CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
Kokapet (Village), Gandipet, Hyderabad, Telangana-500075. www.cbit.ac.in
ISO Certified 9001:2015

COMMITTED TO RESEARCH, INNOVATION AND EDUCATION 42 years

SCHEME OF INSTRUCTION AND SYLLABI

of

III and IV SEMESTERS

of

FOUR YEAR DEGREE COURSE

in

B.E. - COMPUTER SCIENCE AND ENGINEERING

(AICTE Model Curriculum with effect from AY 2021-22)

R-20 Regulation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)
Affiliated to Osmania University
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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION
Model Curriculum (R-20) with effect from AY 2021-22

B.E. (Computer Science and Engineering)

SEMESTER -III

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20EEC01	Basics of Electrical Engineering	3	-	-	3	40	60	3
2	20ECC35	Basic Electronics	3	-	-	3	40	60	3
3	20CSC08	Data Structures	3	-	-	3	40	60	3
4	20CSC09	Discrete Mathematics	3	1	-	3	40	60	4
5	20CSC10	Digital Logic Design	3	-	-	3	40	60	3
6	20EGM02	Indian Traditional Knowledge	2	-	-	2	-	50	No Credit
PRACTICAL									
7	20EEC02	Basics of Electrical Engineering Lab	-	-	2	3	50	50	1
8	20ECC36	Basic Electronics Lab	-	-	2	3	50	50	1
9	20CSC11	Data Structures Lab	-	-	4	3	50	50	2
10	20CSI01	MOOCs / Training / Internship	-	-	4	-	-	-	2
11	20ACT	Activity Points	-	-	-	-	-	-	-
		TOTAL	**17**	**1**	**12**	**-**	**350**	**500**	**22**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

20EEC01

BASICS OF ELECTRICAL ENGINEERING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To understand the behavior of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To understand the basic principle of operation of AC and DC machines
3. To know about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing

Course Outcomes: After the completion of this course, the student will be able to

1. Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
2. Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
3. Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
4. Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
5. Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
6. Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	3	2	3	3	-	3	-	1	2	2	3	-	1	1	1
CO 2	3	3	2	3	2	-	3	-	1	2	2	3	-	1	1	1
CO 3	3	3	2	1	3	-	2	-	1	2	2	3	-	1	1	1
CO 4	2	3	-	1	3	-	2	-	1	2	1	3	-	1	1	1
CO 5	2	-	-	1	1	2	2	1	1	1	2	3	-	1	1	1
CO 6	2	-	-	1	3	1	2	1	1	1	2	3	-	1	1	1

UNIT-I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt, series and compound generators.

DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors. **Three - Phase Induction Motors:** Principle of operation, Applications.

UNIT-V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

Text Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, “Basic Electrical Engineering”, Tata Mc Graw Hill, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGrawHill,2009
4. P.V. Prasad, S. sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013.

20ECC35

BASICS ELECTRONICS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisite: Concepts of Semiconductor Physics and Applied Physics.

Course Objectives: The objectives of this course are
1. Describe semiconductor devices principle and to understand the characteristics of Junction Diode.
2. Understand the concept of amplification and able to examine the BJT in more detail.
3. Understand the concept of digital electronics.
4. Understand working principle of incoherent light sources (LEDs), junction devices, operation of CRO
5. Understand the working principle of the transducers and aware the students about the advances in Instrumentation.

Course Outcomes: After the completion of this course, the student will be able to
1. Interpret the usage of semiconductor devices in making circuits like rectifiers, filters, regulators etc
2. Design and Analyse the characteristics of electronic circuits and systems
3. Make use of various types of small and large signal amplifiers for electronic control systems.
4. Model a prototype module using the operational amplifier for real time applications.
5. Evaluate the performance of various semiconductor devices.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	3	2	1	1	1	1	1	1	1	1	2	3	-	-	1
CO 2	2	2	2	2	1	1	1	1	1	1	1	2	3	2	-	1
CO 3	2	2	1	2	1	1	1	1	1	1	1	2	1	-	-	-
CO 4	2	3	2	3	1	2	1	1	1	1	1	2	1	1	1	1
CO 5	3	2	2	2	2	2	1	1	1	1	1	2	2	1	-	1

UNIT-I

Semiconductor Theory: Energy levels, Intrinsic and Extrinsic Semiconductor, Mobility, Diffusion and Drift current, Hall effect, Law of mass action, Characteristics of P-N Junction diode, current equation, Parameters and Applications.

Rectifiers: Half wave and Full wave Rectifiers Bridge and center tapped with and without filters, Ripple factor, regulation and efficiency.

UNIT-II

Transistors: Bipolar and field effect transistors with their h-parameter equivalent circuits, Basic Amplifiers classification and their circuits (Qualitative treatment only).

Regulators and Inverters: Zener Diode**,** Breakdown mechanisms, Characteristics, Effect of Temperature, Application as voltage regulator.

UNIT-III

Feedback Amplifiers: Properties of Negative Feedback Amplifier, Types of Negative Feedback, Effect of negative feedback on Input impedance and Output impedance, Applications (Qualitative treatment only).

Oscillators: principle of oscillations, LC Type-Hartley, Colpitts and RC Type- Phase shift, Wien Bridge and Crystal Oscillator (Qualitative treatment only).

UNIT-IV

Operational Amplifiers: Basic Principle, Ideal and practical Characteristics and Applications-Summer, Integrator, Differentiator, Instrumentation Amplifier.

Amplifiers: Operation of Class A, Class B, Class AB and Class C power amplifiers

UNIT-V

Data Acquisition systems: Study of transducers-LVDT, Strain gauge. Photo Electric Devices and Industrial Devices: Photo diode, Photo Transistor, LED, LCD, SCR, UJT Construction and Characteristics and their applications only.

Display Systems: Constructional details of C.R.O and Applications.

Text Books:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9th edition, LPE, Reprinted, 2006.
2. Morris Mano, "Digital Design", Pearson Education, Asia 2002.

Suggested Readings:

1. Jacob Millman and C., Halkias, "Electronic Devices", McGraw Hill, Eight Edition, Reprinted, 1985.
2. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Prentice Hall of India, 3rd edition, 1985.
3. W. D. Cooper, A. Helfric, "Electronic Instrumentation and Measurement Techniques", PHI, 4th edition.

20CSC08

DATA STRUCTURES

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basic knowledge of programming language such as C, C++, Java, Python is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: The objectives of this course are
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different balanced binary trees, which provides efficient implementation for data structures.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the basic concepts of data structures and sorting techniques.
2. Analyze the performance of algorithms.
3. Distinguish between linear and non-linear data structures.
4. Apply linear and non-linear data structures.
5. Identify the significance of balanced search trees, graphs and hashing.
6. Establish a suitable data structure for real world applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	-	-	-	1	2	2	1	1
CO 2	2	3	2	2	-	-	-	-	-	-	-	1	2	2	1	1
CO 3	2	1	2	-	-	-	-	-	-	-	-	-	2	2	1	1
CO 4	1	2	2	2	-	-	-	-	1	-	-	1	2	2	1	1
CO 5	2	2	1	1	-	-	-	-	-	-	-	1	2	2	1	1
CO 6	2	3	3	-	-	-	-	-	1	-	-	1	2	2	1	1

UNIT - I

Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms, Complexity, Time-space trade off, Asymptotic Notations. **Recursion**: Introduction, format of recursive functions, recursion Vs. Iteration, examples. **Sorting:** Quick sort, Merge Sort, Selection Sort, Radix sort, Comparison of Sorting Algorithms.

UNIT - II

Linked Lists: Introduction, Linked lists, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays, Types of Linked Lists and operations-Circular Single Linked List, Double Linked List, Circular Double Linked List, Skip List-Definition and uses

UNIT- III

Stacks and Queues: Introduction to stacks, applications of stacks, implementation of stack. Introduction to queues, applications of queues and implementations, Double Ended Queues, Priority Queues and applications

UNIT - IV

Trees: Definitions and Concepts, properties of Binary Trees, types of binary trees, Representation of binary tree, Tree Traversal. **Binary Search Trees:** Representation and operations. Tries- Definition and uses
Heap Tree: Definition, Representation, Heap Sort. **Balanced Search Trees:** AVL Trees

UNIT - V

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals,
Hashing: Introduction, Hashing Functions-Modulo, Middle of Square, Folding, Collision Techniques-Linear Probing, Quadratic Probing, Double Hashing, Separate Chaining.

String Algorithms: Introduction, String Matching Algorithm, Brute Force Method, Rabin-Karp String Matching Algorithm

Text Books:

1. Narasimha karumanchi, "Data Structures and Algorithms Made Easy", Career Monk Publications, 2020
2. S. Sahni and Susan Anderson-Freed, "Fundamentals of Data structures in C", E. Horowitz, Universities Press, 2nd Edition.
3. Reema Thareja, "Data Structures using C", Oxford University Press.
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structure and Algorithms in Python", Wiley, 2013.

Suggested Reading:

1. D. S. Kushwaha and A K. Misra, "Data structures A Programming Approach with C", PHI.
2. Seymour Lipschutz, "Data Structures with C", Schaums Outlines, Kindle Edition
3. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018
4. D. Samantha, "Classic Data Structures", Prentice Hall India, 2nd Edition, 2013

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

20CSC09

DISCRETE MATHEMATICS

Instruction	3L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Course Objectives: The objectives of this course are
1. To introduce Propositional and Predicate Logic.
2. To introduce various proof techniques for validation of arguments.
3. To develop an understanding of counting, functions and relations.
4. Familiarize with fundamental notions and applicability of graph theory and algebraic systems

Course Outcomes: On Successful completion of the course, students will be able to
1. Describe rules of inference for Propositional and Predicate logic.
2. Demonstrate use of Set Theory, Venn Diagrams, relations, functions in Real-world scenarios.
3. Model solutions using Generating Functions and Recurrence Relations.
4. Determine the properties of graphs and trees to solve problems arising in computer science applications.
5. Distinguish between groups, semi groups and monoids in algebraic systems.
6. Formulate solutions to a variety of real world problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	-	1	1	1	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 5	2	1	-	-	-	-	-	-	-	-	-	-	2	1	1	-
CO 6	3	2	-	-	-	-	-	-	-	-	-	1	2	1	1	-

UNIT-I

Introduction to Propositional Calculus: Basic Connectives and Truth tables, Logical Equivalence: Laws of Logic, Logical Implication; Rules of Inference.

Predicates: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.

UNIT–II

Sets: Sets and Subsets, Operations on sets and the Laws of Set Theory, Counting and Venn Diagrams. **Relations and Functions:** Cartesian Products and Relations. Partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations. Pigeon hole principle.

Functions: Types of Functions, Composition of functions and Inverse of functions.

UNIT-III

Fundamental Principles of counting: The Rules of Sum and Product, permutations, Combinations, Binomial Theorem.

Generating Functions: Generating Functions, Calculating Coefficient of generating functions. **Recurrence Relations:** The First Order Linear Recurrence Relation, Second Order Linear. Homogeneous Recurrence relations with constant coefficients, Non Homogeneous Recurrence relations.

UNIT-IV

Introduction to Graphs: Graphs and their basic properties- degree, path, cycle, Sub graphs, Complements and Graph Isomorphism, Euler trails and circuits, Hamiltonian paths and cycles, planar graphs, Euler formula, Graph Coloring and Chromatic polynomial, Matching, Applications**.**

Trees: Definitions, Properties, Rooted Trees, Spanning Trees, Minimum Spanning trees: The Algorithms of Kruskal and Prims.

UNIT–V

Algebraic Structures: Algebraic Systems, Examples and General Properties, Semi groups and Monoids. Groups: Definitions and Examples, Subgroups, Homomorphisms and cyclic groups.

Text Books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", An Applied Introduction, 4th edition, Pearson Education, 2003.
2. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA Mc Graw-Hill Edition, 1995.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 8th Edition, Tata Mc Graw-Hill, 2005

Suggested Reading:

1. R. K. Bisht, H. S. Dhami, "Discrete Mathematics", Oxford University Press, Published in 2015.
2. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 8th Edition, PHI, 1986.
3. David D. Railey, Kenny A. Hunt, "Computational Thinking for the Modern Problem Solving", CRC Press, 2014.

Online Resources:

1. https://nptel.ac.in/courses/111107058/
2. https://nptel-discrete-mathematics-5217

20CSC10

DIGITAL LOGIC DESIGN

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To understand the basic building blocks of digital hardware and various minimization techniques.
2. To analyse and design the Combinational and Sequential circuits.
3. To design the circuits using verilog HDL.

Course Outcomes: On Successful completion of this course, student will be able to
1. Demonstrate the number system conversions and simplify Boolean functions.
2. Recall basic theorems and properties of Boolean algebra to represent logical functions in canonical and standard forms.
3. Analyze and simplify Boolean expressions using karnaugh-maps and tabulation method.
4. Analyze and Design various combinational circuits and Sequential circuits used in Computer Hardware.
5. Understand the designs of Combinational and Sequential circuits using Verilog HDL.
6. Develop different applications by configuring registers, counters and memories.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/ PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO 2	2	1	-	-	-	-	-	-	-	-	-	1	1	2	-	-
CO 3	2	2	-	1	1	-	-	-	-	1	-	1	1	1	-	-
CO 4	3	3	3	2	2	-	1	1	1	1	1	2	2	2	2	2
CO 5	2	2	2	2	2	2	1	1	1	1	1	2	2	2	2	3
CO 6	2	2	2	2	2	2	2	2	2	2	2	2	1	2	3	2

UNIT - I

Digital Systems and Binary Numbers: Digital systems, Binary numbers, Number base conversions, Octal and Hexadecimal numbers, Complements of Numbers, Binary codes. **Boolean Algebra and logic Gates:** Binary logic, Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNIT - II

Minimization of Switching Functions: Introduction, the map method, minimal functions and their properties, the tabulation procedure, the prime implicant chart. **NAND and NOR Gates**: NAND Circuits, Two-level Implementation, Multilevel NAND Circuits, NOR Circuits. **Exclusive OR Gates**: Odd Function, Parity Generation and Checking.

UNIT - III

Combinational Logic Design: Combinational Circuits. **Analysis Procedure:** Derivation of Boolean Functions, Derivation of the Truth Table, Logic Simulation. **Design Procedure:** Decoders, Encoders, Multiplexers - Designing Combinational Circuits using Multiplexers, Binary Adders, Adder-Subtractor, Binary Multiplier, HDL Representations – Verilog.

UNIT - IV

Sequential Circuits: Sequential circuit definitions, Latches, Flip Flops, Sequential circuit analysis, Sequential circuit design, Design with D Flip Flops, Designing with JK Flip-Flops, HDL representation for sequential circuits - Verilog.

UNIT - V

Registers: Registers, Shift registers. **Counters**: Ripple Counters, Synchronous Binary counters, Other Counters. **Memory and Programmable Logic**: Introduction, Random-Access Memory, Memory Decoding, Error

Detection and Correction, Read-Only Memory, Programmable Logic Array (PLA), Programmable Array Logic (PAL).

Text Books:

1. Morris Mano M. and Michael D. Ciletti, "Digital Design, With an Introduction to Verilog HDL", Pearson 5th edition, 2013.
2. ZVI Kohavi, "Switching and Finite Automata Theory", Tata McGraw Hill 2nd Edition, 1995.

Suggested Reading:

1. Ronald J Tocci, Neal Widmer, Greg Moss, "Digital Systems: Principles and Applications", Pearson 11th Edition, 2011.
2. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL design, McGraw Hill 2nd Edition, 2009.

20EGM02

INDIAN TRADITIONAL KNOWELDGE

Instruction	2L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Prerequisite: Knowledge on Indian Culture

Course Objectives: The objectives of this course are
1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand philosophy of Indian culture
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.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO 5	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	

UNIT-I
Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human life, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II
Education System: Education in ancient, medieval and modern India, aims of education, subjects, Languages, Science and Scientists of ancient, medieval and modern India

UNIT-III
Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV
Art, Technology & Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

UNIT-V
Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health

Essential Readings:
1. Kapil Kapoor, Text and Interpretation: The Indian Tradition, ISBN: 81246033375, 2005
2. Samskrita Bharati, Science in Samskrit, ISBN-13: 978-8187276333, 2007
3. Satya Prakash, Founders of sciences in Ancient India, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, The Positive Sciences of the Ancient Hindus, Motilal Banarasidass, ISBN-10: 8120809254, 1915
5. Kancha Ilaiah, Turning the Pot, Tilling the Land: Dignity of Labour in Our Times

Suggested Readings:

1. Swami Vivekananda, Caste, Culture and Socialism, Advaita Ashrama, Kolkata ISBN-9788175050280
2. Swami Lokeswarananda, Religion and Culture, Advaita Ashrama, Kolkata ISBN-9788185843384
3. Kapil Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.
4. Karan Singh, A Treasury of Indian Wisdom: An Anthology of Spiritual Learn,ISBN: 978-0143426158, 2016
5. Swami Vivekananda, The East and the West, Advaita Ashrama, Kolkata 9788185301860
6. Srivastava R.N., Studies in Languages and Linguistics, Kalinga Publications ISBN-13: 978-8185163475
7. Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
8. R.N Misra, Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama, IIAS, Shimla & Aryan Books International, ISBN 8173055149
9. S. Narain, Examinations in ancient India, Arya Book Depot, 1993
10. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
11. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020
12. Shashi Tharoor, The Hindu Way
13. Amartya Sen, Argumentative Indian

SWAYAM/NPTEL:

1. History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
2. Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
3. Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
4. Language and Society - https://nptel.ac.in/courses/109/106/109106091/
5. Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
6. Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
7. Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

20EEC02

BASICS OF ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are

1. To acquire the knowledge of different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power & energy.
3. To determine the characteristics of Transformers, dc, ac machines and switchgear components

Course Outcomes: On Successful completion of this course, student will be able to

1. Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
2. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
3. Comprehend the circuit analysis techniques using various circuital laws and theorems.
4. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
5. Recognize the basic characteristics of transformer and components of switchgear.
6. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	1	1	-	-	1	1	2	1	-	1	-	1	1	1
CO 2	2	1	1	1	-	-	1	1	2	1	-	1	-	1	1	1
CO 3	3	3	2	1	-	-	1	-	2	1	-	1	-	1	1	1
CO 4	3	1	2	1	-	-	1	-	2	1	-	1	-	1	1	1
CO 5	3	3	2	3	-	-	1	-	2	1	-	1	-	1	1	1
CO 6	3	3	2	2	-	-	1	-	2	1	-	1	-	1	1	1

List of Laboratory Experiments/Demonstrations:

1. Demonstration of Measuring Instruments and Electrical Lab components.
2. Verification of KCL and KVL.
3. Time response of RL and RC series circuits.
4. Determination of parameters of a choke or coil by Wattmeter Method
5. Verification of Thevenin's and Norton's theorems
6. Turns ratio /voltage ratio verification of single phase Transformers
7. Open Circuit and Short Circuit tests on a given single phase Transformer
8. Observation of Excitation Phenomenon in Transformer
9. Measurement of three phase power in a balanced system using two Wattmeter method.
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle)
11. Load test on DC Shunt motor
12. Speed control of DC Shunt motor
13. Demonstration of Low Tension Switchgear Equipment/Components
14. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted from the above list.

20ECC36

BASICS ELECTRONICS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Prerequisite: Students should have prior knowledge of Applied Physics and Semiconductor Physics.

Course Objectives: The objectives of this course are
1. Learn about various electronic components, devices and systems.
2. Study the operation of CRO.
3. Study the transistor characteristics in different modes.
4. Analyze application of diodes and transistors.
5. Learn about analog circuits and digital circuits operation.

Course Outcomes: On Successful completion of this course, student will be able to
1. Demonstrate the concepts of basic electronic components, devices, and systems.
2. Analyze the measurements of time period, amplitude and phase of different waveforms.
3. Design and analyze the behavior of the diode and transistor circuits
4. Develop various types of feedback and power amplifiers
5. Examine the functionality of various analog and digital circuits

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	1	2	1	2	2	2	1	2	2	1	-	1	2
CO 2	3	1	1	1	2	2	2	1	1	2	2	1	1	-	1	2
CO 3	3	1	1	1	2	2	2	1	1	2	2	1	1	1	1	2
CO 4	2	3	3	3	2	2	1	2	2	2	2	2	1	1	1	2
CO 5	2	1	2	2	2	1	1	1	1	2	2	1	1	-	1	2

List of Experiments:
1. Study of Electronic components.
2. Characteristics of Semiconductor diodes (Ge, Si and Zener).
3. CRO and its Applications.
4. Half, Full wave rectifiers with and without filters.
5. Voltage Regulator using Zener diode.
6. Characteristics of BJT in CE Configuration.
7. Characteristics of FET in CS Configuration.
8. Amplifier with and without feedback.
9. RC Phase shift oscillator
10. Operational Amplifier and its applications.
11. Power Amplifier Characteristics.
12. Realization of Half and Full adder
13. Structured Enquiry: Design a switching circuit using BJT and analyse its operation.
14. Open ended Enquiry: Design a suitable 10watt audio amplifier.

Text Books:
1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, *Basic Electronics*, A Text - Lab Manual, 7th Edition, TMH, 1994
2. Paul B. Zbar, Industrial Electronics, A Text - Lab Manual, 3rd Edition.

20CSC11

DATA STRUCTURES LAB

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Pre-requisites: Any Programming Language

Course Objectives: The objectives of this course are
1. Understand basic concepts data structures and abstract data types.
2. Differentiate between linear and non-linear data structures.
3. Analyze various searching, sorting and hashing techniques.

Course Outcomes: On Successful completion of the course, students will be able to
1. Implement the abstract data type.
2. Implement linear data structures such as stacks, queues using array and linked list.
3. Implement non-linear data structures such as trees, graphs.
4. Analyze various sorting techniques.
5. Analyze various algorithms of linear and nonlinear data structures.
6. Design and develop real world problem using suitable data structures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 2	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 3	2	1	1	1	-	-	-	-	-	-	-	-	3	1	-	-
CO 4	1	2	2	1	-	-	-	-	-	-	-	-	3	2	2	1
CO 5	1	2	2	1	-	-	-	-	-	-	-	-	3	2	2	1
CO 6	2	3	3	1	1	-	-	1	1	1	1	2	3	3	3	1

List of Experiments
1. Implementation of Quick Sort, Merge Sort, Selection Sort, Radix Sort.
2. Implementation of Insert, Delete and Search operations on Single Linked List.
3. Implementation of Insert, Delete and Search operations on doubly Linked List.
4. Implementation of skip list.
5. Implementation of Stack using array and linked list.
6. Converting of Infix Expression to Postfix.
7. Implement the algorithm for Evaluation of Postfix.
8. Implementation of Queue using array and linked list.
9. Implement application of queue.
10. Implementation of Binary Tree Traversals.
11. Implementation of Binary Search Tree.
12. Implementation of Heap Sort.
13. Implementation of Graph Traversal Techniques.
14. Implementation of Hashing.
15. Implementation of string matching algorithm.
16. **Case study-** Given a page of text from a textbook, break each sentences into words, remove whitespaces, punctuations, special symbols from it. Convert all words into unique case (i.e. either lower or upper case). Perform the following task on those words- find the frequency of each word, find the top k words which are frequent and construct word cloud on those top k words. (Similar type of case studies can be given by the faculty)

Text Books:

1. Brian WKernighan, Dennis Ritchie, "C Programming Language", PH PTR, 2nd Edition.
2. Richard M Reese, "Understanding and Using C Pointers", O`Reily, 2013.
3. Narasimha karumanchi, "Data Structures and Algorithms Thinking with Python ", Career Monk Publications, 2020

Online Resources:

1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

20CSI01

MOOCS / TRAINING / INTERNSHIP

Instruction	4 Hours per week
Duration of End Examination	-
Semester End Examination	-
Continuous Internal Evaluation	-
Credits	2

Course Objectives: The objectives of this course are

Course Outcomes: On Successful completion of the course, students will be able to

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION

Model Curriculum (R-20) with effect from AY 2021-22

B.E. (Computer Science and Engineering)

SEMESTER –IV

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	20MTC13	Mathematical Foundation for Data Science & Security	3	-	-	3	40	60	3
2	20CSC12	Design and Analysis of Algorithms	3	-	-	3	40	60	3
3	20CSC13	Computer Architecture and Microprocessor	3	-	-	3	40	60	3
4	20CSC14	Data Base Management Systems	3	-	-	3	40	60	3
5	20CSC15	Internet & Web Technologies	2	-	-	3	40	60	2
6	20MBC01	Engineering Economics & Accountancy	3	-	-	3	40	60	3
PRACTICAL									
7	20MTC14	Mathematical Foundation for Data Science & Security Lab	-	-	2	3	50	50	1
8	20CSC16	Design and Analysis of Algorithms Lab	-	-	2	3	50	50	1
9	20CSC17	Data Base Management Systems Lab	-	-	2	3	50	50	1
10	20CSC18	Internet & Web Technologies Lab	-	-	4	3	50	50	2
11	20ACT	Activity Points	-	-	-	-	-	-	-
		TOTAL	**17**	**-**	**10**	**-**	**440**	**560**	**22**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

20MTC13

MATHEMATICAL FOUNDATION FOR DATA SCIENCE & SECURITY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. To know the characteristic of various continuous probability distributions
4. To know the impact of number theory before computer age.
5. To know the security issues of Cryptography

Course outcomes: On Successful completion of the course, students will be able to

1. Analyze the coefficient of skewness and fitting of the data by various methods
2. Apply properties of Mathematical Expectations and analyse the various distributions.
3. Evaluate areas of curves by using various distributions.
4. Apply various technics of Number Theory for solving problems
5. Apply RSA –PKC for solving security issues.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	1	3	-	1	-	-	2	1	-	1	2	-	2	2
CO 2	3	2	1	-	-	-	-	-	2	-	-	1	-	-	2	2
CO 3	3	2	2	-	-	-	-	-	2	-	-	1	-	-	2	2
CO 4	3	1	3	1	1	-	-	-	2	1	-	1	-	-	2	2
CO 5	3	1	3	1	1	-	-	-	2	1	-	1	-	-	2	2

UNIT-I: Curve Fitting

Measures of Central Tendency, Measures of Dispersion, Moments (Moments about the mean and moments about a point). Skewness, Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for frequency distribution, Kurtosis. Correlation, coefficient of correlation, limits of correlation coefficient. Linear Regression, Regression coefficients, Properties of Regression Coefficients. Curve fitting by the Method of Least Squares, Fitting of Straight lines, Second degree parabola and Growth curve ($y = ae^{bx},\ y = ax^{b} and y = ab^{x}$).

UNIT-II: Mathematical Expectation and Discrete Probability Distribution

Basic Probability, Conditional Probability, Baye's theorem. Random variable, discrete random variable, Probability Mass Function, continuous random variable, probability density function. Mathematical expectation, properties of Expectation, properties of variance and co-variance. Poisson distribution, MGF and Cumulates of the Poisson distribution, Recurrence formula for the probabilities of Poisson distribution (Fitting of Poisson distribution)

UNIT-III: Continuous Probability Distributions

Normal distribution, Characteristics of normal distribution and Normal probability Curve, MGF and CGF of Normal distribution, Areas under normal curve. Uniform distribution, moment generating function, mean and variance of uniform distribution. Exponential distribution, MGF, CGF, Mean and Variance of Exponential distribution.

UNIT-IV: Number Theory

Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Diophantine Equation ax+by=c, Fundamental Theorem of Arithmetic, Little Fermat's Theorem, Wilson's Theorem, Euler's Phi-Function, Euler's Theorem, Some Properties of the Phi-Function.

UNIT-V: Cryptography (RSA – PKC)

The RSA public key cryptosystem, Implementation and security issues, Pollard's p−1 factorization algorithm, Quadratic Residues and quadratic reciprocity

Text Books:

1. S. C. Gupta, V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. Burton, David M. (2007) Elementary Number Theory (7^{th}edu.). Tata McGraw Hill Edition, Indian Reprint
3. Mathematical Cryptography by Jeffrey Hoffstein, Jill Pipher, Joseph H. Silverman Springer Science+ Business Media LLC.

Suggested Reading:

1. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3^{rd} Ed., Wiley, 1968.
2. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.
3. Koshy, T. Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.

G. A. Jones & J. M. Jones "Elementary Number Theory", Springer UTM, 2007.

20CSC12

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Basics of Data structures and algorithms.

Course Objectives: The objectives of this course are

1. To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. To introduce the different algorithmic approaches for problem solving through numerous example problems.
3. To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify and apply asymptotic notations to measure the performance of algorithms.
2. Describe the algorithmic design techniques of divide and conquer, greedy, dynamic programming, backtracking and branch and bound to solve problems.
3. Apply suitable algorithmic design techniques to solve problems to get optimal solution.
4. Analyze the performance of algorithmic design techniques.
5. Evaluate the efficiency of alternative solutions derived for a problem by applying various algorithmic design techniques.
6. Formulate approximate solutions to NP problem.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	1	1	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	1	1	1	-
CO5	2	2	1	-	-	-	-	-	-	-	-	-	1	1	1	-
CO6	2	3	1	-	-	-	-	-	-	-	-	-	1	1	1	-

UNIT - I

Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Divide and Conquer:** The general method. **Analysis of recursive algorithms through recurrence relations:** Substitution method, Recursion tree method and Masters' theorem.

UNIT - II

Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence, Optimal Binary search tree.

UNIT - III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycle. **Branch-and-Bound**: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT - IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting. **Shortest Path Algorithms**: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms. **Minimum Spanning Tree Algorithms**: Prim's and Kruskal's.

UNIT - V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility. **Standard NP-Complete Problems and Reduction Techniques:** The Clique Problem, vertex-cover and Subset Sum Problem.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 3rd Edition, 2009.
2. E. Horowitz, sartaj sahni and sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2008.

Suggested Reading:

1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and Internet Examples, Wiley Second Edition.

Online Resources:

1. https://nptel.ac.in/courses/106101060/

20CSC13

COMPUTER ARCHITECTURE AND MICROPROCESSOR

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Digital Logic Design.

Course Objectives: The objectives of this course are

1. To understand the basic principles of Instruction Level Architecture and Instruction Execution, Memory System Design.
2. To learn various I/O devices and its operations, knowledge on Instruction Level Parallelism.
3. To impart the knowledge on Micro Programming and Pipelining techniques.

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
2. Design assembly language program for specified computing 16 bit multiplication, division and I/O device interface.
3. Derive flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
4. Design a memory module and analyze its operation by interfacing with the CPU.
5. Apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.
6. Develop testing and experimental procedures on Microprocessor and analyze their operation under different cases.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	-	1	-	-	-	-	-	2	1	-	1	-	-	-
CO2	2	1	1	2	3	-	-	-	3	1	2	-	2	2	1	1
CO3	1	2	-	1	-	-	-	-	-	2	-	1	-		2	1
CO4	-	2	2	1	-	-	-	-	3	1	-	1	-	2	2	1
CO5	-	3	2	1	1	-	-	-	-	1	-	1	-	2	-	-
CO6	-	1	1	1	1	2	2	-	3	1	-	-	2	3	2	2

UNIT - I

Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi-computers. **Arithmetic:** Addition and Subtraction of Signed numbers, Design of fast adders, Multiplication of positive numbers, Signed-Operand Multiplication, Integer Division.

UNIT - II

Basic Processing Unit: Fundamental concepts, Execution of a complete instruction, Multiple-Bus organization, Hardwired control, Micro programmed control. **8086 Architecture:** CPU Architecture, Internal operation, Machine language instructions, Addressing modes, Instruction formats, Instruction execution timing.

UNIT- III

Assembly Language Programming: Instruction format, Data transfer instructions, Arithmetic instructions. **Assembly Language Programming:** Branch instructions, Loop instructions, NOP and HLT, Flag manipulation instructions, Logical instructions, Shift and Rotate instructions, Directives and Operators.
Modular Programming: Linking and Relocation, Stacks, Procedures, Interrupts and Interrupt routines, Macros and String instructions, REP prefix.

UNIT - IV

Peripheral devices and their characteristics: Input-output subsystems, I/O deviceinterface,I/Otransfers– ProgramControlled,InterruptDrivenandDMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces– SCSI,USB.

Pipelining: Basic concepts, Data hazards, Instruction hazards, Influence on instruction sets, Data path and control considerations, Superscalar operation, Performance considerations.

UNIT – V

The Memory System: Memory hierarchy ,Semiconductor RAM Memories, Cache Memories, Performance considerations, Virtual Memories, Memory Management requirements, Secondary Storage. **Large Computer Systems:** Forms of Parallel Processing, Array Processors, Structure of general purpose multiprocessors, Program parallelism and shared variables.

Text Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th Edition, McGraw Hill Education Edition2011.
2. Yu-chengLiu, Glenn A. Gibson, "Microcomputer Systems: The 8086/8088 Family", 2nd Edition, PHI Learning 2011.

Suggested Reading:

1. M. M. Mano, "Computer System Architecture", 3rd edition, Prentice Hall, 1994.
2. William Stallings, "Computer Organization and Architecture, Design for Performance", Pearson, 9th Edition, 2013.
3. Douglas Hall. "Microprocessor and Interfacing programming and Hardware", Tata McGraw Hill, Revised 2nd Edition, 2007.
4. Brey B. Brey, "The Intel Microprocessor, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro-Processors-Architecture, Programming and Interfacing", 4th Edition, Prentice Hall.

20CSC14

DATA BASE MANAGEMENT SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: Discrete mathematics of computer science, Programming and data structures.

Course Objectives: The objectives of this course are

1. To become familiar with fundamental concepts of database management. These concepts include aspects of database design, database languages and database-system implementation.
2. To understand about data storage techniques and indexing.
3. To impart knowledge in transaction management, concurrency control techniques and recovery procedures.

Course Outcomes: On Successful completion of the course, students will be able to

1. Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS .Design the database logically using ER modeling.
2. Outline the schema of the relational database and key constraints. Develop queries using fundamental, extended operators of relational algebra and DDL, DML and DCL of SQL .
3. Explore the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
4. Summarize the concepts of dense ,sparse ,ISAM and B+ tree indexing and get familiar with static and extendable techniques of hashing .
5. Explain the states and properties of transaction. Interpret the locking, time stamp, graph and validation based protocols for concurrency control.
6. Relate log based, ARIES recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transaction .

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	1	-	-	-	1	-	-	-	-	-	2	1	-	2	-
CO 2	3	2	1	-	-	1	-	-	-	-	-	3	1	3	2	-
CO 3	3	2	2	2	-	2	-	-	2	-	-	-	2	2	2	3
CO 4	3	2	2	2	2	2	-	-	2	-	-	-	2	3	2	3
CO 5	3	2	3	2	2	2	3	-	2	-	3	3	2	3	3	3
CO 6	3	3	3	2	2	2	3	-	2	-	3	3	2	3	3	3

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Users and Administrators, Database System Architecture, Application Architectures. **Database Design and E-R Model:** Overview of the Design Process, Data Models, The E-R Model, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Reduction to Relation Schemas.

UNIT - II

Relational Model: Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Fundamental Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations. **Structured Query Language:** Overviews, SQL Data Types, Basic Structure of SQL Queries, Modification of the Database, Set Operations, Aggregate Functions, Data-Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT- III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization–1NF,2NFand 3NF,Dependency Preservation, BCNF, Comparison of BCNF and 3NF.Indexing: Basic Concepts, Primary Index, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+Tree Index Files.

UNIT - IV

Hash based Indexing: Static Hashing, Extendible Hashing. **Transaction Management and Concurrency Control:** Transaction Concept – ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity.

UNIT - V

Deadlocks: Deadlock Prevention, Deadlock Detection and Recovery**. Recovery System:** Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Non-volatile Storage, ARIES Recovery Method, Remote Backup Systems.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", Sixth Edition, McGraw-Hill International Edition, 2011.
2. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database Systems", Eight Editions, Pearson Education, 2006.
3. Raghu Ramakrishnan, Johnnes Gehrke, "Database Management Systems", Third Edition, McGraw-Hill, 2003.
4. Ramez Elmasri, Durvasul VLN Somayazulu, Shamkant B Navathe, Shyam K Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006.

Suggested Reading:

1. J. D. Ullman, "Principles of Database Systems", Galgotia.

Online Resources:

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html

20CSC15

INTERNET AND WEB TECHNOLOGIES

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Pre-requisites: Programming and Problem Solving, Object Oriented Programming concepts.

Course Objectives: The objectives of this course are
1. Acquire knowledge on XHTML, Java Script and XML to develop client side web applications.
2. Acquire knowledge on web frameworks to develop server side web applications
3. Develop dynamic web content using Django.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the technologies required for developing web application.
2. Identify and choose XHTML tags, CSS and java scripts to develop well-structured and easily maintained web pages.
3. Design and Develop interactive and innovative web pages using various platforms/technologies like XHTML, CSS, XML, JAVASCRIPT.
4. Create and deploy web applications in web server by using server-side programming concepts like Python.
5. Build a data driven web site using different frameworks and Databases.
6. Evaluate different web applications to implement optimal solutions for real time problems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
CO 2	2	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
CO 3	2	2	2	2	3	-	-	-	1	-	-	-	-	-	2	2
CO 4	2	2	2	2	3	-	-	-	1	3	1	3	-	-	-	-
CO 5	2	2	2	2	3	3	-	-	1	-	1	3	-	-	2	2
CO 6	2	2	2	2	3	3	-	3	3	3	3	3	-	-	3	3

UNIT – I

Web Basics and Overview: Introduction to Internet, World Wide Web, URL, MIME,HTTP Transactions**,** Enterprise Application Architecture styles, containers, Client-Side Scripting, Server-Side Scripting, Accessing Web Servers, Apache and MySQL, IDE's.

UNIT – II

XHTML: Introduction to basics of XHTML, Cascading Style Sheets.
XML: Introduction to XML, XML document structure, DTD, Namespaces and XML Schemas.

UNIT - III

The Basics of Java script: Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements.
Dynamic Documents with Java Script: Positioning Elements, Moving Elements, Changing Colors and Fonts, Dynamic Content.

UNIT – IV

Django: Introduction, Models, Templates, supported data bases, URL configuration. Templates, Modifying and Improving the Templates , Creating a Form, Connecting Django with databases, enable Django sessions.

UNIT – V

Applications: Introduction to Ajax, Node.js and JSON.
Bootstrap: Introduction to Bootstrap, bootstrap grid, bootstrap components.
Web Application Frameworks: AngularJS, JQuery, Flask, Web2py, FuelPhP**.**

Text Books:

1. Nigel George, "Build a Website with Django3", GNW Independent Publishing, Hamilton NSW, Australia, 2019
2. HTML5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Dreamtech, 2017.
3. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 8th Edition-2013
4. Adrian Holovaty and Jacob Kaplan-Moss" The Definitive Guide to Django Web Development Done Right", après-2009
5. P. J. Deitel - Deitel, H. M. Deitel - Deitel, "Internet & World Wide Web How To Program", 5th Edition, Prentice Hall, 2007.
6. Miguel Grinberg , "Flask Web Development", First edition-2014.

Suggested Reading:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. Chris Bates, "Web Programming, building internet applications", 2nd edition, John Wiley & Sons, 2010.
3. JavaScript for Modern Web Development: Building a Web Application Using HTML, CSS, and JavaScript, by Alok Ranjan, Abhilasha Sinha, Ranjit Battwad, BPB, 2020.

Online Resources:

1. https://www.w3.org/standards/webdesign/
2. https://www.w3schools.com/angular/
3. https://www.w3schools.com/jquery/default.asp
4. https://www.tutorialspoint.com/flask/index.htm
5. https://www.tutorialspoint.com/web2py/index.htm
6. https://www.tutorialspoint.com/fuelphp/index.htm

20MBC01

ENGINEERING ECONOMICS & ACCOUNTANCY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: The Objectives of the Course are:
1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes: After Completion of the Course, Student will be able to:
1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	1	1	3	1	1	1	1	1	1	1	-	-	-	-	1	1
CO 2	2	2	2	2	-	1	1	1	-	1	-	1	-	1	2	1
CO 3	1	2	1	2	2	-	2	1	-	1	-	-	-	1	2	-
CO 4	2	2	1	2	2	1	1	3	-	1	-	-	-	-	1	-
CO 5	1	3	1	2	1	1	2	-	-	1	2	1	-	2	-	-

Unit-I Introduction to Managerial Economics

Introduction to Economics and its evolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

Unit-II Demand and Supply Analysis

Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

Unit-III Production and Cost Analysis

Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.

Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Unit-IV Accountancy

Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Unit-V Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

Text Books:

1. Mehta P.L., "Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2016.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013.

Suggested Readings:

1. Panday I.M. "Financial Management", 11th edition, VikasPublishing House, 2015.
2. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
3. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
4. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

20MTC14

MATHEMATICAL FOUNDATION FOR DATA SCIENCE & SECURITY LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. To know the characteristic of various continuous probability distributions
4. To know the impact of number theory before computer age.
5. To know the security issues of Cryptography

Course outcomes: On successful completion of this course the students shall be able to
1. Analyze the coefficient of skewness and fitting of the data by various methods
2. Apply properties of Mathematical Expectations and analyze the various distributions.
3. Evaluate areas of curves by using various distributions.
4. Apply various technics of Number Theory for solving problems
5. Apply RSA –PKC for solving security issues.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO 2	2	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO 3	2	2	1	-	-	-	-	-	-	-	-	1	-	-	-	-
CO 4	2	2	1	-	-	-	-	-	-	-	-	1	-	-	-	-
CO 5	2	2	1	-	-	-	-	-	-	-	-	1	-	-	-	-

List of Programs
1. Write a Program for Create Graphs and Charts
2. Write a Program for Calculate measures of Central Tendency for the data
3. Write a Program for Standard Deviation for the data
4. Write a Program for Correlation and Covariance using Pearson method
5. Write a Program for simple linear Regression and Logistic regression
6. Write a Program for Compute probabilities using Binomial Distribution
7. Write a Program for Compute Probabilities using Poisson Distribution
8. Write a Program for Compute Probabilities using Normal Distribution

Text books:
1. S. R. Mani Sekhar, Dr. T.V. Suresh Kumar, “Programming with R” CENGAGE Publishers, 2017.
2. K. G. Srinivasa, G. M. Siddesh, “Statistical Programming in R”, Oxford University Press, 2017.
3. Jared P Lander, “R for Everyone” Pearson.2018.

Online Resources:
1. http://www.cyclismo.org/tutorial/R/

20CSC16

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Programming and Problem Solving, Basics of Data structures and algorithms lab and Object Oriented Programming.

Course Objectives: The objectives of this course are

1. Design and construct simple programs by using the different design strategies for solving different problems.
2. To enhance programming skills while improving their practical knowledge in implementing the algorithms.
3. To strengthen the practical ability and to apply suitable algorithmic approaches for solving real time problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Implement greedy, dynamic programming, backtracking and branch and bound techniques.
2. Demonstrate various algorithmic design techniques.
3. Analyze the performance of various algorithms.
4. Compare various design strategies.
5. Formulate solutions to solve real world problems use acquired knowledge.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	2	2	1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	3	1	1	3	-	-	-	-	-	-	-	1	1	1	-
CO 4	2	2	1	1	3	-	-	-	-	-	-	-	1	1	1	-
CO 5	2	2	1	-	2	-	-	-	-	-	-	-	1	1	1	-

The following task should be carried out by the students in the laboratory for each experiment:-

1. Setup the environment for the experiment.
2. Select appropriate design technique to implement the problem.
3. Represent the solution using algorithm
4. Analyze the performance of the algorithm (Time and Space complexity)
5. Justify the performance of your solution is better than other strategies.

By performing the above task for each experiment the following COs are achieved,

Course Outcome	-	1	2	3	4	5
Task	1	2	3	4	5	*

*As all the questions are real world applications so CO5 is achieved

List of Experiments:

1. You are given the task of choosing the optimal path to connect 'N' devices. The devices are connected with the minimum required N-1 wires into a tree structure, and each device is connected with the other with a wire of length 'L' ie 'D_1'connected to 'D_2' with a wire of length 'L_1'. This information will be available for all 'N' devices.
    a) Determine the minimum length of the wire which consists of N-1 wires that will connect all devices.
    b) Determine the minimum length of the wire which connects D_i and D_j
    c) Determine the minimum length of the wire which connects D_i to all other devices.
    d) Determine the minimum length of the wire which connects D_i to all other devices where $1 \leq i \leq N$.
2. An X-ray telescope (XRT) is a telescope that is designed to observe remote objects in the X-ray spectrum. In order to get above the Earth's atmosphere, which is opaque to X-rays, X-ray telescopes must be mounted

on high altitude rockets, balloons or artificial satellites. Planets, stars and galaxies and the observations are to be made with telescope. Here the process of rotating equipment into position to observe the objects is called slewing. Slewing is a complicated and time consuming procedure handled by computer driven motors. The problem is to find the tour of the telescope that moves from one object to other by observing each object exactly once with a minimum total slewing time.

3. CSE department of CBIT want to generate a time table for 'N' subjects. The following information is given- subject name, subject code and list of subjects code which clashes with this subject. The problem is to identify the list of subjects which can be scheduled on the same time line such that clashes among them do not exist.
4. A Test has 'N' questions with a heterogeneous distribution of points. The test-taker has a choice as to which questions can be answered. Each question Q_i has points P_i and time T_i to answer the question, where $1 \leq i \leq N$. The students are asked to answer the possible subsets of problems whose total point values add up to a maximum score within the time limit 'T'. Determine which subset of questions gives student the highest possible score.
5. Given N items with their corresponding weights and values, and a package of capacity C, choose either the entire item or fractional part of the item among these N unique items to fill the package such that the package has maximum value.
6. Given a bunch of projects, where every project has a deadline and associated profit if the project is finished before the deadline. It is also given that every project takes one month duration, so the minimum possible deadline for any project is 1 month. In what way the total profits can be maximized if only one project can be scheduled at a time.
7. N-Queen is the problem of placing 'N' chess queens on an N×N chessboard. Design a solution for this problem so that no two queens attack each other.

   Note: A queen can attack when an opponent is on the same row, column or diagonal.
8. Bi-connected graphs are used in the design of power grid networks. Consider the nodes as cities and the edges as electrical connections between them, you would like the network to be robust and a failure at one city should not result in a loss of power in other cities.
9. Consider a source code structure where you are building several libraries DLLs (Dynamic-Link Library) and they have dependencies on each other. For example, to build DLL , you must have built DLLs B, C and D (Maybe you have a reference of B,C and D in the project that builds A).

Text Books

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, MIT Press/McGraw-Hill, 2009.
2. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis, and Internet Examples", Second Edition, Wiley, 2001.

20CSC17

DATA BASE MANAGEMENT SYSTEMS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The objectives of this course are

1. To become familiar with the concepts of structured query language.
2. To understand about programming language / structured query language (PL/SQL).
3. To become familiar with generation of form and open database connectivity.
4. Add constraints on Databases implement DCL, TCL and advanced SQL commands.
5. Develop programs using cursors, triggers, exceptions, procedures and functions in PL/SQL.

Course Outcomes: On Successful completion of the course, students will be able to

1. Outline the built-in functions of SQL and apply these functions to write simple and complex queries using SQL operators.
2. Demonstrate Queries to Retrieve and Change Data using Select, Insert, Delete and Update. Construct Queries using Group By, Order By and Having Clauses.
3. Demonstrate Commit, Rollback, Save point commands, SQL Plus Reports and formulate the Queries for Creating, Dropping and Altering Tables, Views, constraints.
4. Develop queries using Joins, Sub-Queries and Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update, Creating Password and Security features.
5. Demonstrate the usage of data types , Bind and Substitution Variables , Anchored, Declarations , Assignment Operation and PL/SQL code using Control Structures .
6. Develop PL/SQL code using Cursors, Exception, Composite Data Types and Procedures, Functions and Packages.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	2	2	-	-	-	-	-	-	-	1	-	2	-
CO 2	3	2	2	2	2	-	-	-	3	-	2	-	1	3	2	-
CO 3	3	1	2	-	-	-	-	-	2	-	2	-	2	2	2	3
CO 4	3	-	2	-	-	-	-	-	-	-	-	-	2	3	2	3
CO 5	3	2	2	-	-	-	-	-	-	-	-	-	2	3	3	3
CO6	3	2	2	-	-	-	-	-	-	-	-	-	2	2	2	2

SQL:

1. Queries using Built-In functions, like aggregate functions, String Functions, Numeric Functions, Data Functions, Conversion Functions and other miscellaneous.
2. Queries using operators in SQL.
3. Queries to Retrieve and Change Data: Select, Insert, Delete and Update.
4. Queries using Group By, Order By and Having Clauses.
5. Queries on Controlling Data: Commit, Rollback and Save point.
6. Queries to Build Report in SQL *PLUS.
7. Queries for Creating, Dropping and Altering Tables, Views and Constraints.
8. Queries on Joins and Correlated Sub-Queries.
9. Queries on Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update,
10. Creating Password and Security features.

PL/SQL:

11. Write a PL/SQL code using Basic Variable, Anchored Declarations and Usage of Assignment Operation.
12. Write a PL/SQL code Bind and Substitution Variables, Printing in PL/SQL.
13. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
14. Write a PL/SQL code using Cursors, Exception and Composite Data Types.
15. Write a PL/SQL code using Procedures, Functions and Packages.

Note: The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

Text Books / Suggested Reading:

1. "Oracle: The complete Reference", by Oracle Press.
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick FVander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.

20CSC18

INTERNET AND WEB TECHNOLOGIES LAB

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	2

Pre-requisites: Programming and Problem Solving, Object Oriented Programming concepts.

Course Objectives: The objectives of this course are

1. To acquire knowledge on XHTML, Java Script, Ajax, Node.js, JSON, Bootstrap and XML to develop web applications.
2. Ability to develop dynamic web content using web frameworks.
3. To understand the design and development process of a complete web application.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify and install web development tools.
2. Develop client side web pages using XHTML, CSS and XML.
3. Create dynamic, interactive web applications using java script.
4. Develop server side web application using Django Frame work.
5. Understanding working of Ajax, Node.js and JSON.
6. Identify and explore different frame works for web applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	-	1	3	-	-	-	1	-	-	2	-	-	-	-
CO 2	1	2	2	2	-	-	-	3	2	1	2	2	-	-	2	2
CO 3	1	2	2	2	3	-	-	3	2	1	2	2	-	-	-	-
CO 4	1	2	2	2	2	-	-	3	2	1	2	2	-	-	2	2
CO 5	1	2	2	2	2	-	-	3	2	1	2	2	-	-	-	-
CO 6	1	2	2	2	2	-	-	3	2	1	2	2	-	-	-	-

LIST OF PROGRAMS

1. Creation of development environment (IDE, Web Server)
2. Design simple web pages using XHTML and CSS.
3. Create well-formed document using DTD and XML schema.
4. Develop an application to validate form fields using java script.
5. Installation of Django and creation of web pages.
6. Create a form validation and session handling in Django.
7. Develop a data driven web application using databases (MySQL/SQLite).
8. Create a responsive web site using bootstrap.
9. Build an application on Ajax, Node.js and JSON.
10. Exploration of web frame works (AngularJS, JQuery, Flask, Web2py, FuelPhP).

Text Books:

1. Nigel George,"Build a Website with Django3", GNW Independent Publishing, Hamilton NSW, Australia,2019
2. HTML5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, JQuery), Dreamtech, 2017.
3. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 8th Edition-2013
4. Adrian Holovaty and Jacob Kaplan-Moss "The Definitive Guide to Django Web Development Done Right",aprèss- 2009
5. P.J.Deitel – Deitel, H.M.Deitel – Deitel, "Internet & World Wide Web How to Program", 5th Edition, Prentice Hall, 2007.
6. Miguel Grinberg , "Flask Web Development", First edition-2014

Suggested Reading:

1. Web Technologies, Uttam K Roy, Oxford University Press

2. Chris Bates, "Web Programming, building internet applications", 2nd edition, John Wiley & Sons, 2010.
3. JavaScript for Modern Web Development: Building a Web Application Using HTML, CSS, and JavaScript, by Alok Ranjan , Abhilasha Sinha, Ranjit Battwad, BPB,2020.

Online Resources:

1. https://websitesetup.org/bootstrap-tutorial-for-beginners/
2. https://www.guru99.com/node-js-tutorial.html.
3. https://www.w3.org/standards/webdesign/
4. https://www.w3schools.com/angular/
5. https://www.w3schools.com/jquery/default.asp
6. https://www.tutorialspoint.com/flask/index.htm
7. https://www.tutorialspoint.com/web2py/index.htm
8. https://www.tutorialspoint.com/fuelphp/index.htm

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

SCHEME OF INSTRUCTION AND EXAMINATION
Model Curriculum(R-20) with effect from the A.Y. 2021-22

B.E. (Computer Science and Engineering)

SERVICE COURSES

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
1	20CSC36	Introduction To AI Tools, Techniques And Applications	1	1	-	3	40	60	2
2	20CSC37	Introduction To AI Tools, Techniques And Applications Lab	-	-	2	3	50	50	1
3	20CSC38	Design Thinking And Innovation	-	-	3	3	50	50	1.5
4	20CSC06	Basics of Data Structures	2	-	-	3	40	60	2
5	20CSC07	Basics of Data Structures Lab	-	-	2	3	50	50	1
6	20CSC34	OOPS using Python (for Biotech)	3	-	0	3	40	60	3
7	20CSC35	OOPS using Python Lab (for Biotech)	-	-	2	3	50	50	1

20CSC36

INTRODUCTION TO AI TOOLS, TECHNIQUES AND APPLICATIONS

Instruction	1L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	2

Prerequisite: Basic understanding of computer fundamentals

Course Objectives: The objectives of this course are to:
1. Introduce fundamental concepts of AI
2. Demonstrate the capabilities of AI applications
3. Present various modeling and formulation techniques to solve problems using AI
4. Introduce state-of-art tools and techniques

Course Outcomes: On successful completion of the course, students will be able to
1. Understand fundamental concepts of AI and its importance.
2. Identify various Machine Learning algorithms and their limitations.
3. Develop Chatbots based on requirements.
4. Analyze complex problems involving image processing, Computer Vision and HCI.
5. Understand smart solutions for various domains .

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs			
													1	2	3	4
CO1	2	-	-	-	2	-	-	-	-	-	-	-	2	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	2	2	-	-
CO4	-	-	2	3	2	-	-	-	-	-	-	-	3	-	2	1
CO5	2	2	2	-	-	-	1	-	-	-	-	-	3	-	-	1

UNIT - I

Introduction to Artificial Intelligence: Definition, importance of AI, application areas, state-of-the-art in AI, overview of hard AI problems and challenges facing in the field of AI;

Machine Learning: Introduction, machine learning algorithms, machine learning in practice, testing, problems with machine learning, dangers of machine learning and benefits

UNIT - II

Natural Language Processing: Overview of NLP and components, applications, use cases of NLP and challenges; **Computer Vision:** capabilities of computer vision, use of computer vision, computer vision on mobile devices, best practices and use cases, challenges

UNIT - III

Building AI and Machine Learning Projects: Workflow of a ML project, data science project, data collection, data set preparation; **AI Technologies, Tools, Platforms**: TensorFlow, Scikit, PyTorch, Keras, RapidMiner, AWS, Google Cloud AI, Azure, IBM Watson

UNIT - IV

Chatbots: Introduction to chatbots, architecture of a chatbot, process build Chatbots, challenges in building successful Chatbots, best practices, industry case studies. Virtual assistants

UNIT - V

Applications and Impact of AI: Smart applications, Current challenges, trends, opportunities, scalability, adversarial attacks on AI, adverse uses of AI, impact of AI on world's economy and its social implications

Text Books:

1. Tom Markiewicz & Josh Zheng, "Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications" O'Reilly, 2017
2. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach

Suggested Reading:

1. Aurélien Géron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017
2. Joseph Howse, Prateek Joshi, Michael Beyeler - Opencv_ Computer Vision Projects with Python-Packt Publishing (2016)

Online Resources:

1. https://medium.com/@salisuwy/build-an-ai-assistant-with-wolfram-alpha-and-wikipedia-in-python-d9bc8ac838fe
2. https://www.coursera.org/learn/uol-machine-learning-for-all
3. https://www.coursera.org/learn/uol-machine-learning-for-all#syllabus
4. http://aws.amazon.com 2.http://code.google.com/appsengine
5. http://scikit-learn.org/stable
6. https://opencv.org/
7. https://github.com/qqwweee/keras-yolo3
8. https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/

20CSC37

INTRODUCTION TO AI TOOLS, TECHNIQUES AND APPLICATIONS LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Course Objectives: The main objectives of this course are to:
1. Expose the students to AI related real world problems
2. Familiarize students with AI tools and techniques
3. Expose students with AI technologies and platforms

Course Outcomes: At the end of the course, students shall be able to
1. Demonstrate the capabilities of AI
2. Build models for various real time problems using AI/ML Tools
3. Develop Chatbots, programs for simple applications
4. Analyze and interpret the experimentation results
5. Develop skills to communicate the experimentation results

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs			
													1	2	3	4
CO1	2	-	-	-	2	-	-	-	-	-	-	-	3	2	-	-
CO2	2	2	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	2	3	2	-
CO4	-	2	2	3	-	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-	2

Lab Experiments
1. Overview of AI, AI/ML project life cycle
2. Design/construct the workflow of a general AI project using draw.io
3. Train a ML model to recognize a Person or Object including gestures
4. Train a ML model to recognize various sound bytes and speech
5. Develop an app to recognize objects using image classification
6. Develop an Expression Match app using the trained ML model for facial expressions
7. Develop a Voice Authentication app tat uses a trained audio model of the user using audio classification to recognize the user's voice to authentication
8. Develop a conversational chatbot to automatically recognize speech, understand the intent of the user and generate a response accordingly using Amazon Lex
9. Design a program using Wolfram Language to classify Data (Numbers, Images, Colors) using automatic model selection
10. Design a program using the Wolfram Language to demonstrate Vector Encoding based Feature Extraction and Clustering for a dog image dataset

Text Books:
1. Tom Markiewicz & Josh Zheng, "Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications" O'Reilly, 2017

Online Resources:
1. https://teachablemachine.withgoogle.com/v1/
2. https://appinventor.mit.edu/
3. https://aws.amazon.com/lex/
4. https://www.wolfram.com/
5. https://www.coursera.org/

20CSC38

DESIGN THINKING AND INNOVATION
(Course for all branches)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Course Objectives: The main objectives of this course are:
1. To immerse students into the world of innovation as a systematic process of tackling relevant business and/or social problems
2. To provide a social and thinking space for the recognition of innovation challenges and the design of creative solutions
3. To make the students to understand design thinking techniques, idea generation approaches

Course Outcomes: At the end of the course, students shall be able to
1. Recognize the latest and future issues and challenges in innovations
2. Understand creative thinking techniques, corporate needs and commercialization of ideas/products
3. Identify the state-of-the-art perspectives, ideas, concepts and solutions related to the design and execution of innovation driven projects using design thinking principles
4. Develop innovative ideas or alternative models for solving problems
5. Recognize and specify the best problem to solve and restate the problem as a function of its mutually exclusive and collective exhaustive different dimensions

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO 4	-	-	3	2	-	-	-	-	-	-	-	-	2	3	2	-
CO 5	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-

UNIT-1
Introduction to Design Thinking: Introduction, history of modern design, early innovations industrialization, new materials, nature of design work, design for survival and survival for designing.

UNIT-2
Design Thinking: Design thinking as a systematic approach to innovation, brain storming, visual thinking, design challenges, product development.

UNIT-3
Idea Generation: Innovation, art of innovation, strategies for creativity, teams for innovation, design alternatives, decision making for new design.

UNIT-4
Design Thinking and Commercialization: Design thinking for strategic innovation, application of design thinking in business strategy, linking design thinking solutions to business challenges, Enterprise creativity, competitive logic of business strategy, design thinking for startups.

UNIT-5
Creative Thinking Techniques: Linear thinking, constraints in design, design thinking to meet corporate needs, designs for future

Text Books:

1. David Raizman “History of Modern Design”, Laurence King Publishing Ltd. Ed2, 2010
2. Tim Brown “Change by Design”, Harper Bollins, 2009
3. Tom Kelley with Jonathan Littman, “Ten Faces of Innovation”, Currency Books, 2006
4. Jimmy Jain, “Design Thinking for Startups”, Notion Press, 2018
5. Tom Kelley & Jonathan Littman, “The Art of Innovation”, Harper Collins Business, 2001
6. Michael Michalco, “Thinker Toys”, Ten Speed Press, 2006
7. Idris Mootee, “Design Thinking for Strategic Innovation” , John Willey & Sons, 2013

20CSC06

BASICS OF DATA STRUCTURES
(Common for all Programmes except CSE & IT)

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	20 Marks
Credits	2

Prerequisites: Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: To introduce
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

Course Outcomes: The students will be able to
1. Identify various data structures, searching & sorting techniques and their applications.
2. Describe the linear and non-linear data structures, searching and sorting techniques.
3. Apply suitable data structures to solve problems.
4. Analyze various searching and sorting techniques.
5. Evaluate the linear and non-linear data structures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	2	1	-	-	-	–	-	-	-	–	–	-				
CO 2	2	1	-	-	-	–	-	-	-	–	–	-				
CO 3	2	2	1	-	-	–	-	-	-	–	–	-				
CO 4	2	3	1	-	-	–	-	-	-	–	–	-				
CO 5	2	2	-	-	-	–	-	-	-	–	–	-				

UNIT - 1
Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms- Complexity- Time and space tradeoff.
Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT - 2
Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT - 3
Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications

UNIT - 4
Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

UNIT - 5
Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees
Searching and Sorting: Linear searching, binary Searching, sorting algorithms- bubble sort, selection sort, quick sort, heap sort

Text Books:
1. Narasimha Karumanchi "Data Structures and Algorithms Made Easy", Career Monk Publications, 2017
2. E. Horowitz , S. Sahni and Susan Anderson-Freed, "Fundamentals of Data structures in C", Silicon Pr; 2 edition (1 August 2007)
3. ReemaThareja, "Data Structures using C", Oxford, 2014

Suggested Reading:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

20CSC07

BASICS OF DATA STRUCTURES LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Any Programming Language(C)

Course Objectives:

1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes: The students will be able to

1. Implement the abstract data type.
2. Demonstrate the operations on stacks, queues using arrays and linked lists
3. Apply the suitable data structures including stacks, queues to solve problems
4. Analyze various searching and sorting techniques.
5. Choose proper data structures, sorting and searching techniques to solve real world problems

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	1	-	-	-	-	-	-	-	-	-				
CO 2	1	2	1	2	-	-	-	-	-	-	-	-				
CO 3	2	2	1	-	-	-	-	-	-	-	-	-				
CO 4	2	3	1	-	-	-	-	-	-	-	-	-				
CO 5	2	3	2	-	-	-	-	-	-	-	-	-				

List of Experiments

1. Implementation of operations on arrays
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of Sorting Techniques
7. Case study like Banking System, Students Marks Management, Canteen Management, Library Management etc.

Text Books:

1. Brian W Kernighan, Dennis Ritchie, C Programming Language, PH PTR, 2nd Edition.
2. Richard M Reese, Understanding and Using C Pointers, O`Reily , 2013.

Online Resources:

1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

20CSC34

OOPS USING PYTHON

Instruction	3 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Sessional	40 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Describe the principles of Object-Oriented Programming.
2. Enable the students to solve problems using OOPs features.
3. Debugging in programs and files.
4. Use of library modules to develop applications.

Course Outcomes: On Successful completion of the course students will be able to:
1. Demonstrate the concepts of Object-Oriented Programming languages to solve problems.
2. Apply the constructs like selection, repetition, functions and packages to modularize the programs.
3. Design and build applications with classes/modules.
4. Find and rectify coding errors in a program to assess and improve performance.
5. Develop packages for solving simple real world problems.
6. Analyze and use appropriate library software to create mathematical software.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO 2	-	3	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	-	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	-	1	-	1	-	-	-	-	-	-	-	-	-	-
CO 5	-	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 6	1	2	-	1	-	-	-	-	-	-	-	-	-	1

UNIT - I

Introduction to Object Oriented Programming: Introduction to Programming Languages, Features of Object Oriented Programming, Merits and Demerits of OOPs

Basics of Python Programming: Features of Python, Variables, Identifiers, Data types, Input/Output operations, Operators and Expressions, Operations on Strings, Type Conversion.

UNIT - II

Decision Control Statement: Selection/Conditional Branching, Loop Control Structures, Nested Loops.

Functions and Modules: Uses of functions, Function definition, function call, Variable scope and Lifetime, Recursion, Lambda functions, map, reduce and filter built-in functions, Recursive Functions, Modules, Packages.

UNIT - III

Classes and Objects: Introduction, Classes and Objects, init method, Class variables, and Object variables, Public and Private Data members, calling methods from other methods, garbage collection, class methods, static methods.

UNIT - IV

Inheritance: Introduction, Inheriting classes, Polymorphism and method overloading, Composition or Containership, Abstract classes and inheritance.

Operator Overloading: Introduction, Implementation of Operator Overloading, Overriding.

File Handling: File types, opening and closing files, reading and writing files, file positions, Regular Expression.

UNIT - V

Error and Exception Handling: Introduction to errors and exceptions, Handling Exceptions, Plotting Graphs in Python (Use of Matplotlib).

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Text Books:

1. ReemaThareja "Python Programming", Oxford Press, 2017.
2. Mike McGrath "Python in easy steps: Makes Programming Fun", Kindle Edition,2017.

Suggested Reading:

1. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.

Online Resources:

1. https://anandology.com/python-practice-book/ object_oriented_programming.html
2. http://python-textbok.readthedocs.io/en/1.0/ Object_Oriented_Programming.html
3. http://www.tutorialspoint.com/python/python_classes_objects.html
4. https://docs.python.org/3/

20CSC35

OOPS USING PYTHON LAB

Instruction	2 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Sessional	50 Marks
Credits	1

Course Objectives: The objectives of this course are
1. Identification and installation of required software to work with Python.
2. Program development using OOPs concepts.
3. Handling of errors in program code.
4. Use of library modules to develop applications.

Course Outcomes: On Successful completion of the course, student will be able to
1. Inspect and identify suitable programming environment to work with Python.
2. Choose appropriate control constructs, data structures to build the solutions.
3. Develop the solutions with modular approach using functions, packages to enhance the code efficiency.
4. Analyze and debug the programs to verify and validate code.
5. Demonstrate use of STLs and modules to build applications.
6. Determine the requirements of real world problems and use appropriate modules to develop solutions.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	2	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	1	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 5	1	3	1	2	-	-	-	-	-	-	-	-	-	-
CO 6	1	2	1	1	-	-	-	-	-	-	-	-	-	1

Lab Experiments:
1. Installation of any Object Oriented Programming Language and IDE.
2. Simple scripts to demonstrate the use of basic data types and operators.
3. Simple scripts to demonstrate the use of control structures.
4. Functions and Lambda function and parameter passing.
5. Experimentation with Modules.
6. Implementation of classes with attributes and methods.
7. Demonstration of inheritance.
8. Experiments on Overloading.
9. Experimentation of Files and Regular Expressions.
10. Building code to demonstrate Exceptions and built-in tools.
11. Demonstration of Plotting graphs.

Text Book:
1. Reema Thareja "Python Programming", Oxford Press, 2017.

Online Resources:
1. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
2. http://learning-python.com/class/Workbook/x-exercises.htm
3. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
4. https://anandology.com/python-practice-book/ object_oriented_programming.html
5. http://stanfordpython.com/
6. https://docs.python.org/3/