Scheme of Instruction & Examination
B. E. - Computer Science and Engineering

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P / D	Contact Hours / week	CIE	SEE	
CSE Semester - III									
Theory Courses									
1	3BS305HS	Probability & Statistics	3	1	0	4	40	60	4
2	3ES301EC	Switching Theory and Logic Design	3	0	0	3	40	60	3
3	3PC301CS	Database Management Systems	3	0	0	3	40	60	3
4	3PC302CS	Discrete Mathematics	3	0	0	3	40	60	3
5	3PC303CS	Computer Organization and Microprocessor	3	0	0	3	40	60	3
6	3MC302HS	Essence of Indian Traditional Knowledge	2	0	0	2	40	60	0
Practical / Laboratory Courses									
7	3PC351CS	Database Management Systems Lab	0	0	2	2	40	60	1
8	3PC352CS	Computer Organization and Microprocessor Lab	0	0	2	2	40	60	1
9	3PC353CS	Python Programming Lab	0	0	2*2	4	40	60	2
10	3PW354CS	Skill Development Course-I	0	0	2	2	40	60	1
		Total Credits				28	400	600	21

III SEMESTER

PROBABILITY & STATISTICS

	L	T	P	Credits
Semester III				
Subject code – 3BS305HS	3	1	0	4

Prerequisites: Basics of Differentiation, Integration and Trigonometric results.

Course Objectives:	Course Outcomes:
➢ Study the concepts of Probability and random variables ➢ To provide the knowledge of discrete probability Distributions ➢ To learn theoretical continuous probability distributions. ➢ To provide the knowledge of correlation and regression. ➢ To learn the concept of small sample tests and curve fitting	1. To understand concepts of probability and random variables 2. Apply various probability distributions to solve practical problems, to estimate unknown parameters of populations 3. Find Mean, variance, moment generating function and statistical parameters of continuous probability distributions 4. To perform a regression analysis and to compute and interpret the coefficient of correlation **5.** Evaluate t-distribution, F-distribution and chisquare distributions. Fitting of straight line, parabola and exponential curves.

UNIT I
Introduction of Probability, Conditional probability, Theorem of Total probability, Baye's Theorem and its applications, Random variables, Types of random variables, Probability mass function and Probability density function, Mathematical expectations.

UNIT II
Discrete probability distributions: Binomial and Poisson distributions, Mean, variance, moment generating function and evaluation of statistical parameters for these distributions, Moments, skewness and Kurtosis.

UNIT III
Continuous probability distributions, Uniform, Exponential and Normal distributions, Mean, variance, moment generating function and evaluation of statistical parameters for these distributions

UNIT IV
Correlation, regression and Rank correlation. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

UNIT V
t-Test for single mean, difference of means, f-test for ratio of variances, Chi-square test for goodness of fit and independence of attributes. Curve fitting by the method of least squares: fitting of straight lines, second degree parabolas and more general curves,

TEXT BOOKS

1. Dr.B.S. Grewal, Higher.EngineeringMathematics, KhannaPublicatins,43 Edition,2014. (unit 1-5)
2. Advance Engineering Mathematics by R.K.Jain and Iyengar,Fifth Edition, Narosa Puoblications (unit 1-5)
3. EngineeringMathematics,P.Sivaramakrishna Das & C. Vijaya Kumar,Pearson India Education Services Pvt.Ltd.

REFERENCE BOOKS

1. Fundamentals of Mathematical Statistics, S.C.Gupta & V.K.Kapoor, S.Chand Pub.
2. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968

DATABASE MANAGEMENT SYSTEMS

Semester III	**L**	**T**	**P**	**Credits**
Subject code – 3PC301CS	**3**	**0**	**0**	**3**

Prerequisites: Data Structures

Course Objectives:	**Course Outcomes**:
➤ To get familiar with fundamental concepts of database management which includes database design, database languages, and database-system implementation. ➤ To get familiar with data storage techniques and indexing. ➤ To impart knowledge in transaction Management, concurrency control techniques and recovery techniques. ➤ To master the basics of SQL and construct queries using SQL. ➤ To become familiar with database storage structures and access techniques	1. Develop the knowledge of fundamental concepts of database management and Designing a database using ER modelling approach. 2. Implement storage of data, indexing, and hashing. 3. Apply the knowledge about transaction management, concurrency control and recovery of database systems. 4. Ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data 5. Apply the knowledge to retrieve database from multiple table using Sql and Pl/sql

UNIT I

Introduction to Database and System Architecture: Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages- DDL and DML, Transaction Management, Database users and Administrators, Database System Structure. Introduction to Database Design: ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship set, Extended ER Features, Conceptual Design with the ER Model, Logical database Design.

UNIT II

SQL Queries and Constraints: SQL Data Definition, Types of SQL Commands, Form of Basic SQL Query, SQL Operators, Set Operators, , Aggregate Operators, NULL values ,Functions, Integrity Constraints Over Relations, Joins, Nested Queries, Introduction to Views, Destroying / Altering Tables and Views, PL/SQL Functions and Stored procedures ,Cursors, Triggers and Active Databases.

UNIT III

Relational Model: Introduction to Relational Model, Basic Structure, Database Schema, Keys, Relational Algebra and Relational Calculus. Storage and Indexing: File Organizations and

Indexing-Overview of Indexes, Types of Indexes, Index Data Structures, Tree structured Indexing, Hash based Indexing.

UNIT IV

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD, Normal Forms and Normalization: INF,2NF,3NF, BCNF,4NF,5NF, Properties of Decomposition

UNIT V

Transaction Management: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability. Concurrency Control: Lock based Protocols, Timestamp based protocols, Recovery System: Recovery and Atomicity, Log based recovery, Shadow Paging, Recovery with concurrent Transactions, Buffer Management.

TEXTBOOKS

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, III Edition, TATA McGraw Hill.
2. Data base System Concepts, Silberschatz, Korth, V Edition, McGraw Hill.
3. Introduction to Database Systems, C.J.Date Pearson Education.
4. Database Systems design, Implementation, and Management, Rob & Coronel ,V Edition.

REFERENCE BOOKS

1. Database Management System, ElmasriNavate, PearsonEducation.
2. Database   Management System, Mathew Leon,Leo

DISCRETE MATHEMATICS

Semester – III   **L   T   P   Credits**

Subject code -   3PC302CS   **3   0   0   3**

Course Objectives:	Course Outcomes:
➢ To understand the concepts of Logic, Rules of inference and Quantifiers ➢ To explain with examples, the basic terminology of functions, relations, and sets. ➢ To impart the knowledge on Groups, Normal subgroups, Rings and Field ➢ To relate the ideas of mathematical induction to recursion and recursively defined structures. ➢ To develop Graph Algorithms by using the concepts of Graphs and Trees	1. Apply mathematical logic to solve problems 2. Illustrate by examples the basic terminology of functions, relations, and sets and demonstrate knowledge of their associated operations. 3. Identify structures of algebraic nature and apply basic counting techniques to solve combinatorial problems. 4. Formulate problems and solve recurrence relations. 5. Apply Graph Theory in solving computer science problems

UNIT I
Mathematical Logic: Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers.
Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving

UNIT II
Set Theory and Relations: Basic Concepts of Set Theory, Relations and Ordering, Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations Hasse Diagram.
Functions: Composition of functions, Inverse Functions, Recursive Functions, Lattice and its Properties

UNIT III
Algebraic structures: Algebraic Systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism, Fields, Rings, Integral domains
Elementary Combinatorics: Basis of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion – Exclusion. Pigeon hole principles and its application.

UNIT IV
Recurrence Relations: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

UNIT V

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

TEXT BOOKS

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition.TMH
2. Elements of Discrete Mathematics- A Computer Oriented Approach- C L Liu, D P Mohapatra. Third Edition, Tata McGrawHill.
3. Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott, A. Kandel, T.P. Baker,Second Edition, PHI.

REFERENCE BOOKS

1. Discrete Mathematical Structures Theory and Application- Malik & Sen,First Edition,Cengage Learning.
2. Discrete Mathematics with Applications, Thomas Koshy, First Edition, Elsevier

COMPUTER ORGANIZATION AND MICROPROCESSOR

Semester III	L	T	P	Credits
Subject code – 3PC303CS	**3**	**0**	**0**	**3**

Course Objectives:	Course Outcomes:
➢ To explore the I/O organizations in depth. ➢ To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design. ➢ To be familiarized with the hardware components and concepts related to the memory organization. ➢ To be familiarized with the hardware components and concepts related to the input-output organization ➢ Understand the concepts and applications of Internet of Things ,Building blocks of Internet of Things and characteristics	1. Recall and apply a basic concept of block diagram of computer (CPU) with Microprocessor processor UNIT (MPU) 2. Understand the internal architecture and register organization of 8086 3. Apply knowledge and demonstrate programming proficiency using the various addressing modes and instruction sets of 8086 4. Identify and compare different methods for computer I/O mechanisms 5. Categorize memory organization and explain the function of each element of a memory hierarchy

UNIT I
Basic Computer Organization: Functions of CPU, I/O UNITs, Memory: Instruction: Instruction Formats- One address, two addresses, zero addresses and three addresses and comparison; addressing modes with numeric examples: Program Control- Status bit conditions, conditional branch instructions, Program Interrupts: Types of Interrupts

UNIT II
8086 CPU Pin Diagram: Special functions of general purpose registers, Segment register, concept of pipelining, 8086 Flag register, Addressing modes of 8086
Pipelining: Introduction, processors, performance, hazards, super scalar operations and performance considerations

UNIT III
8086-Instruction formats: assembly Language Programs involving branch & Call instructions, sorting, evaluation of arithmetic expressions.

UNIT IV
Input-Output Organizations I/O Vs Memory Bus, Isolated Vs Memory-Mapped I/O, Asynchronous data Transfer Techniques, Asynchronous Serial transfer- Asynchronous Communication interface (8251), Modes of transfer Programmed I/O, Interrupt Initiated I/O, DMA; DMA Controller (8257), IOP-CPU-IOP Communication, Intel 8089 IOP

UNIT V
Memory Organizations: Memory hierarchy, Main Memory, RAM, ROM Chips, Memory Address Map, Memory Connection to CPU, associate memory, Cache Memory, Data Cache, Instruction cache, Miss and Hit ratio, Access time, associative, set associative, mapping, waiting into cache, Introduction to virtual memory

TEXTBOOKS

1. Computer system Architecture: Morris Mano, Third Edition,
2. Computer Organization and Architecture–William Stallings, Sixth Edition, Pearson/PHI.
3. Advanced Micro Processor and Peripherals- Hall/ A K Ray

REFERENCE BOOKS

1. Computer Organization V. Carl Hamacher, Safwat G. Zaky, ZvonkoVranesic, Zvonko G Vranesic,Fifth Edition
2. Microprocessor Architecture, Programming, Applications with 8085, Ramesh S Gaonkar, Fifth Edition, Prentice Hall,2002

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Semester III		**L**	**T**	**P**	**Credits**
Subject code – 3MC302HS		**2**	**0**	**0**	**0**

Course Objectives:	Course Outcomes:
➢ To reinforce the students understanding with the Pan-Indian heritage in terms of culture, traditions and knowledge. ➢ To impart understanding of the importance of the roots of the traditional knowledge and types. ➢ To impart basic knowledge on the evolution of the multiple languages that highlight India's diversity. ➢ To know Indian Languages, Philosophies, Religion, Literature, Fine arts and Technology. ➢ To explore the Ancient Science, Scientists, in Medieval and Modern India; the education system.	1. Understand the concepts of Indian culture and Traditions and their importance. 2. Distinguish the Indian languages and literature 3. Learn the philosophy of ancient, medieval and modern India. 4. Acquire the information about the fine arts in India 5. Know the contribution of scientists of different eras, interpret the concepts and the importance to protect Intellectual property of the nation.

UNIT I

Dawn of human civilization and evolution of various cultures, Introduction to Culture: Civilization, Culture and heritage, General characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT II

Indian Languages, Culture and Literature: Indian Languages and Literature-I: the evolution and role of Sanskrit, significance of scriptures to current society -Indian philosophies, other Sanskrit literature, literature of south India. Indian Languages and Literature-II: -Northern Indian languages & literature

UNIT III

Religion and Philosophy: -Religion and Philosophy in ancient India -Religion and Philosophy in medieval India -Religious reform movements in modern India (selected movements only)

UNIT IV

Fine Arts in India (Art, Technology& Engineering): -Indian Painting, Indian handicrafts, Music: Divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India: development of science in ancient, medieval and modern India. Their relation in terms of modern scientific perspective, Protection of traditional knowledge, significance, value to economy, role of

government in protection of indigenous knowledge and technology, protection of traditional knowledge bill, 2016.

UNIT V

Education System in India: Education in ancient, medieval and modern India, Aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

TEXTBOOKS

1. Indian Knowledge Systems (2 Vols-Set), Kapil Kapoor and Avadhesh Kumar Singh; ISBN 10: 8124603367 / ISBN 13: 9788124603369, Published by D K Print world, Publication Date: 2007
2. Science in Samskrit, Samskrita Bharati, Published by Samskrita Bharati, New Delhi, India, 2007; ISBN 10: 8187276339 / ISBN 13: 9788187276333.
3. Traditional Knowledge System and Technology in India, Book by Basanta Kumar Mohanta and Vipin K. Singh, originally published: 2012 Publication Date: 2012; ISBN 10: 8177023101 ISBN 13: 9788177023107.
4. 1.7-Position paper, National Focus Group on Arts, Music, Dance and Theatre NCERT, March 2006, ISBN 81-7450-494-X, NCERT, New Delhi, 2010.
5. Indian Art and Culture, 4th Edition, By Nitin Singhania, ISBN: 9354601804 · 9789354601804, © 2022 | Published: December 20, 2021
6. 'Education and Examination Systems in Ancient India, written/authored/edited by S. Narain', published 2017, English-Hardcover, ISBN 9789351282518 publisher: Kalpaz Publications.
7. Satya Prakash, Founders of Sciences in Ancient India, Vijay Kumar Publisher, New Delhi, 1989
8. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, New Delhi, 2005

DATABASE MANAGEMENT SYSTEMS LAB

Semester III		L	T	P	Credits
Subject code – 3PC351CS		**0**	**0**	**2**	**1**

Prerequisites: C Language

Course Objectives:	Course Outcomes:
➢ To practice various DDL, DML commands in SQL ➢ To write simple and Complex queries in SQL ➢ To practice various Functions, Jons &sub queries in SQL ➢ To write PL/SQLusing cursors and collections ➢ To write PL/SQL using Stored Procedures	1. Design and implement a database schema for a given problem 2. Develop the query statements with the help of structured query language. 3. Populate and query a database using SQL and PL/SQL 4. Develop multi-user database application 5. Design and implement E-R model for the given requirements

List of Programs:

1. Creation of database Tables (exercising the all SQL commands)
2. Simple and complex condition query creation using SQL Plus
3. Creation of database Tables using Integrity constraints and Functions
4. Simple and complex condition query creation using Joins
5. Simple and complex condition query creation using Sub queries and set operators
6. Creation of Views (exercising the all types of views)
7. Writing PL/SQL function and cursors
8. Writing PL/SQL stored procedure and triggers
9. Creation of Forms and reports for student Information, library information, Pay roll etc.
10. Case Study: Design Database for Bank
                 => Collect the information Related with Bank organization
                 => Draw E-R Diagrams for Bank
                 => Reduce E-R Diagrams to tables
                 => Normalize your Database up to 3rd Normal form
                 => Retrieve Bank information using SQL commands

COMPUTER ORGANIZATION AND MICROPROCESSOR LAB

	L	T	P	Credits
Semester III				
Subject code – 3PC352 CS	**0**	**0**	**2**	**1**

Prerequisites: C Language

Course Objectives:	Course Outcomes:
➢ Provide practical hands on experience with Assembly Language Programming. ➢ Familiar with the architecture and Instruction set of Intel 8086 microprocessor. ➢ Familiarize the students with interfacing of various peripheral devices with 8086 microprocessors. ➢ Identify a detailed s/w & h/w structure of the Microprocessor. ➢ Develop the programs for microprocessor based applications.	1. Interpret the principles of Assembly Language Programming, instruction set in developing microprocessor based applications 2. Develop Applications such as:8-bit Addition, Multiplication, and Division, array operations, swapping, negative and positive numbers. 3. Build interfaces of Input-output and other units 4. Understand working of instruction set and addressing modes 5. Analyze the function of traffic light controller.

List of Programs:

1. Tutorials with 8086 kit / MASM software tool.(Data transfer instructions)
2. Arithmetic operations
3. Addressing modes
4. Branch instructions
5. Logical instructions
6. Searching.
7. Sorting
8. Display a string of characters using 8279.
9. Interfacing seven-segment LED using 8255.
10. A case study on traffic light signal controller.

PYTHON PROGRAMMING LAB

Semester III   **L   T   P   Credits**

Subject code – 3PC353CS   **0   0   4   2**

Prerequisite: Experience with a high-level language (C/C++, Java, MATLAB)

Course Objectives:	Course Outcomes:
➢ To learn how to design and program using lists, tuples, and dictionaries. ➢ To learn how to use indexing and slicing to access data in Python programs. ➢ To learn structure and components of a Python and to read and write files. ➢ To learn how to design object-oriented programs with Python classes and Exception handling techniques. ➢ To learn how to design and build the GUI applications using python	1. Develop solutions to simple computational problems using Python programs. 2. Solve problems using conditionals and loops in Python. 3. Develop Python programs by defining functions and calling them. 4. Use Python lists, tuples and dictionaries for representing compound data. 5. Develop Python programs for GUI applications

List of Programs
1. Develop program to demonstrate different number datatypes in python
2. Develop program to understand the control structures of python
3. Develop program on String manipulation
4. Develop program to perform various operations on files
5. Develop programs to learn different types of structures (list, dictionary, tuples) in python
6. Develop programs to learn concept of functions scoping, recursion and list mutability
7. Develop program to demonstrate classes and OOP principles
8. Develop programs to understand working of exception handling and assertions
9. Develop event driven GUI programs
10. Explore different debugging methods in Python: A Case Study

TEXTBOOKS

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2nd Edition, 2017, Cengage Learning
2. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India

REFERENCE BOOKS / LINKS

1. Mark Summerfield. ―Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist,,,,, 2nd edition, Updated for Python 3, Shroff/O,,Reilly Publishers, 2016
3. NPTEL Course, Programming, Data Structures and Algorithms using Python,
   Link: https://nptel.ac.in/courses/106106145

4.NPTEL Course, The Joy of Computing using Python,
Link: https://nptel.ac.in/courses/106106182
5. FOSSEE, Python, Link: https://python.fossee.in/

SKILL DEVELOPMENT COURSE-I

Semester III	**L**	**T**	**P**	**Credits**
Subject code – 3PW354 CS	**0**	**0**	**2**	**1**

Guidelines for Evaluation of Skill Development

1.   Continuous Evaluation method is adopted for skill development courses of all semesters and 40 marks are allocated for CIE.
At the end of each module, the student is evaluated by allocating marks as given under.
Observation- 10 marks
Continuous Performance and Execution -20 marks
Viva-Voce—10marks
Average of marks obtained in all experiments is considered as the marks obtained in CIE

2.   The Semester End Examination shall be conducted with an external examiner
and the internal examiner for 60 marks. The external examiner shall be appointed by
the Principal from the panel of examiners recommended by Controller of Evaluation and
Board of Studies.
Quiz/ Skill Test/Assignment/ Mini Project– 40 marks
Viva-voce-20 marks

CISCO INTRODUCTION TO INTERNET OF THINGS (IoT)

Semester –III			L	T	P	Credits
Subject code – 3PW354CS			0	0	2	1

Course Objectives:	Course Outcomes:
➢ Learn how digital transformation turns information into action, creating unprecedented economic opportunity. ➢ Understand how the IoT brings together operational technology and information technology systems. ➢ Discover how business processes for evaluating and solving problems are being transformed. ➢ Learn the security concerns that must be considered when implementing IoT solutions. ➢ Practice what you learn using Cisco Packet Tracer, a network configuration simulation tool	1. Explain the meaning and impact of Digital Transformation. • 2. Apply basic programming to support IoT devices. 3. Explain how data provides value to Digital Business and Society. 4. Explain the benefits of automation in the digitized world. 5. Explain the need for enhanced security in the digitized world and discover opportunities provided by digital transformation.

MODULE 1: Everything is Connected

Digital Transformation: Explain how digital transformation affects business, industry, and our daily lives, explain how digital transformation enables innovation, explain how networks provide the platform for Digital Business and society.

Devices that Connect to the IoT: Configure an IoT device to connect to the network, describe the exponential growth of connected IoT devices, configure devices to communicate in the IoT

MODULE 2: Everything Becomes Programmable

Apply Basic Programming to Support IoT Devices: Use Python to create programs that accept user input and read and write to external files, Describe basic programming variables and fundamentals. Apply basic programming variables and fundamentals in Blockly. Apply basic programming variables and fundamentals using Python

Prototyping Your Idea: Explain prototyping and its purpose,Describe Prototyping, Describe the various tools and materials to use to prototype.

MODULE 3: Everything Generates Data

Big Data: Explain the concept of Big Data, Describe the sources of Big Data, Explain the challenges and solutions to Big Data storage, Explain how Big Data analytics are used to support Business.
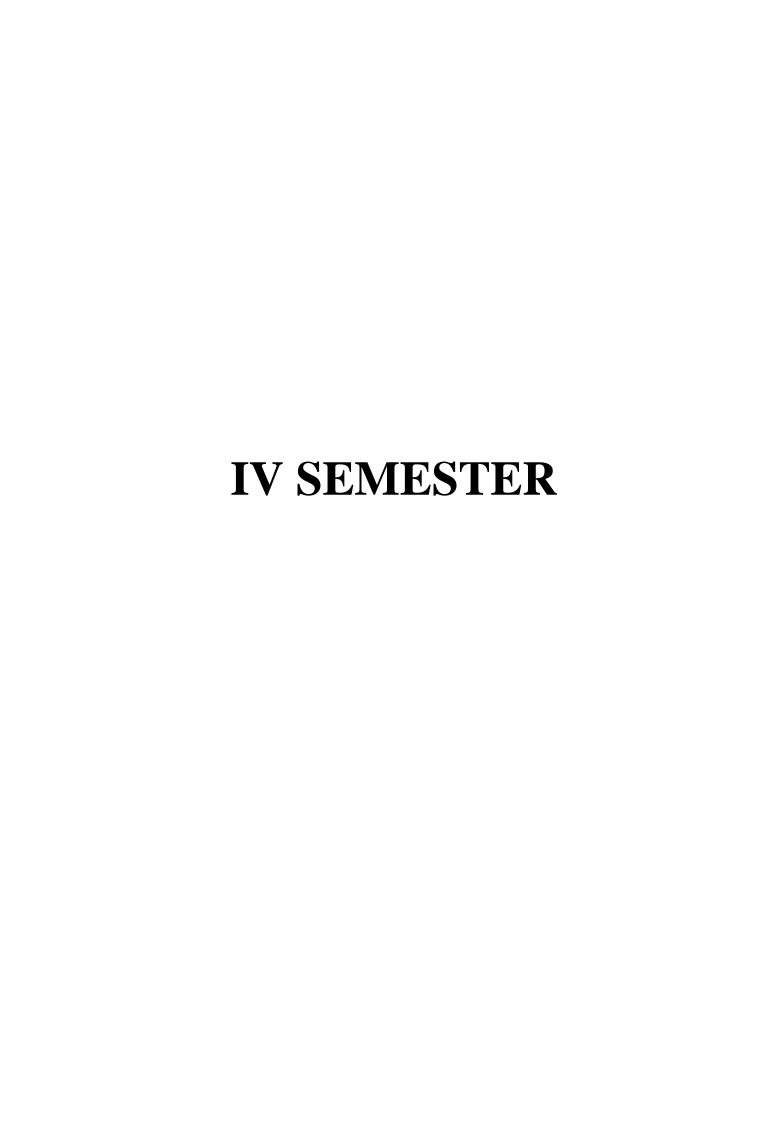
MODULE 4: Everything Can be Automated

What Can be Automated?: Explain how digitization allows business processes to embrace automation, Describe automation Explain how artificial intelligence and machine learning impact automation. Explain how intent-based networking adapts to changing business needs.

MODULE 5: Everything Needs to be Secured

Security in the Digitized World: Explain why security is important in the digitized world. Explain the need for security in the digitized world, explain how to help secure the corporate world, and explain how to secure personal data and devices.

REFERENCES

1. Introduction to IoT by CISCO Network Academy, Version 2.0,July 2018

IV SEMESTER

Scheme of Instruction & Examination
B. E. - Computer Science and Engineering

S. No.	Course Code	Course Title	Scheme of Instruction			Contact Hours / week	Scheme of Examination		Credits
			L	T	P / D		CIE	SEE	
CSE Semester - IV									
Theory Courses									
1	3HS404HS	Optimization & Problem Solving Techniques	3	0	0	3	40	60	3
2	3PC404CS	Data Mining	3	1	0	4	40	60	4
3	3PC405CS	Operating Systems	3	0	0	3	40	60	3
4	3PC406CS	Computer Networks	3	0	0	3	40	60	3
5	3HS403HS	Human Values Professional Ethics	2	0	0	2	40	60	2
Practical / Laboratory Courses									
6	3PC455CS	Operating Systems Lab	0	0	2	2	40	60	1
7	3PC456CS	Computer Networks Lab	0	0	2	2	40	60	1
8	3PC457CS	Java Programming Lab	0	0	2*2	4	40	60	2
9	3PW458CS	Skill Development Course- II	0	0	2	2	40	60	1
Total Credits						25	360	540	20

OPTIMIZATION & PROBLEM SOLVING TECHNIQUES

	L	T	P	Credits
Semester IV				
Subject code: 3HS404HS	3	0	0	3

Course Objectives:	Course Outcomes:
➢ Prepare the students to have the knowledge of Linear Programming Problem in operations. ➢ Study Economic Interpretation, Post optimal of sensitivity analysis ➢ Use variables for formulating complex mathematical models in management science, industrial engineering and transportation models. ➢ Make students understand the concept replacement models. ➢ Prepare the students to understand the theory of Game in operations research	1. Solve Linear Programming Problems by various methods 2. Finding relationship between primal and dual solution, Economic Interpretation Research. 3. Understand the mathematical tools that are needed to solve optimization problems like Transportation models 4. Understand the Assignment models, replacement models with change in money value considering with time and without time. **5.** Understand the theory of Game in operations research at the end students would able to explain applications of Game theory in decision making for conflict.

UNIT I
Introduction: Definition and scope of operations Research.
Linear Programming: Introduction, Formulation of Linear programming problem, graphical method of solving LP problem, simplex method, maximization and minimization, Degeneracy in LPP, Unbounded and, Infeasible solutions.

UNIT II
Duality: Definition, Relationship between primal and dual solution, Economic Interpretation, Post optimal of sensitivity analysis, Dual simplex method.

UNIT III
 Transportation Models: Finding an initial feasible Solution-North West corner method, least cost method, Vogel's Approximation method, Finding the optimal solution, optimal solution by stepping stone and MODI methods, special cases in Transportation Problems-Unbalanced Transportation problem**.**

UNIT IV
Assignment Problems: Hungarian Method of Assignment problem, Maximization in Assignment problem, unbalanced problem, problems with restrictions, travelling salesman problems.
Replacement models: Introduction, replacement of items that deteriorate ignoring change in money value, replacement of items that deteriorate considering change in money value with

time, replacement of items that fail suddenly- Individual replacement policy, Group replacement policy.

UNIT V

Game Theory: Introduction, 2 person zero sum games, Maximin – Minimax principle of Dominance, Solution for mixed strategy problems, Graphical method for $2 \times n$ and m×2 games.

Sequencing Models: Introduction, General assumptions, processing n jobs through 2 machines, rocessing 'n' jobs through m machines, Processing 2 jobs through m machines.

TEXTBOOKS

1. Hamdy, A. Taha, "Operations Research-An Introduction", Sixth Edition, Prentice Hall of IndiaPvt. Ltd.,1997

2.S.D Sharma, Operations Research, Kedarnath, Ramnath & Co., Meerut,2009

3.J.B. Gupta, "Utilization of Electric Power and Electric Traction" S.K. Kataria & Sons Publications, 2010 Hrvey M. Wagner, Principles of Operations Research, Second Edition, Prentice Hall of India Ltd., 1980.

4.V.K. Kapoor, Operations Research, S. Chand Publishers, New Delhi,2004

5. R. Paneer Selvam, Operations Research, Second Edition, PHI Learning Pvt. Ltd., New Delhi,2008.

DATA MINING

Semester – IV

	L	T	P	Credits
Subject code - 3PC404CS	3	1	0	4

Course Objectives:	Course Outcomes:
➢ Introduce the basic concepts of Data Warehouse and Data Mining ➢ Introduce current trends in data mining ➢ Identify data mining problems and implement the data warehouse ➢ Write association rules for a given data pattern. ➢ Choose between classification and clustering solution	1. Understand the principles of Data Warehousing and Data Mining. 2. Implementing data warehouse architecture and its applications. 3. Organize and prepare the data needed for data mining using preprocessing techniques 4. Implement the appropriate data mining methods like classification, association and clustering on a given data set. 5. Understanding the importance of data mining application and using the most appropriate approach for the realistic strategy

UNIT I
Data Warehousing & Modeling:
Basic Concepts: Data Warehousing: A multitier Architecture, Data warehouse models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading, Data Cube: A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations.

UNIT II
Data warehouse implementation& Data mining: Efficient Data Cube computation: An overview, Indexing OLAP Data: Bitmap index and join index, Efficient processing of OLAP Queries, OLAP server Architecture ROLAP versus MOLAP Versus HOLAP.
Introduction: What is data mining, Challenges, Data Mining Tasks.
Data: Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity.

UNIT III
Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.

UNIT IV
Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT V
Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

TEXTBOOKS

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First impression,2014.
2. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining -Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012.

REFERENCE BOOKS

1. Sam Anahory, Dennis Murray: Data Warehousing in the Real World, Pearson, Tenth Impression,2012.
2. Michael. J. Berry, Gordon. S. Linoff: Mastering Data Mining, Wiley Edition, second edtion,2012.

OPERATING SYSTEMS

Semester – IV   L   T   P   Credits

Subject code - 3PC405CS   3   0   0   3

Course Objectives:	Course Outcomes:
➢ To learn the fundamentals of Operating Systems. ➢ To learn the mechanisms of OS to handle processes and threads and their communication. ➢ To learn the mechanisms involved in memory management in contemporary OS. ➢ To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection. ➢ To know the components and management aspects of concurrency management	1. Describe the concepts of OS structure and Process synchronization 2. Evaluate and design different process scheduling algorithms 3. Identify the rationale behind various memory management techniques along with issues and challenges of main memory and virtual memory 4. Compare different file allocation methods and decide appropriate file allocation strategies 5. Describe the mechanisms available is OS to control access to resources and provide system security.

UNIT-I

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine.

UNIT-II

Processes: Definition, Process Relationship, Different states of a Process, Process Statetransitions, Process Control Block (PCB), Context switching

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling Criteria, Scheduling algorithms, multiprocessor scheduling

UNIT-III

Process Synchronization: Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Peterson's Solution, classical problems of synchronization: The Bounded buffer problem, Producer\Consumer Problem, reader's & writer problem, Dinning philosopher's problem. Semaphores, Event Counters, Monitors, Message Passing,

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Methods for Handling: Deadlocks: Deadlock prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT-IV

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation, fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, structure of page table, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacementalgorithms, Trashing

UNIT-V

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software,

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods, Free-space management, directory implementation, efficiency and performance.

Secondary-Storage Structure: Disk structure, Disk scheduling algorithms, Disk Management, RAID structure

TEXTBOOKS

1. Abraham Silberschatz, Peter B Galvin, Greg Gagne, Operating System Concepts Essentials, 9th Edition, Wiley Asia Student Edition, 2017.
2. William Stallings, Operating Systems: Internals and Design Principles, 5th Edition, Prentice Hall of India, 2016.
3. Andrew S. Tanenbaum (2007), Modern Operating Systems, 2nd edition, Prentice Hall of India, India.

REFERENCE BOOKS

1. Maurice Bach, Design of the Unix Operating Systems, 8th Edition, Prentice-Hall of India, 2009.
2. Daniel P. Bovet, Marco Cesati, Understanding the Linux Kernel, 3rd Edition, O'Reilly and Associates.

COMPUTER NETWORKS

Semester – IV   **L   T   P   Credits**

Subject code -   3PC406CS   **3   0   0   3**

Course Objectives:	Course Outcomes:
➢ To provide a conceptual foundation for the study of data communications using the open Systems interconnect (OSI) model for layered architecture. ➢To study the principles of network protocols and internetworking ➢To understand the Network security and Internet applications. ➢To understand the performance of data link layer protocols for error and flow control. ➢To understand various routing protocols and network security.	1.Understand and explain the concept of Data Communication and networks, layered architecture and their applications 2.Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction 3.Interpret the network layer, routing protocols and analyse how to assign the IP addresses for the given network 4. Examine the Transport layer services and protocols. 5.Comprehend the functionality of application layer

UNIT I

Introduction to Data communication: Representation of data communication, flow of networks, Network Types: LAN, WAN, MAN. Network Topologies: Bus, Star, Ring, Hybrid. Line configurations. Reference Models: OSI, TCP/IP, Transmission media
Techniques for Bandwidth utilization: Multiplexing –Frequency division, time division and wave division, Asynchronous and synchronous transmission

UNIT II

Data Link Layer: Framing, Error Detection and Correction: Fundamentals, Block coding, Hamming Distance, CRC
Flow Control and Error Control Protocols: Stop and Wait, go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, HDLC
Multiple Access Protocols: ALOHA, CSMA, CSMA/CD, CSMA/CA.

UNIT III

Network Layer: Switching Techniques (Circuit and Packet) concept, Network layer Services, Sub-netting concepts
Routing algorithms: Shortest Path Routing, Flooding, Hierarchical routing, Broadcast, Multicast, Distance Vector Routing, and Congestion Control Algorithms.

UNIT IV

Internet Networking: Tunnelling, Fragmentation, Congestion Control (Leaky Bucket and Token Bucket Algorithm), Internet control protocols: ARP, RARP and DHCP
The Network Layer in Internet: IPV4, IPV6, IP Addressing, NAT.

UNIT V

Transport Layer: Transport Services, Elements of Transport Layer, Connection management, TCP and UDP protocols, QoS improving techniques.
Application Layer: Domain Name System, SNMP, SMTP, HTTP, Bluetooth

TEXTBOOKS
1. Andrew S Tanenbaum, "Computer Networks," 5/e, Pearson Education, 2011.
2. Behrouz A. Forouzan, "Data Communication and Networking,"4/e, TMH, 2008.
3. William Stallings, "Data and Computer Communications," 8/e, PHI, 2004.

REFERENCE BOOKS

1. Douglas EComer, "Computer Networks and Internet", Pearson Education Asia, 2000.
2. PrakashC. Gupta, "Data Communications and Computer Networks", PHI learning, 2013

OPERATING SYSTEMS LAB

Semester – IV   **L   T   P   Credits**

Subject code -   3PC455 CS   **0   0   2   1**

Course Objectives:	Course Outcomes:
➢ To Learn various system calls in Linux ➢ To Learn different types of CPU scheduling algorithms. ➢ To Demonstrate the usage of semaphores for solving synchronization problem ➢ To Understand memory management techniques and different types of fragmentation. ➢ To Learn various disk scheduling algorithms	1. Use different system calls for writing application programs 2. Evaluate the performance of different types of CPU scheduling algorithms. 3. Implement producer-consumer problem, reader-writers problem, Dining philosopher's problem. 4. Simulate Banker's algorithm for deadlock avoidance. 5. Implement paging replacement and disk scheduling techniques

List of Programs (preferred programming language is C)

Perform a case study by installing and exploring various types of operating systems on a physical or logical (virtual) machine

1. Write C programs to implement UNIX system calls and file management system calls.
2. Write C programs to demonstrate various process related concepts.
3. Write C programs to demonstrate various thread related concepts.
4. Write C programs to simulate CPU scheduling algorithms: FCFS, SJF, Round Robin
5. Write C programs to simulate Intra & Inter-Process Communication (IPC) techniques: Pipes, Messages Queues, Shared Memory.
6. Write C programs to simulate solutions to Classical Process Synchronization Problems: Dining Philosophers, Producer-Consumer, Readers-Writers
7. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
8. Write C programs to simulate Page Replacement Algorithms: FIFO, LRU
9. Write C programs to simulate implementation of Disk Scheduling Algorithms: FCFS, SSTF.
10. Shell programming: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, and commands).

COMPUTER NETWORKS LAB

Semester – IV	**L**	**T**	**P**	**Credits**
Subject code - 3PC456CS	**0**	**0**	**2**	**1**

Course Objectives:	Course Outcomes:
- Learn to communicate between two desktops - Learn to implement different protocols - Be familiar with socket programming - Be familiar with various routing algorithms - Be familiar with different simulation tools - Use simulation tools to analyze performance of various network protocols	1. Demonstrate a broad knowledge of the area of computer networking and its terminology 2. Understand to configure intermediary network devices 3. Program using sockets 4. Use simulation tools to analyze the performance of various network protocols 5. Implement and analyze various routing algorithms.

List of Programs

1. Running and using services/commands like tcpdump, netstat, ifconfig, nslookup, FTP, TELNET and trace route. Capture ping and trace route PDUs using network protocol analyzer and examine
2. Implement the data link layer framing methods such as character-stuffing and bit stuffing
3. Implement on a dataset of characters using CRC polynomials CRC 12 and CRC 16
4. Initial Configuration of router and switch (using real devices or simulators)
5. Design and implement the following experiments using packet tracer software
    I.   Simulation of network topologies
    II.   Configuration of network using different routing protocols
6.Do the following using NS2/NS3/NetSim or any other equivalent tool
    I. Simulation of Congestion Control Algorithms
    II. Simulation of Routing Algorithms
7. Socket programming using UDP and TCP (e.g simple DNS, date & time client/server, echo client/server, iterative & concurrent servers)
8. Programming using RPC

JAVA PROGRAMMING LAB

	L	T	P	Credits
Semester – IV				
Subject code - 3PC458 CS	**0**	**0**	**4**	**2**

Prerequisite: Programming nC

Course Objectives:	Course Outcomes:
➢ To implement various java concepts. ➢ To write java programs to solve mathematics, science and engineering problems. ➢ To identify compile time and runtime errors, syntax and logical errors ➢ To import the essentials of java class library and user defined packages. ➢ To develop skills in internet programming using applets and swings	1. To understand the use of OOPs concepts. 2. Develop Java program using packages, inheritance and interface. 3. Develop java programs to implement error handling techniques using exception handling. 4. Develop graphical user interface using AWT. 5. Demonstrate event handling mechanism

List of Programs

1. Implement the concept of classes and objects.
2. Implement Arrays to a given application.
3. Use String and String Tokenizer classes and develop a java programs.
4. Develop a java programs Using interfaces and packages.
5. Develop Java Programs using inheritance.
6. Develop Java programs using Method overloading and method overriding.
7. Develop java programs using Exception handling (using try, catch, throw, throws and finally).
8. Develop java programs using Multithreading (using Thread class and Runnable interface, synchronization).
9. Develop java programs using collections (using list, set, Map and generics).
10. CASE STUDY: Develop a program to calculate SGPA & CGPA of a student and display the progress report.
    INPUT:

INPUT		
ROLL NO	NAME	HOW MANY SEMESTERS? Semester wise : Subject Code, Subject Name And Marks

OUTPUT:
Progress report of   <NAME>
Roll No:
Program(BE/ME)
Branch:
College Code and Name:
Year of joining:

Semester-I Grades	Semester-II Grades	Semester-III Grades
Subject 1:	Subject 1:	Subject 1:
Subject 2:	Subject 2:	Subject 2:
Subject 3:	Subject 3:	Subject 3:
….	….	….
SGPA :	SGPA :	SGPA :
CGPA :	CGPA :	CGPA :

Note: The above experiments can be implemented using any IDE.

SKILL DEVELOPMENT COURSE-II

Semester IV	**L**	**T**	**P**	**Credits**
Subject code – 3PW458CS	**0**	**0**	**2**	**1**

Guidelines for Evaluation of Skill Development

1. Continuous Evaluation method is adopted for skill development courses of all semesters and 40 marks are allocated for CIE.
At the end of each module, the student is evaluated by allocating marks as given under.
Observation- 10 marks
Continuous Performance and Execution -20 marks
Viva-Voce—10marks
Average of marks obtained in all experiments is considered as the marks obtained in CIE

2.   The Semester End Examination shall be conducted with an external examiner
and the internal examiner for 60 marks. The external examiner shall be appointed by
the Principal from the panel of examiners recommended by Controller of Evaluation and
Board of Studies.
Quiz/ Skill Test/Assignment/ Mini Project– 40 marks
Viva-voce-20 marks

CISCO CCNA MODULE I

Semester – IV   **L   T   P   Credits**

Subject code - 3PW458CS   **0   0   2   1**

Course Objectives:	Course Outcomes:
➢ Explain the advances in modern network technologies, configure IP address, passwords etc ➢ Explain how network protocols enable devices to access local and remote network resources ➢ Explain how routers use network layer protocols and services to enable end-to-end connectivity ➢ Implement IPv4 and IPv6 addressing scheme ➢ Configure a switch port to be assigned to a VLAN based on requirements.	1. Build simple LANs, perform basic configurations for routers and switches, 2. Implement IPv4 and IPv6 addressing schemes. 3. Implement VLANs and trunking in a switched network 4. Implement DHCPv4 to operate across multiple LANs and explain how WLANs enable network connectivity. 5. Develop critical thinking and problem-solving skills using real equipment and Cisco Packet Tracer.

MODULE I:
Networking today: Network Affect our Lives, Network Components, Network topologies, Types of Networks
Basic Switch and End Device Configuration: IOS Access, Command Structure, basic device configuration, Ports and addresses, configuring IP address, protocols and models

MODULE II:
Physical Layer: Introduction to cables, Number Systems
Data Link Layer: Topologies, Data Link frame
Ethernet Switching :Ethernet Frame, MAC Address Table

MODULE III:
Network layer : IPv4 and IPv6 packet , addressing of IPv4 and IPv6
Address Resolution: MAC & IP, ARP, IPv6 Neighbour Discovery

MODULE IV:
ICMP, Transport layer : TCP & UDP
Application Layer: Web and email protocols, IP Addressing Services

MODULE V:
Network Security Fundamentals: Network Attacks, Device Security

REFERENCES
CCNA ROUTING & SWITCHING BY CISCO PRESS