston's learning program, decision trees, perception, vision, speech recognition, navigation, manipulation, robot architecture - data analytics using scalable logistic regression - sentimental classification of big data using logistic regression.

Practical:

1. No SQL (using Cassandra/MongoDB/Spark)
2. Visualization (using Tableau)

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the key issues in big data management
CO2 - Acquire various analysing techniques, software tools in big data analytics
CO3 - Analyse various AI approaches to solve problems.
CO4 - Learn various classification techniques in big data analytics.
CO5 - Design models for real world scenarios.
CO6 - Design a case study and retrieve the patterns from large data to solve complex tasks.

TEXT / REFERENCE BOOKS

1. Distributed Databases: Principles and Systems Paperback – 1 Jul 2017 by Stefano Ceri , Giuseppe Pelagatti , McGraw Hill Education, ISBN-10: 0070265119, ISBN-13: 978-0070265110, 2017.
2. Tom White " Hadoop: The Definitive Guide" Fourth Edition, O"reilly Media, 2015
3. Prajapati, V. Big data analytics with R and Hadoop. Packt Publishing Ltd, 201
4. E.RichK.Knight, and B. Nair, Artificial Intelligence, 3rdEdition, TMH, 1 July 2017
5. RusselNorvig, Artificial Intelligence A modern Approach, 3 rd Edition, Pearson Education,2010

SECB2502	NEURAL NETWORKS USING MATLAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

COURSE OBJECTIVES

- To make students familiar with basic concepts and tools used in neural networks.
- To understand students' structure of a neuron including biological and artificial.
- To implement learning in network (Supervised and Unsupervised).
- To get familiarized the concepts of learning rules.
- To Use MATLAB to perform complex arithmetic

LIST OF EXPERIMENTS

1. Study of MATLAB
2. (a) Program to perform basic operations in MATLAB
   (b) Program to perform matrix operations in MATLAB
3. Program to calculate the factorial of a number by creating a script file by using while loop
4. Program to plot the straight line and sine curve.
5. Program in MATLAB to find the factorial by creating a function file by using for loop.
6. Program to draw a graph with multiple curve.
7. Program to plot Activation function used in neural network.
8. Program to plot piecewise continuous activation function (threshold and signum function in neural network)
9. Program to realize gates using McCulloh Pitt model in MATLAB.
10. Program to implement XOR gate using McCulloh-Pitts neuron.
11. Program to create `Perceptron using commands.
12. Program for creating a Back Propagation Feed-forward neural network.
13. Program to design a Hopfield Network which stores 4 vectors.
14. Program to illustrate how the perception learning rule works for non-linearly separable problems
15. Program to illustrate Linearly non-separable vectors;

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Remembering the concept of MATLAB and its operations.
CO2 - Understand supervised and unsupervised learning concepts
CO3 - Able to apply for cognitive tasks and processing of sensorial data such as vision, image- and speech recognition, control, robotics, expert systems
CO4 - Design single and multi-layer feed-forward neural networks
CO5 - understand training of recurrent Hopfield networks and associative memory concepts.
CO6 - Ability to create Back Propagation Feed-forward neural network

SMTB1601	OPTIMIZATION TECHNIQUES FOR COMPUTING	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., Kedar Nath Ram Nath Publication, 2010.
4. Nita H Shah, Ravi M Gor & Hardik Soni, 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.**

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**

SMRA1301	INTRODUCTION TO MECHANICAL SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To develop the knowledge of mechanisms and mechanical systems.
- To learn about machines and mechanical systems.
- To study mechanical systems and understand what the system does, how it's made, what it's made of.
- To learn about modeling and control of electro mechanical systems.
- To identify systems and subsystems, practice drawing process diagrams

UNIT 1 INTRODUCTION TO MECHANICAL SYSTEMS 9 Hrs.

Introduction to Mechanical systems: Basic elements of mechanical system, Types of mechanical systems, symbols used in translational mechanical systems, symbols used in rotational mechanical systems, Newton's second law in translation mechanical systems, Force calculations in mass, springs and dashpot, Transfer function of translation mechanical systems, torque calculation in rotational mechanical systems.

UNIT 2 MACHINES AND MECHANICAL SYSTEMS 9 Hrs.

Mechanical advantage, Factors affecting mechanical advantage, Levers and Inclined planes, three classes of levers, wheel and axle, fixed pulley, movable pulley, gears- types of gear trains, Belt conveyors.

UNIT 3 ANALYSIS OF MECHANICAL SYSTEMS 9 Hrs.

Study of forces, motion and deformation, Application of laws relating the forces to the rotation and deformation, Introduction to pressure vessels- thick and thin cylinders, Introduction to ANSYS and MATLAB, Steady state and transient thermal analysis.

UNIT 4 MODELING AND CONTROL OF ELECTRO MECHANICAL SYSTEMS 9 Hrs.

Physical System Modeling, Modeling of Mechanical, Electrical and Electro-mechanical Systems. Response of Dynamic Systems, First order, Second Order and Higher Order System Response, Modelling of armature-controlled DC motor.

UNIT 5 SENSORS AND ACTUATORS 9 Hrs.

Introduction to sensors, Types of sensors- position and speed measurement, temperature measurement and force measurement, Introduction to actuators- DC motor, Hydraulics and Pneumatic.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the elements of mechanical systems and apply the laws to calculate force, torque on mechanical systems
CO2 - Understand the factors that affects mechanical systems
CO3 - Analyse the mechanical systems using MATLAB and ANSYS.
CO4 - Apply the knowledge of mathematics to control the electro mechanical systems
CO5 - Build an electro-mechanical system using armature control DC motor.
CO6 - Apply knowledge to identify and use relevant sensors and actuators in mechanical systems

TEXT / REFERENCE BOOKS

1. System Dynamics for Engineering Students – Nicolae Lobontiu, Academic Press
2. Fundamentals of Mechanical Vibrations – S Graham Kelly, McGraw-Hill
3. Feedback Control of Dynamic Systems – Franklin, Powell and Naeini, Pearson Education Asia
4. Advanced Control Systems – Dorf and Bishop, Pearson Education Asia
5. Control Systems Engineering – Norman S Nise, John Wiley & Sons
6. Identification and Control of Mechanical Systems, Juang and Phan, Cambridge University Press
7. Feedback Control of Dynamic Systems, Franklin, Powell and Naeini, Pearson Education
8. Dynamic Systems Control, Skelton, John Wiley and Sons

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

SECB1602	ROBOTIC PERCEPTION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To study the basics of the Perception systems.
- To expose the student on the algorithms used in Perception systems.
- To study the recognition technique for objects.
- To understand the applications for vision systems.
- To introduce the concept on Object Tracking and Applications

UNIT 1 FUNDAMENTALS 9 Hrs.

Historical Perspective, Specifications of Robots, Classifications of robots, Work envelope, Flexible automation versus Robotic technology, Applications of Robots.

UNIT 2 VISION ALGORITHM 9 Hrs.

Fundamental Data Structures: Images, Regions, Sub-pixel Precise Contours – Image Enhancement - Gray value transformations, image smoothing, Fourier Transform – Geometric Transformation – Image segmentation – Segmentation of contours, lines, circles and ellipses – Camera calibration – Stereo Reconstruction.

UNIT 3 OBJECT RECOGNITION 9 Hrs.

Object recognition, Approaches to Object Recognition, Recognition by combination of views – objects with sharp edges, using two views only, using a single view, use of depth values.

UNIT 4 VISION TRACKING 9 Hrs.

Transforming sensor reading, Mapping Sonar Data, aligning laser scan measurements - Vision and Tracking: Following the road, Iconic image processing, Multiscale image processing, Video Tracking - Learning landmarks: Landmark spatiograms, K-means Clustering, EM Clustering.

UNIT 5 OBJECT TRACKING AND APPLICATIONS 9 Hrs.

Stochastic Search - Shapes, Contours, and Appearance Models. Mean-shift tracking; Contour-based- Applications of robotics in active perception, medical robotics, autonomous vehicles.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of course students will be able to

CO1 - Select the Perception systems components.
CO2 - Apply suitable algorithm to recognize objects
CO3 - Perform object recognition techniques for detecting the objects.
CO4 - Design vision system for robot applications.
CO5 - Learn the applications of vision system in modern manufacturing environment
CO6 - Design the system for Medical Applications

TEXT / REFERENCE BOOKS

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. Peter Corke, Robotics, Vision and Control: Fundamental Algorithms, Springer Tracts in Advanced Robotics,Volume 118, Second Edition, 2016
3. David Forsyth and Jean Ponce, Computer Vision: A modern Approach, Prentice Hall India 2004
4. Klafter, Chmielewski and Negin, Robotic Engineering - An Integrated approach, PHI, 1st edition, 2009
5. Shimon Ullman, ―High-Level Vision: Object recognition and Visual Cognitionǁ, A Bradford Book, USA, 2000
6. R.Patrick Goebel, ― ROS by Example: A Do-It-Yourself Guide to Robot Operating System – Volume IIIǁ, A Pi Robot Production, 2012.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

S19BLH51	ROBOT PROGRAMMING	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	100

COURSE OBJECTIVES

- To understand why Robot programming needed for programming a robot.
- To learn how Commands, Instructions in Robot programs.
- To understand how to provide Signal, Delay and Call functions in Robot Programming.
- To learn how to control a robot using offline programming.
- To design a robot program for controlling a industrial robot manipulator

UNIT 1 INTRODUCTION TO ROBOT PROGRAMMING 12 Hrs.

Robot software functions – coordinate systems - position control, other control functions, subroutines, Program planning for Robot flow charting for robot programs with few examples.

Practical:

1. Hands on working of Basic Movements of IRB 1520 industrial robot
2. Hands on working of Linear and Reorient mode in IRB 1520 Industrial Robot

UNIT 2 METHODS OF ROBOT PROGRAMMING 12 Hrs.

Online programming, off-line programming, advantages of off-line programming, lead through methods - powered lead through, manual lead through, teach pendant, Robot program as a path in space, defining position in space, motion interpolation, WAIT, SIGNAL and DELAY commands, Branching capabilities and Limitations of head through methods.

Practical:

1. Hands on Working on Tracing Square in IRB 1520 Industrial robot.
2. Hands on working on Tracing Circle , Triangle in IRB 1520 Industrial robot.

UNIT 3 ROBOT LANGUAGES 12 Hrs.

Textual ROBOT Languages, first generation and second-generation languages, structure of a robot language -operating systems, Elements and Functions, constants, variables and other data objects, Motion commands, points in workspace, End effector and sensor commands, computations and operations, program control and subroutines, communications and Data processing.

Practical:

1. Hands on Working on performing PLUSE DO command in IRB 1520 Industrial robot.
2.Hands on working on Performing WAIT Command in IRB 1520 Industrial robot.

UNIT 4 VAL II 12 Hrs.

General description, Monitor commands, motion command, Hand Control, Configuration control, interlock commands, INPUT/OUTPUT Controls, Program Control, examples.

Practical:

1.Hands on Working on performing simple Pick and Place operation in IRB 1520 Industrial robot.
2.Hands on working on Performing Pick and Place with Variations in Speed in IRB 1520 Industrial robot

UNIT 5 AML 12 Hrs.

General description, AML statements, Constant and variables, program control statements, motion commands, Sensor commands, Grip sensing capabilities, Data processing, examples.

Practical:

1.Hands on Working on performing Continuous cycle operation in IRB 1520 Industrial robot
2.Hands on working on Performing complex movements in automatic mode in IRB 1520 Industrial robot.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe the types of robot coordinate systems and programming functions.
CO2 - Describing how to perform robot programming using online and offline method
CO3 - Explain how to programming in various programming languages.
CO4 - Design and develop robot programs with WAIT, SIGNAL and DELAY commands.
CO5 - Ability to design robot program with interlock functions.
CO6 - Apply the sensor feedbacks in robot programs.

TEXT / REFERENCE BOOKS

1. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel and Nicholas G. Odrey, 'Industrial Robotics
2. Technology, Programming and Applications' Mc Graw Hill Book company, 1986.
3. Bernard Hodges, 'Industrial Robotics', Second Edition, Jaico Publishing House, 1993

SCSB3031	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 the student will be able to

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

TEXT / REFERENCE BOOKS

1. David A. Forsyth, Jean Ponce."Computer Vision: A Modern Approach", 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 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**

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 Open CV
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 the 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

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 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**

SCSB3815	WEB PROGRAMMING THROUGH PHP AND HTML	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Understand PHP Basics.
- Learn operators, structures and functions in PHP.
- Learn arrays and PHP file handling.
- Object Oriented programming features of PHP.
- Learn advanced PHP.

UNIT 1 PHP BASICS 9 Hrs.

Introduction to PHP, Support for Database, PHP Installation, Working with PHP, Why PHP? Basic Syntax of PHP, PHP statement terminator and case insensitivity, Embedding PHP in HTML, Comments, Variables, assigning value to a variable, Constants, Managing Variables.

UNIT 2 OPERATORS, CONTROLS STRUCTURES AND FUNCTIONS IN PHP 9 Hrs.

Arithmetic Operators, Bit-wise Operators, Comparison Operators, Logical Operators, Concatenation Operator, Incrementing/Decrementing Operator, Ternary Operator, Operator Precedence, String Manipulation: strtoupper(), strtolower(), ucfirst(), ucwords(), strcmp(), strlen(), substr(), trim(), Conditional Control Structures: If statement, If- else statement, Ifelse if statement, Nested If, Switch statement, Looping Control Structures: For loop, While loop, Do- While loop, For-each, Loop control: Break and Continue. Functions, User-Defined function, Function Definition, Function Call, Function with arguments, Function with return value, call by value and call by references, understanding variable scope, Global Variables, Static Variables, Include and Require, Built-in functions in PHP.

UNIT 3 ARRAYS AND PHP FILE HANDLING 9 Hrs.

Introduction to Array, Array in PHP, Creating an Array, Accessing Elements of an Array, Modifying Elements of an Array, Finding the Size of an Array, Printing an Array in the readable Way, Iterating Array Elements, Modifying Array while iteration, Iterating Array with Numeric index, Removing Element from an Array, Converting an Array to String, Converting String to an Array, Array Sorting, Multidimensional Array, Accessing elements of a Multidimensional Array, Iterating Multidimensional Array. Introduction, File Open, File Creation, writing to files, Reading from File, searching a record from a file, closing a File, Using PHP with HTML Forms.

UNIT 4 CLASS, OBJECT AND EXCEPTION HANDLING, JAVA SCRIPT 9 Hrs.

Introduction, Object, Class, Defining Class in PHP, Object in PHP, Usage of $this variable, Constructor, Constructor with Parameters. Introduction to Exception, Exception Handling mechanisms, Creating Custom Exceptions, Multiple Catch Blocks, Exception Propagation, Error Handling in PHP. Java Introduction, JavaScript Basics.

UNIT 5 INTRODUCTION TO ADVANCE PHP, SET UP PHP DEVELOPMENT ON ECLIPSE CREATING AND DEBUGGING PHP PROJECTS 9 Hrs.

Advanced functions in PHP, Serializing data for persistence, Pattern matching with PHP, Object-oriented Programming and PHP, PHP frameworks – Cake PHP, Symfony, & Zend Framework, Manage PEAR modules, install prebuilt PHP applications, Eclipse installation – All in one, PDT runtime, installation via Update Manager Eclipse, installing a debugger, Running the code inside the web server. Install the local Web Server, Install the PHP engine. Create and Run PHP Project, Understanding Debug View, The PHP debug perspective – the Variables view, the breakpoints' view, the editor view, the console view, the

debug output view, the browser output view; Installing and Configuring the debuggers – Install the Zend debugger, Install XDebug, Configure the debuggers, setting up PDT (PHP Development Tools) – Set up PHP servers, set up PHP executables, Debug Web Application, Inserting other languages e.g., SQL, HTML, Java Script in PHP Code. SQL – PHP SQL Script Installing PHP Projects on Web Server.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Do PHP programming.
CO2 - Embed PHP in HTML.
CO3 - Have learnt Java script.
CO4 - Have understood advanced concepts in PHP programming.
CO5 - Discuss the concepts of PHP on Eclipse.
CO6 - Demonstrate various web applications.

TEXT / REFERENCE BOOKS

1. Web Programming Thru PHP (IBM ICE Publications).
2. PHP Bible - Tim Converse REFERENCE BOOKS 1. PHP A beginner's guide - Bill McCarthy.
3. PHP and MySQL Web Development - Luke Welling.
4. Learning PHP - OReilly Press.
5. http://in.php.net/quickref.php.
6. http://www.w3schools.com/php/default.asp.
7. http://www.tizag.com/php/.

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**

SCSB3026	APPLICATION OF MACHINE LEARNING IN INDUSTRIES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Determine the factors involved in decision support that can improve business performance across the provider/payer ecosystem
- Identify opportunities for business applications in healthcare by applying journey mapping and pain point analysis in a real world context
- Identify differences in methods and techniques in order to appropriately apply to pain points using case studies

UNIT 1 ADVANCED MACHINE LEARNING 9 Hrs.

Deep learning for customer services, Chatbot: Deep learning approach, AI powered marketing systems, Deep learning in cyber security, Types of cyber-attacks in banks, Deep learning methods used in cyber security, Deep learning v/s restricted Boltzmann machines, Convolution Neural Networks (CNNs), Recurrent neural networks, Machine learning techniques: Loan underwriting & sentiment/news analysis, Sentiment or news analysis, Current challenges and opportunities: Banking and security domain.

UNIT 2 MACHINE LEARNING IN BANKING AND SECURITIES 9 Hrs.

Role of machine learning in banking sector, Use of AI in banking and finance, Fraud detection, Customer data management, Personalized marketing, Challenges of banking sector and securities, Widely used machine learning algorithms in banking and security, Fraud prevention and detection systems, Rule based and machine learning based approach in fraud detection, Anomaly detection: Ways to expose suspicious transactions in banks, Advanced fraud detection systems, Risk management systems

Case study: Application of machine learning for financial risk management, Credit risk analysis using machine learning classifier, Investment prediction systems

UNIT 3 MACHINE LEARNING IN HEALTHCARE AND LIFE SCIENCES 9 Hrs.

Applications of machine learning in health and life sciences, Role of machine learning in drug discovery, Medical image analysis, Why deep learning for medical image analysis, Neural network and deep learning architecture, Comparisons between architecture of different types of deep learning models, Machine learning in genetics and genomics, Genomics and AI background, Interpreting deep learning models, Predictive medicine: Prognosis and diagnostics accuracy, Predictive medicine: Examples, ML applications in breast cancer diagnosis and prognosis.

UNIT 4 MACHINE LEARNING IN EDUCATION 9 Hrs.

Advantages of machine learning in education, learning analytics, Academic analytics, Action research, Educational data mining, Recommender system, Personalized adaptive learning, Learning analytics process.

Case study: Sentimental analysis for student's feedback using ML, Recommender systems in education, Domain model, Learner model, Students classification algorithm, Recommendation model, Case study: Application of ML in predicting students' performance, Proposed methodology, Data description, Sample data sets, Visualization, Selection of machine learning technique.

UNIT 5 MACHINE LEARNING IN MEDIA AND COMMUNICATION 9 Hrs.

Machine learning in communication, media and entertainment, Usage of machine learning in media and entertainment industry, Machine learning techniques for customer sentiment analysis, World embedding's, Sentiment analysis with long short term memory networks, Real-time analytics in communication, media and entertainment industries, Real time analytics and social media, Deep learning

for social media analytics, Recommendations engines, Collaborative filtering, Memory based collaborative filtering, Model based collaborative filtering, Content based filtering, Hybrid recommendation systems, Summary of recommendation systems, Deep learning techniques on recommender systems

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Comprehend advanced concepts of machine learning and deep learning.
CO2 - Analyze concepts of machine learning on banking domain
CO3 - Apply concepts of Machine Learning in Healthcare sectors.
CO4 - Appreciate the various applications in Education sectors.
CO5 - Identify the applications in Media and Communication Sectors.
CO6 - Recognize and apply various machine learning concepts on case studies from different business sectors.

TEXT / REFERENCE BOOKS

1. Application of machine learning in industries, IBM ICE Publications
2. Machine Learning Algorithms for Industrial Applications, Studies in Computational Intelligence, Springer Book series, 2021.
3. Pedro Larrañaga, David Atienza, Javier Diaz-Rozo, Alberto Ogbechie, Carlos Esteban Puerto-Santana, Concha Bielza, Industrial Applications of Machine Learning, ISBN 9780367656874, CRC press, 1st edition, 2020
4. Ian Goodfellow, YoshuaBengio, and Aaron Courville, Deep Learning, ISBN: 978-0262035613
5. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer series in statistics, 2nd edition, 2019, ISBN: 978-0387848570
6. Drew Conway and John Myles White, Machine Learning for Hackers: Case Studies and Algorithms to Get you Started, First Edition, O'Reilly Media, 2020
7. John D. Kelleher, Brian Mac Namee, and Aoife D'Arcy, 13. Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies, MIT press, 1st edition, 2020

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

SCSB3413	MATHEMATICS FOR INTELLIGENT SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To lay down the basic concepts and techniques of linear algebra, calculus and basic probability theory
- To explore the concepts initially through computational experiments and then try to understand the concepts/theory.
- To provide an appreciation of the wide application of these disciplines within the scientific field.
- To provide connection between the concepts of linear algebra, differential equation and probability theory.

UNIT 1 LINEAR ALGEBRA 9 Hrs.

Highlights of Linear Algebra: Four Fundamental Spaces - Eigenvalues and Eigenvectors - SVD - PCA and best low rank matrix. Raleigh Quotients and Generalized Eigenvalues - Norms of vectors andmatrices - Factoring matrices and tensors. Computation with Large matrices: Krylov subspaces and Arnoldi iteration - Linear System solution by Arnoldi and GMRES - Conjugate gradient method.

UNIT 2 THEORY OF OPTIMIZATION 9 Hrs.

Theory of Optimization: (Convex and Non-convex basics) - Unconstrained optimization methods - Direct methods for convex functions - sparsity inducing penalty functions - Newton methods for non-convex functions. Constrained Convex Optimization problems - Formulating problems as LP and QP - support vector machines - solving by packages (CVXOPT) - Lagrangian multiplier method - KKT conditions - Introduction to Alternating direction method of multipliers- the algorithm. Kalman Filter - Optimal Sensor based Control - Full state Feedback of Cartpole Pendulum - Robust Control and Frequency domain Techniques

UNIT 3 SIGNAL PROCESSING 9 Hrs.

Applications in signal processing and pattern classification. Introduction to PDEs arising in Physics and Engineering (problem formulations and simple numerical methods for solutions).

UNIT 4 NEURAL NETWORKS 9 Hrs.

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

UNIT 5 PROBABILITY AND STATISTICS 9 Hrs.

Probability and statistics - Moments - cumulants - and inequalities of statistics - Covariance matrices and joint probabilities - Multivariate Gaussian and weighted least squares - Markov chains - Markov decision process - advanced aspects. Expectation-Maximization - Variational Inference - Variational Learning - Support Vector Machines - Neural Networks - Bayesian Modelling.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - To develop an understanding of the basic concepts and techniques of linear algebra, calculus and basic probability theory needed for AI

CO2 - To provide an appreciation of the wide application of these disciplines within the scientific field.

CO3 - To provide connection between the concepts of linear algebra, differential equation and probability theory

CO4 - To develop an insight into the applicability of linear algebra in business and scientific domains.

CO5 - To enable the students to understand the use of calculus and Linear algebra in modelling electrical and mechanical elements.

CO6 - To equip the students to understand the role of probability theory in providing data sets for computational experiments in data science

TEXT / REFERENCE BOOKS

1. 'Linear Algebra and learning from data', Gilbert Strang, Wellesley, Cambridge press, 2019
2. 'Data Driven Science and Engineering', Steve Brunton and Nathan Kutz, Cambridge University Press,2018 'Machine Learning: A Probabilistic Perspective', Kevin Murphy and Francis Bach, 2012
3. Differential Equations and Linear Algebra', Gilbert Strang, Wellesley, Cambridge press, 2018.
4. 'Linear Algebra and learning from data', Gilbert Strang, Wellesley, Cambridge press, 2019.
5. 'Convex Optimization', Stephen Boyd and LievenVandenberghe, Cambridge University Press, 2018
6. 'Introduction to Applied Linear Algebra – Vectors, Matrices, and Least Squares', Stephen Boyd and LievenVandenberghe, Cambridge University Press, 2018

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

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

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 and Grammar-Processing Indian Languages- NLP Applications Information Retrieval. Language Modeling: Various Grammar- based Lanuage Models-Statistical Language Model, The role of Machine Learning in NLP.

UNIT 2 WORD LEVEL ANALYSIS 9 Hrs.

The role of language models, 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 9Hrs.

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 the student will be able to

CO1 - Understand NLP problems and survey the literature about that problem
CO2 - Understand language modeling
CO3 - Describe automated natural language generation and machine translation
CO4 - Learn the natural language generation.
CO5 - Analyse the logic and semantics of world knowledge
CO6 - Analyze and compare the use of different statistical approaches for different types of NLP applications.

TEXT / REFERENCE BOOKS

1. Richard M Reese, ―Natural Language Processing with Java, OReilly Media, 2015
2. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition,Chapman and Hall/CRC Press, 2010.
3. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 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**

SCSB3611	APPLICATIONS OF AI	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Learning general purpose applications that use Supervised Learning algorithms.
- Examining different interactive and intelligent real-time applications in medicine field.
- Implementing real world AI applications in computer engineering.
- Applying AI state of art techniques for IoT based applications.
- Learning trending applications in the domain of artificial intelligence and machine learning.

UNIT 1 GENERAL PURPOSE APPLICATIONS 9 Hrs.

Classification techniques under Supervised Learning – Dimensionality Reduction – Data Visualization – Recommender system technology – Knowledge modeling – Information retrieval – Ontology management – E-Commerce system.

UNIT 2 INTERACTIVE AND INTELLIGENT APPLICATIONS 9 Hrs.

High level activity detection in video – Collaborative filtering approach – Medical Image Processing in wavelet domain – Ulcer Lesion Diagnosis using AI – State of art techniques in Skin Cancer Diagnosis – Fuzzy systems in Biomedicine – Gene expression interpretation.

UNIT 3 REAL WORLD COMPUTER ENGINEERING APPLICATIONS 9 Hrs.

Classifier ensemble approach for Intrusion Detection – Indoor Smart Antenna system – Interpretation of cross media content – Video watermarking and benchmarking – State of art techniques in Face Detection and recognition systems – Tracking system – Robotic Sensor Networks.

UNIT 4 IOT BASED APPLICATIONS 9 Hrs.

Bacteria Foraging Optimization for graphical routing in IoT – ZigBee protocol Security in IoT – State of art techniques of AI for applications in IoT – IoT based runaway syndrome tracking system – IoT based smart wheelchair for type-2 diabetes and spine- disorder patients – Spade to Spoon IoT based ML approach for Precision Agriculture.

UNIT 5 OTHER TRENDING APPLICATIONS 9 Hrs.

NLP: Single-Sentence, Similarity and paraphrase and Inference task – Literature Mining: Indexing and Retrieval – Knowledge graph representation – Misinformation detection – Public Sentiment Analysis – Medical Image Analysis – Ambient Intelligence – Vision-based robotics – Precision Diagnostics – Protein structure prediction – Drug Repurposing.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - To learn general purpose application that uses Artificial Intelligence.
CO2 - To examine different interactive and intelligent applications in AI.
CO3 - To implement real world AI applications in computer engineering.
CO4 - To apply AI techniques for IoT based applications.
CO5 - To learn trending applications in the domain of artificial intelligence.
CO6 - To design applications for real time societal needs.

TEXT / REFERENCE BOOKS

1. Xiao-Zhi Gao, Rajesh Kumar, SumitSrinivastava, Bhanu Pratap Soni Applications of Artificial Intelligence in Engineering: Proceedings of First Global Conference on Artificial Intelligence and Applications (GCAIA 2020)
2. Ilias G. Maglogiannis, Emerging Artificial Intelligence Applications in Computer Engineering: Real Word AI Systems with Applications in eHealth, HCI, Information Retrieval and ... in Artificial Intelligence and Applications)

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 Explore the cloud level services offered by Linux Operating System

UNIT 1 STARTING WITH LINUX 9 Hrs.

Understanding What Linux Is- Exploring Linux History- Understanding How Linux Differs from Other Operating Systems- Understanding How Linux Distributions Emerged- Creating the perfect Linux desktop- Lab: Ubuntu OS installation on Virtual machines- Starting with the Ubuntu Desktop Live image- Handling Ubuntu desktop- Using the Desktop- Understanding the importance of threads- Lab: Understanding Basic Desktop Application Management in Ubuntu- Adding an application launcher- Managing files and folders-- Installing and managing additional software- Lab: Knowing Advanced Desktop Application management in Ubuntu- Using tools- Lab: Configuring basic tools in Ubuntu OS- Working with shell in UBUNTU- Lab1: Getting aquatinted with different types of shell- LAB3: Basic Shell Management.

UNIT 2 GAINING ACCESS 9 Hrs.

Using the root User Account-Exploring Administrative Commands, Configuration Files, and Log Files- Using Other Administrative Accounts- Lab: Implementing privilege escalation- Using Shell Variables, expanding arithmetic expressions Expanding variables- Lab: Manipulating environmental/shell variable- Getting Information about Commands and help- Managing user accounts in UBUNTU- User Management- Lab: Managing Regular User Account-Group Management-Lab: Group Management- Moving around the file system UBUNTU- File Management- Lab: Working with basic file system- Permission Management- Lab: Working with file system permissions- Access Control Lists- Lab: Managing User and Group Permissions- Working with text files in UBUNTU.

UNIT 3 FILE MANIPULATIONS 9 Hrs.

Editing text files from shell prompt- Managing running processes- Process Management-Lab: Monitoring process activity- Writing simple shell scripts- Understanding Shell Scripts- Lab: Implementing basic shell programs- Understanding server managing in RHEL- Install the server RHEL- Lab: RHEL 8 Installation on Virtual Machine- Initial Server Configuration- Lab: Configuring and Verifying the Initial Server Settings- Remote Server Management- Lab: RHEL Remote Server management-Initial Server Configuration- Lab: Configuring and Verifying the Initial Server settings-Remote Server Management-
Lab: RHEL Remote Server management- File Transfer-Lab: Securely coping files between Servers-Log Management- Lab1: Monitoring system logs-Lab2: Recording and Managing Server Logs- Server Monitoring- Lab: Monitoring the Health of the server.

UNIT 4 MANAGING SOFTWARE IN RHEL 9 Hrs.

System software and package management- administering networking in RHEL- Lab: Examining and Configuring Network in Server- Starting and stopping services in RHEL- Lab: Managing Daemons and Services in RHEL- Configuring a web server in RHEL- Lab: Managing a Basic Webserver- Advance Webserver Management-Lab: Advance Webserver Management- Secure Webserver-Lab: Securing the Webserver Effectively- Managing disks and file systems- Lab: Making Simple Partitions- Logical Volume Management- Lab: Implementing Logical Volume Management (LVM)- Configuring Samba server in

RHEL- Lab: Deploy a samba share directory- Configuring an NFS file server in RHEL- Lab: Deploy a NFS Share export- Introducing container technology.

UNIT 5 INTRODUCTION TO GIT 9 Hrs.

Getting started with GIT and its architecture- Lab: Installing and Configuring GIT in RHEL- Remote Repositories - Lab: Exploring GIT Remote Repository- BRANCHING AND MERGING- Lab: Learning and Exploring Branches in GIT- Configuring databases in LINUX- Lab: MariaDB (MYSQL) installation and configuration in RHEL-MongoDB-Lab: MongoDB installation and configuration in RHEL-UNDERSTANDING LINUX SECURITY OS- Lab: Kali Linux Installation on Virtual Machine- Description about Different Security tools in Kali Linux-Hands-on Study on Nmap and Metasploit-Lab: Gathering information using NMAP-Metasploit-Lab: Vulnerability Management using Metasploit- Knowing LINUX as cloud workhorse- Amazon Web Service (AWS- Lab: Operating and Managing an EC2 Instance in AWS Cloud.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify the need of a Linux Operating System.
CO2 - Know the process management functions of a Linux Operating System.
CO3 - Understand the need of users and group management in Linux Operating System.
CO4 - Find the significance of GIT repositories and databases.
CO5 - Recognize the essentials of file management part of a Linux Operating System.
CO6 - Gain an insight of the importance of cloud and security in Linux Operating System.

TEXT / REFERENCE BOOKS

1. "Comprehensive Linux for All ", Red Hat, 1st Edition, 2023.
2. Petersen, Richard, "Red Hat Enterprise Linux 8: Desktops and Administration, Surfing Turtle Press, 2019.
3. Colino, Miguel Perez, " Red Hat Enterprise Linux 8 Administration: Master Linux Administration Skills ", Packt Publishing, 2021.
4. Günther, Tobias, "Learn Version Control with Git: A Step-By-step Course for the Complete Beginner, Independently Published, 2017.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

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 - Analysing efficient speech features used for modelling
CO3 - Evaluate different Speech modelling 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 Processing,Computational Linguistics, and Speech Recognition”, Pearson Education. 2008
2. Speech and Language Processing (3rd edition),Dan Jurafsky and James H. Martin, October 16, 2019
3. Lawrence RabinerandBiing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2008.
4. Steven W. Smith, “The Scientist and Engineer’s Guideto DigitalSignal Processing”, California TechnicalPublishing. 2011
5. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education.2002
6. Claudio Becchettiand LucioPrinaRicotti, “Speech Recognition”, John Wiley and Sons, 1999.
7. Ben gold and Nelson Morgan, “Speech and audio signal processing”, processing andperceptionofspeechandmusic, Wiley-India Edition, 2006 Edition.
8. FrederickJelinek, “Statistical Methods of Speech Recognition”, MIT Press,1998
9. Himanshu Mohan, Megha Yadav, " Speech Recognition System and its Application”, LAPLAMBERT 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**

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

COURSE OBJECTIVES

- To impart knowledge on various types of Binary logics.
- To design a binary logic circuit for an arithmetic expressions.
- To understand the usage of registers and counters used in various digital circuits.
- To understand the design of memory devices used.
- To get an exposure about the electronics behind design of Basic digital logical elements.

UNIT 1 NUMBER SYSTEMS, LOGIC FUNCTIONS AND BOOLEAN ALGEBRA 9 Hrs.

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

UNIT 2 DESIGN OF COMBINATIONAL LOGIC 9 Hrs.

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

UNIT 3 COMBINATIONAL CIRCUITS 9 Hrs.

Introduction to Combinational circuits – Half Adder, Full Adder - Half Subtractor, Full Subtractor- Parallel binary Adder, Parallel binary Subtractor - Carry look ahead Adder- BCD Adder- Decoders- Encoders - Priority Encoder- Multiplexers- MUX as universal combinational modules- Demultiplexers- Code convertors- Magnitude Comparator.

UNIT 4 SEQUENTIAL CIRCUITS 9 Hrs.

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

UNIT 5 DIGITAL LOGIC FAMILIES, MEMORIES AND PROGRAMMABLE DEVICES 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analyze various coding techniques and number conversion systems.
CO2 - Develop suitable techniques to minimize the Boolean equations.
CO3 - Design the digital circuit using combinational logic.
CO4 - Design the digital circuit using sequential logic.
CO5 - Analyze the performance of various digital logic families.
CO6 - Solve the arithmetic expressions using memories and programmable logic devices and implement memory units with Programmable logic devices

TEXT / REFERENCE BOOKS

1. John M. Yarbrough, “Digital logic: Applications and Design”, Thomas - Vikas Publishing House, 2002.
2. Morris Mano, “Digital design-With an Introduction to the Verilog HDL”, 5th Edition, Pearson, 2013.
3. R.P.Jain, “Modern Digital Electronics”, 4th Edition, TMH, 2010.
4. Thomas L Floyd, “ Digital Fundamentals”, 11th edtion, Pearson, 2015
5. William H. Gothmann, “Digital Electronics”, Prentice Hall, 2001.
6. Tutorial Website: https://www.tutorialspoint.com/digital_circuits/index.htm.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

SCSB3551	HEALTH CARE ANALYTICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Understand the health data formats, health care policy and standards
- Learn the significance and need of data analysis and data visualization
- Understand the health data management frameworks
- Learn the use of machine learning and deep learning algorithms in healthcare
- Apply healthcare analytics for critical care applications

UNIT 1 INTRODUCTION TO HEALTHCARE ANALYSIS 9 Hrs.

Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning, Probabilistic reasoning and Bayes Theorem, Weighted sum approach.

UNIT 2 ANALYTICS ON MACHINE LEARNIN 9 Hrs.

Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model : Sensitivity , Specificity , PPV ,NPV, FPR ,Accuracy , ROC , Precision Recall Curves , Valued target variables –Python: Variables and types, Data Structures and containers , Pandas Data Frame :Operations – Scikit –Learn : Pre-processing , Feature Selection.

UNIT 3 HEALTH CARE MANAGEMENT 9 Hrs.

IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.

UNIT 4 HEALTHCARE AND DEEP LEARNING 9 Hrs.

Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.

UNIT 5 CASE STUDIES 9 Hrs.

Predicting Mortality for cardiology Practice –Smart Ambulance System using IOT –Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Use machine learning and deep learning algorithms for health data analysis
CO2 - Apply the data management techniques for healthcare data
CO3 - Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications
CO4 - Design health data analytics for real time applications
CO5 - Design emergency care system using health data analysis
CO6 - Utilize machine learning, deep learning, and data analysis for solving complex healthcare challenges, including predicting mortality

TEXT / REFERENCE BOOKS

1. Handbook of Intelligent Healthcare Analytics: Knowledge Engineering with Big Data Analytics, A. Jaya, K. Kalaiselvi, Dinesh Goyal, Dhiya AL-Jumeily, First published:6 May 2022
2. Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Hui Yang, Eva K. LeeFirst published:1 August 2016
3. Handbook of Healthcare Analytics: Theoretical Minimum for Conducting 21st Century Research on Healthcare Operations, Tinglong Dai, First published:3 August 2018

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

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

SCSB3713	DIGITAL IMAGE PROCESSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand and gain complete knowledge about the fundamentals of digital image processing
- To develop a theoretical foundation of image processing techniques
- Describe color image processing, image compression, image segmentation and representation
- To provide analytic skills to process the images

UNIT 1 INTRODUCTION 9 Hrs.

Image Representation, Components of Digital Image Processing Systems, Image Sensing and Acquisition, Elements of Visual Perception, Image formation model, Image Sampling and Quantization, Relationship between pixels.

UNIT 2 IMAGE ENHANCEMENT 9 Hrs.

Enhancement by Point Processing, Histogram Processing, Arithmetic/Logic Operations, Image Averaging, Spatial Filters for Smoothing and Sharpening, Frequency domain filters for Smoothing and Sharpening; Image Degradation & Restoration Model, Noise Models, Inverse Filtering, Geometric Mean Filter.

UNIT 3 IMAGE SEGMENTATION 9 Hrs.

Detection of Discontinuities, Edge Linking and boundary Detection, Thresholding, Region based Segmentation, Coding Redundancy, Inter pixel Redundancy, Image Compression model, Error Free Compression, Variable Length Coding, Lossy Compression.

UNIT 4 MORPHOLOGICAL AND COLOUR IMAGE PROCESSING 9 Hrs.

Dilation and Erosion, Opening and Closing, Basic Morphological Algorithms: Boundary Extraction, Region Filling, Thickening and Thinning; Colour Image Representation, Colour Models, Pseudo Colour Image Processing, Colour Transformations, Smoothing and Sharpening, Segmentation based on Colour.

UNIT 5 MEDICAL IMAGE PROCESSING 9 Hrs.

Noise Reduction in Nuclear Medicine Imaging, Contrast enhancement of mammograms, Detection of Spinal Canal, Detection of calcifications by multi-tolerance region growing, Shape analysis of calcifications, Analysis of Ligament Healing.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the fundamentals of Digital Image Processing.
CO2 - Learn the image enhancement techniques in Spatial and Frequency Domain
CO3 - Model the Noises, Restoration and Compression.
CO4 - Analyze segmentation and compression techniques.
CO5 - Apply various algorithms for Colour Image Processing.
CO6 - Apply various algorithms for Medical Image Processing.

TEXT / REFERENCE BOOKS

1. Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", 4th Edition, Pearson Education, 2017.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision", 4th Edition, Cengage Learning, 4th Edition, 2014.
3. B. Chanda, D. Dutta Majumdar, "Digital Image Processing and Applications", Prentice Hall of India, 2011.
4. William K Pratt, "Digital Image Processing", 4th Edition, John Willey 2007.
5. Rangaraj M. Rangayyan, “Biomedical Image Analysis”, CRC Press LLC, Boca Raton, FL, 2005
6. Jain A.K., "Fundamentals of Digital Image Processing", Pearson Education, 1989

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**

SCSB3641	FUNDAMENTALS OF FUZZY LOGIC AND NEURAL NETWORKS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To impart knowledge on signal transmission in human al system.
- To understand the various artificial neural architectures based on human neural network.
- To study and analyze the principles of fuzzy logic.
- To implement Fuzzy logic based controllers for different applications.

UNIT 1 FUNDAMENTALS OF ANN 9 Hrs.

Introduction - Biological Neuron structure, ANN - Definition – Topology - Models - Learning strategies. Characteristics of ANN - Different Learning Rules - Activation dynamics - Synaptic dynamics - Perceptron Model (Both Single & Multi-Layer) - Training Algorithm - Linear Separability Limitation and Its Over Comings, Problems in perceptron weight adjustments.

UNIT 2 MULTI LAYER NETWORKS 9 Hrs.

BPN - Training - Architecture-Algorithm, Counter Propagation Network - Training - Architecture, BAM - Training-stability analysis, Adaptive Resonance Theory - ART1- ART2 – Architecture -Training, Hop Field Network - Energy Function - Discrete - Continuous - Algorithm - Application – TSP.

UNIT 3 SOM & SPECIAL NETWORKS 9 Hrs.

SOM-Introduction - Kohonan SOM - Linear vector quantization, Probabilistic neural network ,Cascade correlation, General Regression neural network, Cognitron - Application of ANN - Texture classification - Character recognition.

UNIT 4 INTRODUCTION TO FUZZY LOGIC 9 Hrs.

Classical set - Operations and properties - Fuzzy Set - Operations and properties - Problems, Classical Relations - Operations and Properties, Fuzzy Relations - Operations and Properties - Compositions Membership function -FLCS - Need for FLC- Fuzzification - Defuzzification.

UNIT 5 FLCS, CLASSIFICATION & APPLICATIONS 9 Hrs.

Fuzzy decision making -Types, Fuzzy Rule Based System, Knowledge Based System, Non linear Fuzzy Control system -Fuzzy Classification - Hard C Means - Fuzzy C Means. Applications of fuzzy - Water level controller, Fuzzy image Classification, Speed control of motor.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Classify various topologies of artificial neural networks.
CO2 - Illustrate training and learning of neural systems using supervised and unsupervised methodologies.
CO3 - Demonstrate the usage of multi-layer and special networks for different case studies.
CO4 - Describe the behavior of Fuzzy Logic control system.
CO5 - Explain the Defuzzification, fuzzy decision systems.
CO6 - Implement Fuzzy based controller for motor speed control, image processing etc.

TEXT / REFERENCE BOOKS

1. Timothy Ross, “Fuzzy Logic with Engineering Application”, McGraw Hill, Edition 1997.
2. James A. Freeman & Skapura, “Neural Networks”, Pearson Education, 2007.
3. B.Yegnanarayana, “Artificial Neural Networks” Prentice Hall, September 2007.
4. Simon Haykin, “Artificial Neural Networks”, 2nd Edition, Pearson Education.
5. Drainkov, H.Hallendoor and M.Reinfrank, “An Introduction to Fuzzy Control”, Edition 2001.

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**

SCSB3612	DEEP REINFORCEMENT LEARNING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- This course aims to provide the cutting edge concepts in deep reinforcement learning.
- To train an agent that can perform a variety of complex tasks.
- To help students to learn about the core challenges and approaches, including generalization and exploration
- To make the students well versed in the key ideas and techniques for deep reinforcement learning

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 RECURRENT AND RECURSIVE NEURAL NETWORKS 9 Hrs.

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

UNIT 3 CONVOLUTIONAL NEURAL NETWORKS 9 Hrs.

Convolution neural networks - recurrent and recursive neural networks - backpropagation algorithms - regularization and optimization techniques for training such networks.

UNIT 4 DYNAMIC PROGRAMMING 9 Hrs.

Dynamic programming - Monte Carlo - and temporal difference - and function approximation reinforcement learning algorithms - and applications of deep and reinforcement learning.

UNIT 5 DEEP REINFORCEMENT LEARNING 9 Hrs.

Value function methods - Deep RL with Q-learning – Multi agent RL - Eligibility Traces – Policy Gradient Methods – Applications and Case studies

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the basics of deep reinforcement learning.
CO2 - Implement in code deep reinforcement learning algorithms.
CO3 - Criticize the core challenges and opportunities in the field of deep reinforcement learning.
CO4 - Apply Monte Carlo reinforcement learning algorithms
CO5 - Apply temporal-difference reinforcement learning algorithms
CO6 - Construct on-policy reinforcement learning algorithms with function approximation

TEXT / REFERENCE BOOKS

1. Richard.S.Sutton and Andrew G.Barto, Reinforcement Learning, second edition, MIT Press, 2018.
2. “Deep Learning” by Ian Goodfellow, Yoshua Bengio, and Aaron Courville (MIT Press, 2016) http://www.deeplearningbook.org/;
3. “Reinforcement Learning: An Introduction” by Richard S. Sutton and Andrew G. Barto http://incompleteideas.net/book/the-book-2nd.html
4. Richard S. Sutton and Andrew G. Barto, “Reinforcement Learning-An Introduction”,2nd Edition,The MIT Press,2018

. END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

SCSB3614	INTELLIGENT EMBEDDED SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Introducing students to Embedded system processor and its software
- Enabling students to design an Embedded system using various methodologies
- Preparing students to build process for an Embedded system.
- To introduce Embedded system principles and programming concepts
- To expose the concepts of microcontroller-based system integration and interfacing by introducing ARM architecture

UNIT 1 EMBEDDED SYSTEM BASICS 9 Hrs.

Introduction to Embedded systems, Characteristics and quality attributes (Design Metric) of embedded system, hardware/software co-design, Embedded micro controller cores, embedded memories, Embedded Product development life cycle, Program modeling concepts: DFG, FSM, Petri-net, and UML.

UNIT 2 EMBEDDED SYSTEM DESIGN REQUIREMENTS 9 Hrs.

Embedded C-programming concepts, Basic embedded C programs/applications for ARM-v7, Interfacing and Integration of microcontroller-based systems, communication protocols like SPI, SCI (RS232, RS485), I2C, CAN, USB (v2.0), fundamentals of wireless networks for embedded system - Bluetooth, Zig-Bee. Examples of Industrial process automation, software development using python, Introduction to Linux OS, Rapid prototyping using low-cost hardware (STM32 discovery board, Raspberry Pi)

UNIT 3 EMBEDDED SOFTWARE DESIGN 9 Hrs.

Embedded software, Embedded system architectures: state of the art and practice, Typical System on Chip (SOC) components., SOC architectures, Embedded system's Codesign methodologies: state of the art and practice, Aspect-oriented Codesign, Model-driven Codesign, Web-based Codesign, Cloud Codesign, FCodesign: formal Codesign, PCodesign: prototypic Codesign.

UNIT 4 INTELLIGENT EMBEDDED SOFTWARE DESIGN FLOW 9 Hrs.

Conventional Codesign flow, Embedded software synthesis flow. IP-based Codesign, Platform-based Codesign, Design pattern- based Codesign, IDE-based Codesign, Codesign for reuse, Conventional Codesign flow, Embedded software synthesis flow. IP- based Codesign, Platform-based Codesign, Design pattern-based Codesign, IDE-based Codesign, Codesign for reuse.

UNIT 5 INTELLIGENT EMBEDDED SYSTEMS 9 Hrs.

Intelligent embedded systems, Intelligent embedded system features, intelligent embedded software, Adaptable embedded software flow, application of AI in the field of ES Codesign, Expert systems, neural networks and fuzzy logic, Multiagent systems, Ontologies, Nature/bioinspired approaches Constraint satisfaction, Logic programming, Hybrid models, Organic computing, generic OC system architecture. IA-based Codesign flow for intelligent embedded systems, Embedded computing vs. intelligent computing, IA-based IES Co-design, Challenges and perspectives

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the terminologies and characteristics of basic embedded systems
CO2 - Apply modelling and programming concepts for embedded product development
CO3 - Examine different interfacing techniques to communication with embedded hardware
CO4 - Investigate case studies in industrial embedded systems
CO5 - Create an intelligent embedded system for Industrial applications
CO6 - Apply embedded system solution to real world problems

TEXT / REFERENCE BOOKS

1. Jonathan Valvano, "Embedded Systems: Introduction to ARM® Cortex™-M Microcontrollers", Fourth Edition, Create Space Publishing, 2013.
2. Fateh Boutekkouk, RidhaMahalaine, Zina Mecibah, SalihaLakhdari, RamissaDjouani and DjalilaBelkebir, Intelligent
3. Embedded Software: New Perspectives and Challenges.
4. K.V. Shibu, "Introduction to Embedded Systems", McGraw Hill Education, 2009
5. Edward A. Lee, and Sanjit A. Seshia, "Introduction to Embedded Systems- A Cyber Physical Systems Approach",
6. Second Edition, 2015.
7. Jeff C. Jensen, Edward A. Lee, and Sanjit A. Seshia, "An Introductory Lab in Embedded and Cyber-Physical Systems",
8. First sys Edition, 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**

SCSB3642	INTELLIGENT ROBOTS AND DRONE TECHNOLOGY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To explore the knowledge of intelligent robots.
- To explore the mechanism of drone technology.
- To understand the various applications of drones in real world.

UNIT 1 INTRODUCTION 9 Hrs.

Overview of robotics - Robotics in AI - Embedded Systems – Agent Task Environment model-Embodied Systems - Sensors and signal processing - Planning approaches to robot control: STRIPS and SHAKEY-Robot manipulator kinematics.

UNIT 2 APPROACHES 9 Hrs.

Control Theory: Feedback, feed forward and open loop control - Linear first order lag processes - Limitations of control theory- Probability Based Approaches: Markov Decision Processes (MDPs) - Navigation - Behaviour-Based Control: The subsumption architecture - Hybrid architectures - Formalising behavior based control (SMDPs) - Adaptive approaches to robot control- Reinforcement learning for control- Model Based learning approaches to control- Learning maps - Evolutionary approaches.

UNIT 3 DRONE TECHNOLOGY 9 Hrs.

Drone Concepts - Terminologies - History of drone - Types of current generation of drones based on their method of propulsion - Drone design and fabrication: Classifications of the UAV - Overview of the main drone parts technical characteristics of the parts Function of the component parts.

UNIT 4 DRONE PROGRAMMING 9 Hrs.

Drones' configurations The methods of programming drone Download program Install program on computer Running Programs Multirotor stabilization Flight modes - Drone flying and operation: Concept of operation for drone Flight modes - Drone accessories - Sensors - Onboard storage capacity Removable storage devices Linked mobile devices and applications.

UNIT 5 DRONE MAINTENANCE 9 Hrs.

Drone commercial applications: Drones in agriculture - Drones in inspection of transmission lines and power distribution - Drones in filming and panoramic picturing - Future of drones : Miniaturization of drones - Increasing autonomy of drones - The use of drones in swarms.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - To understand the basics behind robotics and embedded system
CO2 - To learn basic approaches behind robotic controls
CO3 - To list out different terminologies and concept behind drone
CO4 - To design and develop programs for drone movement and configuration
CO5 - To apply drone technology for various commercial applications
CO6 - To develop drones for real time societal needs

TEXT / REFERENCE BOOKS

1. Nitin Goyal, Sharad Sharma, Arun Kumar Rana, Suman Lata Tripathi, Internet of Things Robotic and Drone Technology, CRC Press, 2021.
2. Neil Wilkins, Robotics: What Beginners Need to Know about Robotic Process Automation, Mobile Robots, Artificial Intelligence, Machine Learning, Autonomous Vehicles, Speech Recognition, Drones, and Our Future, Independently Published ,2019.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

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

COURSE OBJECTIVES

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

UNIT 1 UNRSTANDING THE THREAT FROM CYBER CRIME 9 Hrs.

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

UNIT 2 RESPONDING TO CYBER CRIME 9 Hrs.

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

UNIT 3 INVESTIGATING CYBER CRIME 9 Hrs.

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

UNIT 4 DIGITAL FORENSICS 9 Hrs.

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

UNIT 5 CASE STUDY 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Infer the various ideas about cybercrime.
CO2 - Describe the Cyber Crime Strategy.
CO3 - Identify the Cyber Crime Investigation Methodology.
CO4 - Generalize the knowledge on Digital Forensics.
CO5 - Apply the Concepts of Cyber Crime and Digital Forensics in Real Time Scenarios

TEXT / REFERENCE BOOKS

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

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

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 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**

SCSB3644	INDUSTRIAL ROBOTICS AND EXPERT SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Understand the basics of robotics and Automation Systems.
- Learn the robot cell design, Robot Configuration and robot programming.
- Understand the application of artificial intelligence and expert systems in robotics.

UNIT 1 INTRODUCTION AND ROBOTIC KINEMATICS 9 Hrs.

Definition need and scope of industrial robots - Coordinate Systems Classification of Robot- Robot anatomy - work volume - Precision movement – End effectors - sensors. Robot kinematics – Basics about plane rotation – rotation matrix - Direct and inverse kinematics - Robot trajectories-Control of robot manipulators - Robot dynamics - Methods for orientation and location of objects. Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load.

UNIT 2 ROBOT DRIVES AND CONTROL 9 Hrs.

Controlling the robot motion - Position and velocity sensing devices - Design of drive systems - Hydraulic and Pneumatic drives - D.C. Servo Motors, Stepper Motors, A.C. Servo Motors Linear and rotary actuators and control valves –Electro hydraulic servo valves, electric drives – Motors – Selection of Drives- designing of end effectors - Vacuum, magnetic and air operated grippers.

UNIT 3 ROBOT PATH PLANNING AND IMAGE PROCESSING 9 Hrs.

Introduction-Path planning overview- Road map path planning- Cell decomposition path planning-Potential field path planning-Obstacle avoidance- Robotic vision system - Image Gripping - Image processing and analysis - Image segmentation – Pattern recognition - Training of vision system.

UNIT 4 ROBOT CELL DESIGN AND FIELD ROBOTS 9 Hrs.

Robot work cell design and control - Safety in Robotics - Robot cell layouts - Multiple robots and machine interference - Robot cycle time analysis - Ariel robots- Collision avoidance-Robots for agriculture, mining, exploration, underwater, civilian and military applications, nuclear applications, Space applications.

UNIT 5 ROBOT PROGRAMMING, ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS 9 Hrs.

Methods of robot programming - characteristics of task level languages lead through programming methods-Motion interpolation. Artificial intelligence - Basics - Goals of artificial Intelligence - AI techniques – problems representation in AI - Problem reduction and solution techniques - Application of AI. Elements of Knowledge Representation - Logic, Production Systems, Semantic Networks, Expert Systems Knowledge Building Environment Systems (KBES)-Humanoids.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Recall fundamental Concepts of Robots and Kinematics.
CO2 - Implement Drives concepts in End effectors.
CO3 - Analyze and design Path planning and Image processing.
CO4 - Design robot work cell for automation industries.
CO5 - Apply the knowledge about robot programming methods.
CO6 - Apply the concepts of AI and expert systems.

TEXT / REFERENCE BOOKS

1. K.S.Fu, R.CGonzalez and C.S.G. Lee, Robotics control, Sensing, Vision and intelligence", McGraw Hill,1994.
2. Kozyrey, Yu, "Industrial Robotics", MIR Publishers Moscow, 1998.
3. Richard.D.,Klafter, Thomas.A, Chmielewski, Machine Negin "Robotics Engineering-An Integrated Approach", Prentice Hall of India, 1984.
4. Deb, S.R. "Robotics Technology and Flexible Automation", Tata McGraw Hill, 1994.
5. Mikell,P.Groover, Mitchell Weis, Roger N.Nagel, Nicholas Odrey "Industrial Robotics Technology, Programming and Applications", McGraw Hill, Int., 1986.
6. Timothy Jordonidesetal,"Expert Systems and Robotics", Springer-Verlag, New York, May 1991.

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**

SCSB3615	INTRODUCTION TO VIRTUAL REALITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To make students to know the basic concepts and framework in virtual reality. To teach students the principles and multidisciplinary features in virtual reality.
- To teach students the technology for multimodal user interaction and perception in VR, in particular the visual, audial and haptic interface and behavior.
- To teach students the technology for managing large scale VR environment in real time.
- To provide students with an introduction to the VR system framework and development tools.

UNIT 1 INTRODUCTION OF VIRTUAL REALITY 9 Hrs.

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

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

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

UNIT 3 VISUAL COMPUTATION IN VIRTUAL REALITY 9 Hrs.

Fundamentals of Computer Graphics-Software and Hardware Technology on Stereoscopic Display-Advanced Techniques in CG: Management of Large-Scale Environments & Real Time Rendering - Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development ToolsinVR.X3DStandard;Vega,MultiGen,Virtoolsetc.

UNIT 4 DECODING HARDWARE: METRICS AND DISPLAY 9 Hrs.

Metrics: update rate – refresh rate – latency hardware devices: PC – Supercomputer – workstation – Motion Tracking: Mechanical – Optical – Ultrasonic – Electromagnetic – Active Infrared – Inertial – Input type : Manual operation and Automatic tracking Input Devices: 3D Mouse – Gloves – Trackpads – Body suits – Joystick – Tracking Balls – Output devices: Force Feedback Sensors – Haptic interface – Glasses: Shutter glasses – Display: 3D Screen – HMD – BOOM – Retinal Displays – Panoramic Screen – Virtual Table – CAVE.

UNIT 5 APPLICATION OF VR IN DIGITAL ENTERTAINMENT 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Design and implement the VR system.
CO2 - Apply visual computation in a virtual environment.
CO3 - Analyze and design the framework in VR using various software development tools in VR.
CO4 - Design the multi modal user interface.
CO5 - Describe the principles and features of VR.
CO6 - Recognize the technologies used to manage the large-scale VR environment in real time.

TEXT / REFERENCE BOOKS

1. Sherman, William R.and Alan B.Craig. Understanding Virtual Reality Interface, Application, and Design,MorganKaufmann,20
2. Fei GAO.DesignandDevelopmentofVirtualRealityApplicationSystem,Tsinghua Press,March2012.
3. GuangranLIU.VirtualRealityTechnology,TsinghuaPress,Jan.2011.
4. Burdea, G.C. and P. Coffet. Virtual RealityTechnology,SecondEdition.Wiley-IEEEPress,2003/2006.

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**

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

COURSE OBJECTIVES

COURSE OBJECTIVES

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

UNIT 1 INTRODUCTION TO UI 9 Hrs.

What is User Interface Design (UI) -Relationship between UI and UX , Roles in UI/UX, A brief historical Overview of interface design, Interface conventions, Approaches to screen based UI, Template vs Content, Formal elements of interface design, Active elements of interface design, Composing the elements of interface design, UI design process, Visual communication design component in interface design.

UNIT 2 INTRODUCTION TO UX 9 Hrs.

UX Basics - Foundation of UX design - Good and poor design - Understanding your users - Designing the experience - Elements of user experience - Visual design principles - Functional layout - Interaction design - Introduction to the interface - Navigation design - User testing -Developing and releasing your design.

UNIT 3 WIREFRAMING FOR UI DESIGNERS 9 Hrs.

Wire framing - Why and how to create wireframes - Issues to solve steps in creating a wireframe Designing on a Grid System (like Bootstrap) - Get critiques incorporate feedback and improve your designs - Wireframe to refined design iterate and refine - Understanding the mobile experience.

UNIT 4 UI OR VISUAL DESIGN CONCEPTS 9 Hrs.

Color Harmonies - Creating contrast with color guidelines for proper color usage - Typography and Fonts Display Text (Such as Headings) versus Body Text Legibility Type Trends Typeface Selection and Pairing Where to Get Web Fonts Ideal Line Height Column Width (Line Length) Hyphenation and Justification Design Elements Proximity Similarity Continuity.

UNIT5 THE BUSINESS OF UX and UI DESIGN 9 Hrs.

UX and UI design industry getting into the business - Strategies and ideas - Resources - Creating your portfolio website - Examples of UX and UI portfolio websites - What you should include on your portfolio website - Get 1-on-1 feedback on your case studies and portfolio website -Resume development what you should include on your resume - Get 1-on-1 feedback on your resume.

Max. 45 Hrs.

COURSE OUTCOMES

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

CO1 - Understand the definition and principles of UI/UX Design in order to design with intention.
CO2 - Achieve a deep understanding of the entire life cycle of design—the process, purpose, and tools.
CO3 - Discover the industry-standard tools and specific project deliverables in UI/UX.
CO4 - Explain why you made design decisions, through presentations of assignments.
CO5 - Apply the user Interfaces to different devices and requirements,
CO6 - Create high quality professional documents and artifacts related to the design process.

TEXT / REFERENCE BOOKS

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

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

SCSB1451	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To present the mathematical, statistical and computational basis of neural networks.
- To study the concepts of deep learning.
- To introduce dimensionality reduction techniques.
- To enable the students to know deep learning techniques to support real-time applications.
- To examine the case studies of deep learning techniques.

UNIT 1 INTRODUCTION 9 Hrs.

Introduction to machine learning - Linear models (SVMs and Perceptrons, logistic regression) - Intro to Neural Nets: What a shallow network computes - Training a network: loss functions, back propagation and stochastic gradient descent - Neural networks as universal function approximates.

UNIT 2 DEEP NETWORK 9 Hrs.

History of Deep Learning - A Probabilistic Theory of Deep Learning - Backpropagation and regularization, batch normalization - VC Dimension and Neural Nets -Deep Vs Shallow Networks - Convolutional Networks - Generative Adversarial Networks (GAN), Semi-supervised Learning.

UNIT 3 DIMENTIONALITY REDUCTION 9 Hrs.

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet – Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization.

UNIT 4 OPTIMIZATION AND GENERALIZATION 9 Hrs.

Optimization in deep learning – Non-convex optimization for deep networks - Stochastic Optimization - Generalization in neural networks - Spatial Transformer Networks - Recurrent networks, LSTM - Recurrent Neural Network Language Models - Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

UNIT 5 CASE STUDY AND APPLICATIONS 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand basics of deep learning.
CO2 - Implement various deep learning models.
CO3 - Realign high dimensional data using reduction techniques.
CO4 - Analyze optimization and generalization in deep learning.
CO5 - Explore the deep learning applications.
CO6 - Design and creation of data models.

TEXT / REFERENCE BOOKS

1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2. Deng and Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
3. Ian Good fellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

SECB3016	PATTERN RECOGNITION AND IMAGE VISION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To comprehend the concepts of pattern recognition.
- To study the various methodologies of object detection in pattern recognition.
- To study the various classifiers like fuzzy and neural classifier.

UNIT 1 OBJECT RECOGNITION 9 Hrs.

Introduction to pattern recognition - types of images - regular pattern - irregular pattern - fuzzy methods. Statistical pattern recognition - feature selection - syntactic pattern recognition - clustering and non supervised learning methods.

UNIT 2 OBJECT DETECTION METHODOLOGIES 9 Hrs.

Combined detection method - edge detection - edge linking - gradient. Laplacian - line detection -, method based - point detection - snake methods. Boundary description detection – matching - merges segmentation – smoothing - splitting of boundaries syntactic -analysis of region boundaries -, study of shape by region analysis.

UNIT 3 FUZZY LOGIC IN PATTERN ANALYSIS 9 Hrs.

Explanation of how fuzzy approach can be applied to pattern recognition - classificatory analysis preprocessing - feature detection and primitive extraction - adaptive classification of fuzzy grammar. Algorithms for pattern recognition - neural network fundamentals - approaches for pattern recognition.

UNIT 4 IMAGE EXTRACTION CONCEPTS 9 Hrs.

Introduction of Computer Vision - Computer Imaging System - Image Formation and sensing CVIP tools Software - Image representation. Area Extraction: Concepts - Data-structures - Edge - Line- Linking - Hough transform - Line fitting - Curve fitting.

UNIT 5 BOUNDARY ANALYSIS AND MATCHING 9 Hrs.

Region Analysis: Region properties - External points - spatial moments - mixed spatial gray-level moments - Boundary analysis: Signature properties - Shape numbers. General Frame Works for Matching: Distance relational approach - Ordered- structural matching - View class matching - Models database organization. Knowledge Based Vision: Knowledge representation - Control strategies - Information integration - Application.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Study the concepts of pattern recognition.
CO2 - Understand the various methodologies of object detection in pattern recognition.
CO3 - Acquire knowledge about pattern classifications.
CO4 - Study and compare the various classifiers like fuzzy and neural classifiers.
CO5 - Predict the concept of image extraction through computer vision and boundary analysis.
CO6 - Analyse different region and boundary and different matching techniques.

TEXT / REFERENCE BOOKS

1. Dude, Hart and Stock, "Pattern Classification", John Wiley and Sons, 2nd Edition, 2001.
2. Gose, Johnsonbaugh and Jost, "Pattern Recognition and Image Analysis", Prentice Hall, Har/Dsk Edition, 1996.
3. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis and Machine Vision", 2007.
4. Robert Haralick and Linda Shapiro, "Computer and Robot Vision", Vol.I, II, Addison-Wesley, 1993.

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**

SCSB3741	HARDWARE INTERFACES AND ITS APPLICATIONS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the components on the motherboard
- To understand different storage media
- Install and Repair computer system
- Install Network devices, configuration, optimization
- Understand the features of different I/O peripheral devices and their interfaces.

UNIT 1 INTRODUCTION TO PC AND MEMORY 9 Hrs.

Evolution of Personal Computers - Overview of Systems and Components - Processor Modes - Modern CPU Concepts - Architectural Performance Features - Intel Core X-Series Processor - CPU Over Clocking - Essential Memory Concepts - Memory Packages - Logical Memory Organizations - Memory Considerations - Memory Types - SSD - OPTANE Memory - Memory Techniques - Selecting and Installing Memory - CPU Coolers.

UNIT 2 MOTHERBOARD DESIGNS 9 Hrs.

Motherboard Form Factors - IBM PC XT -IBM PC AT - The Baby AT - Micro-AT -LPX and Mini-LPX - ATX – Mini - ATX - NLX - Active Motherboards - Sockets and Expansion Slots - DIMM.2 - M.2 Expansion Card – PCIE GEN3 M.2 - Intel D850GB - Upgrading a Mother Board - DDR4 BOOST - Chipsets - Intel - Non-Intel Chipsets - North Bridge - South Bridge - CMOS - Motherboard BIOS - RGB Headers - Live Dash OLED - NEXT GEN Connectivity 802.11 AD WIFI - USB 3.1 GEN2 Controller.

UNIT 3 POWER SUPPLIES AND STORAGE DEVICES 9 Hrs.

Power Supplies and Power Management - Modular - Non-Modular - Concepts of Switching Regulation - Potential Power Problems - Power Management -The Floppy Drive - Magnetic Storage - Floppy Drive - Hard Drive - SSD- CD-ROM Drive - DVD-ROM - DVD Media - DVD Drive and Decoder.

UNIT 4 I/O PERIPHERALS AND BUS ARCHITECTURE 9 Hrs.

Parallel Port - Signals and Timing Diagram - IEEE1284 Modes - Asynchronous Communication - Serial Port Signals - Video Adapters - Mice - Keyboards - Sound Cards - ISA - PCI - AGP.

UNIT 5 NETWORK COMPONENTS 9 Hrs.

Introduction of Network Cable - Ethernet Cable - FIBER Optics – HUB - Unmanageable Switch - Manageable Switch – Router – Modem - Wi-Fi - Access Point - PCI Wireless Card - USB Wireless Device - Print Server.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Explain the relationship between hardware and software
CO2 - Classify and explain the function of different computer hardware components
CO3 - Understand purpose and functions of networking
CO4 - Understand the purpose and functions of the computer peripherals
CO5 - Understand diagnostic procedures and troubleshooting techniques to operating systems.
CO6 - Understand troubleshooting techniques to personal computers, portable devices and computer peripherals.

TEXT / REFERENCE BOOKS

1. Stephen J Bigelow, “Trouble Shooting, maintaining and Repairing PCs”, Tata McGraw-Hill.
2. Ron Gilster, “PC Hardware: A Beginner's Guide”, Tata McGraw-Hill.
3. Craig Zacker and John Rourke, “The complete reference: PC hardware”, Tata McGraw-Hill.
4. Mike Meyers, “Introduction to PC Hardware and Troubleshooting”, Tata McGraw-Hill.
5. B.Govindarajulu, “IBM PC and Clones hardware trouble shooting and maintenance”, Tata McGraw-Hill

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	SYSTEM MODELING AND SIMULATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

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

.

UNIT 1 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 .

UNIT 2 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.

UNIT 3 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 - Implement numerical 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. Geoffrey Gordon, “System Simulation”, Second Edition, PHI, 2006 .
2. Frank L. Severance, “System Modeling and Simulation”, Wiley, 2001.
3. Averill M. Law and W. David Kelton, “Simulation Modeling and Analysis, Third Edition,McGraw Hill, 2006.
4. Sheldon M. Ross: Introduction to Probability Models 7th 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 practices 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 experience 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 SPublishers; 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**

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 development 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”, A press, 2013.
6. Henry Lee, Eugene Chuvyrov, “, Beginning Windows Phone App Development”, Apress 2012.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

SCSB3862	UNMANNED AERIAL VEHICLE DESIGN	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce the concepts of applying aerodynamics to UAV Design.
- To familiarize the student's ability to analyse the concepts of Avionics.
- To understand the basics of navigation in UAV Design.
- To understand the basics of Image Processing.

UNIT 1 INTRODUCTION TO UAV 9 Hrs.

History of UAV – classification – basic terminology - The Systemic Basis of UAV - System Composition - Conceptual Phase - Preliminary Design - Selection of the System - Some Applications of UAV - Characteristics Of Aircraft Types.

UNIT 2 BASICS OF AERODYNAMICS AND AIRFRAME CHARACERTICTICS OF UAV 9 Hrs.

Lift-induced Drag - Parasitic Drag - Rotary-wing Aerodynamics - Response to Air Turbulence - Airframe – dynamics – modelling - structures – wing design - engines types - equipment maintenance and management - control surfaces - specifications.

UNIT 3 AVIONICS HARDWARE 9 Hrs.

Geysering Phenomenon. Autopilot – AGL - pressure sensors – servos - accelerometer – gyros – actuators - power supply processor, integration, installation, configuration, and testing.

UNIT 4 COMMUNICATION PAYLOADS, CONTROLS AND NAVIGATION 9 Hrs.

Payloads –Telemetry –tracking - Aerial photography – controls - PID feedback - radio control frequency, range –SAS - flight director - commands and videos - elements of control loops - flight computer, - Sensors - Waypoints navigation.

UNIT 5 DIGITAL IMAGE PROCESSING FOR UAV 9 Hrs.

Principles of digital aerial photography- Sensors for aerial photography - Photo-interpretation, objective analysis and image quality - Image Recognition - Image Classification – Image Fusion – Colour Image Processing - Video Motion Analysis.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the working principles of Unmanned Aerial Vehicle.
CO2 - Comprehend the sound foundation in the Aerodynamics and Airframe characteristics.
CO3 - Learn the operation of Avionics Hardware.
CO4 - Understand the concept of Communication payloads.
CO5 - Understand the principle and performance of control and navigation.
CO6 - Applying the importance of Digital image processing for UAV.

TEXT / REFERENCE BOOKS

1. Kimon P. Valavanis, George J. Vachtsevanos, " Handbook of Unmanned Aerial Vehicles " Volume Set- FIRST Edition, ISBN-13: 978- 9048197064, 2015.
2. R. Jha. "Theory, Design, and Applications of Unmanned Aerial Vehicles".1st Edition, 2015.
3. Jane's Unmanned Aerial Vehicles and Targets, Jane' s Information Group; ASIN: 071 061 2575,1999.
4. Alex Elliott,"Build Your Own Drone Manual: The practical guide to safely building, operating and maintaining an Unmanned Aerial Vehicle (UAV)".2016.
5. R. Said and H. Chayeb, "Power supply system for UAV", KTH, 2002.
6. Robert C. Nelson, Flight Stability and Automatic Control, McGraw -Hill, Inc, 1998.
7. Skafidas, "Microcontroller Systems for a UAV", KTH, TRITA-FYS 2002:51 ISSN 0280-316 X.34, 2002.
8. Kimon P. Valavanis, "Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy", Springer,2007.

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**

SCSB3863	ROBOTICS AND MACHINE VISION SYSTEM	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce the robotic concepts, parts and various types of robots.
- To make the students familiar with sensors, drive systems for robot and their applications in robots, programming of robots.
- To understand the various applications of robots, justification, implementation and safety of robot.

UNIT 1 BASICS OF ROBOTICS 9 Hrs.

Introduction - Anatomy of Robot - Laws of robotics - Configurations of robot - work volume - Spatial resolution – accuracy - resolution – repeatability of robot-Drive Systems of Robot - Control system of Robot -: Robot motions Rotary to rotary motion, Rotary to linear motion, Harmonics drives - Robotic sensors and actuators - control systems - Robot actuation and feedback components - Power transmission system.

UNIT 2 ROBOT END EFFECTORS 9 Hrs.

Robot End effectors: Types of End effectors - Mechanical gripper - types of gripper mechanism - gripper force analysis - other types of gripper - special purpose grippers –Tools - Selection and design of Grippers.

UNIT 3 ROBOT MECHANICS 9 Hrs.

Robot kinematics: Introduction - Position representation - rigid motion & homogeneous transformation forward & inverse kinematics - trajectory planning - Wrist Orientation - Manipulator path control. Robot Dynamics: Robot Arm dynamics – Lagrange - Euler formulation - Newton - Euler formulation.

UNIT 4 MACHINE VISION SYSTEM 9 Hrs.

Machine vision:- Sensing and Digitizing - Imaging Devices - Lighting Techniques - AD Converter - Image Processing - Date reduction-segmentation- Thresholding - Region Growing - Edge Detection - Feature extraction - Object recognition – Applications – Inspection – identification - visual servicing and navigation -Training the vision.

UNIT 5 ROBOT PROGRAMMING 9 Hrs.

Robot programming: Types - Methods of Defining Position - Motion Interpolation – Commands - Branching-Robot Languages - Classification of robot language - Computer control and robot software - Val system and Languages - application of robots.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the basic concepts of Robotics.
CO2 - Educate the various types of End effectors used in robots for various applications.
CO3 - Introduce the position representation on work space.
CO4 - Understand machine vision system and its applications.
CO5 - Impart knowledge on robot programming language and to educate how to program a robot.
CO6 - Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics.

TEXT / REFERENCE BOOKS

1. M.P.Groover, M.Weiss ,R.N. Nagal, N.G.Odrey, "Industrial Robotics - Technology, programming and Applications"Tata, McGraw-Hill Education Pvt Limited, 2010.
2. Sathya Ranjan Deb, "Robotics Technology & flexible Automation" 6th Edition, Tata McGraw- Hill Publication, 2013.
3. K.S.Fu, R.C.Gonzalez, C.S.G.Lee, "Robotics: Sensing, Vision & Intelligence", Tata McGraw- Hill Publication, 2009.
4. John.J.Craig, "Introduction to Robotics: Mechanics & Control", 2nd Edition, 2012.
5. Jazar, "Theory of Applied Robotics: Kinematics, Dynamics and Control", Springer, Indian Reprint, 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**

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

COURSE OBJECTIVES

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

UNIT 1 INTRODUCTION TO INDUSTRY 4.0 AND CYBER PHYSICAL SYSTEM 9 Hrs.

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

UNIT 2 EMBEDDED SYSTEMS MODELING AND DESIGN AND CPS 9 Hrs.

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

UNIT 3 SENSORS, ACTUATORS AND SENSOR NETWORKS 9 Hrs.

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

UNIT 4 SECURITY OF CYBER PHYSICAL SYSTEMS 9 Hrs.

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

UNIT 5 CYBER-PHYSICAL SYSTEMS CASE STUDIES AND PROJECTS 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

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

TEXT / REFERENCE BOOKS

1. "Industry 4.0: The Industrial Internet of Things", Alasdair Gilchrist (Apress)
2. "Industrial Internet of Things: Cyber manufacturing Systems" Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer)
3. Edward A. Lee and Sanjit A. Seshia, Introduction to Embedded Systems, A Cyber-Physical Systems Approach, Second Edition, http://LeeSeshia.org, ISBN 978-1-312-42740-2, 2015.
4. Rajeev Alur. Principles of Cyber-Physical Systems. MIT Press. 2015.
5. K. J. Astrom and R. M. Murray. Feedback Systems: An Introduction for Scientists and Engineers. Prince- ton University Press, 2009. http://www.cds.caltech.edu/~murray/amwiki/index.php/Main_Page.
6. Sajal Das, Krishna Kant, and Nan Zhang, Securing Cyber-Physical Critical Infrastructure – Foundations and Challenges, Morgan Kaufmann, 2012.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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

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 KNOWLEDGE MANAGEMENT 9 Hrs.

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

UNIT 2 KNOWLEDGE MANAGEMENT SYSTEM 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 – Consensus Decision Making–Repertory Grid-Concept Mapping–Black boarding.

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**

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 - Ad-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 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**

SCSB3818	PERFORMANCE EVALUATION OF COMPUTERS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain in depth knowledge of fundamentals of performance Evaluation of Computers.
- To discuss appropriate evaluation techniques - performance metrics and workloads for a system field.

UNIT 1 INTRODUCTION AND BASIC CONCEPTS 9 Hrs.

Background - Performance Evaluation Viewpoints and Concepts - Goals of Performance Evaluation - Applications of Performance Evaluation – Techniques - Metrics of Performance - Workload characterization - Benchmarking.

UNIT 2 PROBABILITY THEORY REVIEW 9 Hrs.

Basic Concepts on Probability Theory - Sample Space and Events - Conditional Probability and Independence - Mean and Median use - Geometric - and Harmonic Mean - Variance - and Standard Deviation - Random Variables - Expectation and Variance - Density and Distribution Functions - Comparing Systems Using Sample Data - Regression Models.

UNIT 3 MEASUREMENT/TESTING TECHNIQUE 9 Hrs.

Event and Measurement Strategies - Event Tracing - Hardware Monitor - Software Monitors. Hybrid Monitors - Traffic Issues and Solutions - Accounting Logs. Benchmarking and Capacity Planning-Types of Benchmark Programs -Common Mistakes in Benchmarking - Example Benchmark Programs - Procedures of Capacity planning - Problems in Capacity Planning.

UNIT 4 DATA REPRESENTATION AND GAME RATIO 9 Hrs.

Guidelines for Preparing Plots - Charts Used for Data Presentation - Program Profiling - Common Mistakes in Charts Construction - Errors in Experimental Measurements.

UNIT 5 BASICS OF QUEUEING THEORY AND QUEUEING NETWORKS 9 Hrs.

Introduction - Queueing Modelling Notations - Rules for all Queues - Single-Queue - Single (M/M/ 1) System - Single-Queue - Multiple Server (M/M/c) System - Other Queues - Little's Law. Queueing Networks- Definitions - Open Queueing Networks -Closed Queueing Networks - Product-Form Queueing Networks - Case Studies.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Develop both analytical and simulation modelling of computer systems.
CO2 - Compute probabilities.
CO3 - Infer properties of samples and associate confidence measures to sampled statistics.
CO4 - Extract the salient features from a sample and to present them.
CO5 - Follow a scientific approach to understanding.
CO6 - Recognize why the performance of a system varies with some fact.

TEXT / REFERENCE BOOKS

1. Raj Jain, The Art of Computer System Performance Analysis: Techniques for Experimental Design Measurements Simulation and Modelling, Wiley, (2015).
2. Mor Harchol-Balter, Performance Modelling and Design of Computer Systems, Cambridge, (2013).
3. Peter G. Harrison, Naresh M. Patel, Performance Modelling of Communication Networks and Computer Architectures, Addison-Wesley Longman, (1993).
4. K. S. Trivedi, Probability and Statistics with Reliability Queueing and Computer Science Applications, Wiley, (2001).

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 study the fundamental concepts of robotics and automation.
- To impart knowledge on various drive system, sensors & machine vision system.
- To learn the various manipulators, grippers as well as the various dynamic process.
- To acquire the concept of kinematics and inverse kinematics.
- To understand the programming and specific industrial applications.

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 DRIVES, SENSORS AND MACHINE VISION 9 Hrs.

Hydraulic, Pneumatic and Electric drives - Machine vision - Sensing - Range, Proximity, Position, Velocity, Acceleration, Tactile, Acoustic, Force, Torque, Optical & laser sensors. Machine vision - Introduction, Image acquisition, Illumination Techniques, Image conversion, Cameras, Image processing and analysis – Image data reduction – Segmentation feature extraction – Object recognition.

UNIT 3 ANIPULATORS, 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. Implementation of Robots in industries-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 - Summarize knowledge of basic concepts of robotic system.
CO2 - Analyze the function of sensors and machine vision system in the robot.
CO3 - Categorize the drives, manipulators and grippers.
CO4 - Develop the qualitative knowledge of. Robot dynamics and kinematics.
CO5 - Evaluate the recent trends and application of robotics in various fields.
CO6 - Propose the theoretical concepts through specific experimental tasks.

TEXT / REFERENCE BOOKS

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., “Industrial Robotics”, McGraw-Hill Singapore, 1996.
2. Ghosh, “Control in Robotics and Automation: Sensor Based Integration”, Allied Publishers, Chennai, 1998.
3. Asfahl C.R., “Robots and Manufacturing Automation”, John Wiley, USA 1992.
4. Klafter R.D., Chimielewski T.A., Negin M., “Robotic Engineering - An integrated approach”, Prentice Hall of India, New Delhi, 1994.
5. M.P.Groover, “Industrial Robotics – Technology, Programming and Applications”, TATA McGraw-Hill Publishing Company, New Delhi,2008.
6. Mc Kerrow P.J. “Introduction to Robotics”, Addison Wesley, USA, 1991.
7. Fu K.S. Gonzaleaz R.C. and Lee C.S.G., "Robotics Control Sensing, Vision and Intelligence" McGraw Hill International Editions, 1987.
8. Janakiraman.P.A., ―Robotics and Image Processing", Tata McGraw-Hill, 1995.
9. Deb S.R,” Robotics Technology and Flexible Automation”, Tata McGraw Hill, New Delhi, 1994

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**

SCSB3820	DIGITAL TRANSFORMATION AND FUTURE SOCIETIES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

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

UNIT 1 INTRODUCTION TO SOCIETY 5.0 9 Hrs.

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

UNIT 2 EMERGING TECHNOLOGIES WITH SOCIETY 5.0 9 Hrs.

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

UNIT 3 INTRODUCTION TO INDUSTRY 4.0 9 Hrs.

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

UNIT 4 CHALLENGES AND TECHNOLOGIESTOWARDS SOCIETY 5.0 9 Hrs.

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

UNIT 5 INNOVATION WITH FUTURE TRENDS WITH APPLICATIONS 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the Social Problems by A System That Highly Integrates Cyberspace and Physical space to solve.

CO2 - Get Skills for Economic Development and a Human-Centered Society That Balances Economic Advancement

CO3 - Achieve a High Degree of Convergence between Cyberspace (Virtual Space) and Physical Space (Real Space)

CO4 - Use of Emerging Technologies with Society 5.0 to Achieve More Production / Avoid Loss of Productions

CO5 - Internet and IoT, Big data for production lines to be adaptive, intelligent, and flexible enough to meet the updated requests.

CO6 - Design and apply in Health Care, Agriculture, Food Products, Disaster Prevention

TEXT / REFERENCE BOOKS

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

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PART A : 10 Questions of 2 marks each-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 the 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. Timothy J. Ross ," Fuzzy Logic with Engineering Applications", Wiley; 4 edition,2016
3. by Snehashish Chakraverty, Deepti Moyi Sahoo Nisha Rani Mahato," Concepts of Soft Computing: Fuzzy and ANN with programming, Springer; 1st ed. 2019 edition
4. S.R.Jang, C.T. Sun And E.Mizutani, "Neuro-Fuzzy And Soft Computing", PHI / Pearson Education 2004.
5. David E. Goldberg, "Genetic Algorithm In Search Optimization And Machine Learning" Pearson Education India, 2013.
6. Stuart J. Russel, Peter Norvig, "Artificial Intelligence A Modern Approach", 2nd Edition, Pearson Education, 2003.
7. Russell, " Artificial Intelligence : A Modern Approach", Pearson, 2015
8. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd., 2nd Edition, 2011.
9. 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**

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 EXAM QUESTION PAPER PATTERN

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

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

S41BPB41	VENTURE CREATION	L	T	P	EL	Credits	Total Marks
		2	0	0	3	3	100

COURSE OBJECTIVES

- To develop an entrepreneurial mindset, understand the concept of entrepreneurship and identify personal strengths and weaknesses
- To understand the design thinking process and apply design thinking to real-world problems
- To identify problems and opportunities and develop ideas for new ventures by assessing market potential
- To develop a value proposition, business model canvas, build MVP to create sustainable differentiation for the venture with a well-structured business plan, unit economics, go-to-market strategies and funding plan for managing business growth
- To build an idea pitch and deliver it with confidence to potential stakeholders

UNIT 1 INTRODUCTION TO ENTREPRENEURSHIP 9 Hrs.

Defining Entrepreneurship, evolution the concept & Emerging Trends in Entrepreneurship (Domain specific), Understanding the unique opportunities; Why be an Entrepreneur? Entrepreneurship in Indian Scenario & Its role in economic development; Success stories of Entrepreneur (Domain specific); Entrepreneurial style assessment tool; Developing the Entrepreneurial mindset- Attributes & skills, recognizing your sweet spot for starting up; Principles of Effectuation; Myths about Entrepreneurship; Types of Entrepreneurs; Entrepreneur vs Intrapreneur; Role of Entrepreneurial Teams.

UNIT 2 DESIGN THINKING AND OPPORTUNITY DISCOVERY 9 Hrs.

Introduction to Design Thinking for startups; Design Thinking principles & process; Define the problem using Design thinking principles and validate Problem; Generation of ideas, Idea generation techniques and evaluating creative ideas; Identify problem worth solving; Sharpen your Problem Pitch.

UNIT 3 CUSTOMER, MARKETS AND CREATING A SUSTAINABLE DIFFERENTIATION 9 Hrs.

Differentiate between a customer and a consumer; Who is your customer and what is your segment; Customer Job, Pains, and Gains using Value proposition Canvas; Build solution using Value Proposition Canvas; Market Estimation-TAM,SAM,SOM; Competitive analysis; Minimum viable product – what is MVP: Build - Measure - Learn, differentiate between solution Demo & MVP; How to validate MVP-Achieve a Product – Market fit.

UNIT 4 BUSINESS MODEL, BUSINESS PLANNING AND GO TO MARKET STRATEGIES 9 Hrs.

Introduction to Business model, Business plan ; Lean approach 9 block lean canvas model; Financial feasibility: Costs, revenue streams, Pricing, Financial Projections, Key Financial Metrics using financial template, Managing growth & targeting scale, Unit economics; Selecting the Right Channel; Introduction to Digital Marketing and tools; Branding strategy.

UNIT 5 FUNDING STRATEGY 9 Hrs.

Sources of funds: Debt & Equity ; Map the Start-up Lifecycle to Funding Options; Build an Investor ready pitch deck.

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 stakeholder

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 EXAM QUESTION PAPER PATTERN

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

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

SCSB4006	SOFTWARE PROJECT MANAGEMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the fundamental principles of software project management.
- To have a good knowledge of responsibilities of project manager.
- To be familiar with the different methods and techniques used for project management

UNIT 1 INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9 Hrs.

Introduction to Software Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Categorizing Software Projects, Project Evaluation and Programme Management, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programme Management, An Overview of Project Planning.

UNIT 2 SELECTION OF APPROPRIATE PROJECT APPROACH, EFFORT ESTIMATION 9 Hrs.

Selection of an Appropriate Project Approach, Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, Software Effort Estimation, Problems with Over and Under-Estimates, Software Effort Estimation Techniques, Bottom-up Estimation, Top-down Approach and Parametric Models, Expert Judgment, estimating by Analogy, COCOMO Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression.

UNIT 3 ACTIVITY PLANNING AND RISK MANAGEMENT 9 Hrs.

Activity Planning, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Risk Management, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Boehm's Top 10 Risks and Counter Measures, Resource Allocation, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost.

UNIT 4 MONITORING AND CONTROL 9 Hrs.

Monitoring and Control, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management, Managing Contracts, Managing People in Software 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 EXAM QUESTION PAPER PATTERN

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

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

SCSB1714	SMART PRODUCT DEVELOPMENT	L	T	P	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 NodeMCU and Location Tracker etc..,: New model technology development, Anbazhagan k, 2019 .

END SEMESTER EXAM QUESTION PAPER PATTERN

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

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