IT Department

R-20 BE (IT)

Scheme & Syllabus of

III-IV Semesters

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instruction of III Semester of B.E. – Information Technology as per AICTE Model Curriculum w.e.f: 2021-22

B.E. –INFORMATION TECHNOLOGY

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	20ECC34	DC Circuits, Sensors and Transducers	3	-	3	40	60	3
2	20ITC05	Digital Logic and Computer Architecture	3	-	3	40	60	3
3	20ITC06	Discrete Mathematics and Applications	3	-	3	40	60	3
4	20ITC07	Java Programming & Enterprise Frameworks	3	-	3	40	60	3
5	20ITC08	Database Management Systems	3	-	3	40	60	3
6	20EGM01	Indian Constitution and Fundamental Principles	2	-	2	-	50	Non-Credit
7	20EGM02	Indian Traditional Knowledge	2	-	2	-	50	Non-Credit
PRACTICAL								
8	20ITC09	Java Programming & Enterprise Frameworks Lab	-	2	3	50	50	1
9	20ITC10	DBMS Lab	-	2	3	50	50	1
10	20ITC11	IT Workshop	-	2	-	50	-	1
11	20ITC12	Mini Project-1	-	2	-	50	-	1
12	20ITI01	MOOCs/Training/Internship	2-3 weeks/90 hours					2
TOTAL			**19**	**8**		**400**	**500**	**21**

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

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

20ECC34 DC CIRCUITS, SENSORS AND TRANSDUCERS

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Concepts of Semiconductor Physics and Applied Physics.

Course Objectives:

1. Understand DC circuit theory for sensors and transducers.
2. Describe semiconductor device's principles and understand the characteristics of junction diode and transistors.
3. Understand working principles of Oscillators, Sensors, and Transducers.
4. Understand Interfacing of various modules of DAQ with myDAQ and myRIO

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Understand about the basics of lower power systems, DC circuits.
2. Use semiconductor devices in making circuits like rectifiers, filters, regulators, etc.
3. Design transistorized circuits of amplifiers and oscillators
4. Acquire the data from various sensors and transducers with the help of DAQ.
5. Analyze usage of sensors/transducer for the development of real-time applications.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	2	3	2	3	2	3	2	1	-	1
CO2	3	3	3	2	1	2	3	2	3	2	3	2	1	-	1
CO3	3	2	3	2	3	3	3	2	3	2	3	2	2	2	1
CO4	3	3	3	3	3	3	3	2	3	2	3	2	2	2	1
CO5	3	3	3	3	3	3	3	2	3	2	3	2	2	2	1

UNIT-I

DC Circuit theory: Basic DC theory, Voltage and Current relationship, Power in Electronics and its calculation, Types of Current - Direct Current (DC) and Alternating Current (AC), DC Voltage, Conventional Current Flow Vs. Electron Flow. Measurement of DC current and power in a circuit, Parallel and Series circuits, Batteries and alternative sources of energies.

UNIT-II

Introduction to semiconductor: Characteristics of P-N Junction diode, current equation. Characteristics of Zener Diode

Applications: Zener Diode as a voltage regulator, Half Wave Rectifier and Full Wave Rectifier

Introduction to Transistors: Classification, Bipolar Junction Transistors Configurations.

UNIT-III

Feedback Circuits: Principles of Negative Feedback Amplifiers, Advantages, Types, Topologies of negative feedback, Outline the Effect of negative feedback on Gain, Input Impedance and Output Impedance; Principle of Oscillator, Operation of LC Type- Hartley, Colpitts; RC phase shift Oscillator.

Op-Amps Circuits: Basic Principle, Ideal and practical Characteristics and Applications: Summer, Integrator, Differentiator.

UNIT-IV

Sensors: Definition, classification of sensors

Proximity Sensors: Eddy current proximity sensors and its Applications, Inductive proximity switch and its Applications

Velocity, motion, force and pressure sensors: Tacho generator, Optical encoders, Strain Gauge as force Sensor, Fluid pressure: Tactile sensors

Temperature and light sensors: Resistance Temperature detectors, Photo Diodes, Applications of Photo Diodes.

UNIT-V

Transducers: Definition, classification of Transducers

Mechanical Transducers: Displacement-to-Pressure, Seismic Displacement Transducers

Passive Electrical Transducers: LVDT, Resistor Moisture Transducer

Active Electrical Transducers: Hall Effect Transducer, Piezoelectric transducer

Data Acquisition methods: myDAQ, MyRIO-1900 Architecture, myDAQ Interfacing: Interfacing LED's, Seven segment display, temperature sensors, IR Sensors, Range Finder sensors, Motors, motor driver interfaces, Thermistors, Buzzers.

Text Books:

1. John Bird, Electrical Circuit Theory and Technology, Fifth Edition, 2014.
2. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9th edition, LPE, Reprinted, 2006.
3. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
4. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013
5. Ed Doering, NI myRIO Project Essentials Guide, Feb.2016

Suggested Reading:

1. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
2. Anindya Nag, Subhas Chandra Mukhopadhyay, JurgenKosel ,Printed Flexible Sensors: Fabrication, Characterization and Implementation, Springer International Publishing, Year: 2019, ISBN: 978-3-030-13764-9,978-3-030-13765-6
3. User guide, NI myDAQ
4. User guide and specifications NI myRIO-1900

20ITC05 DIGITAL LOGIC AND COMPUTER ARCHITECTURE

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To familiarize with logic gates, combinational and Sequential logic circuits.
2. To provide understanding of Data representation.
3. To present the operation of the Central Processing Unit.
4. To facilitate with the techniques that computers use to communicate with input and output devices.
5. To introduce the concept of memory hierarchy and memory management.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand simplification of logic gates, fundamentals of combinational and sequential logic gates.
2. Design of registers, counters and representation of data using numbers.
3. Understand the architecture and functionality of central processing unit.
4. Discuss the technique s that computers use to communicate with I/O devices for data transfer.
5. Comprehend memory hierarchy, cache memory and virtual memory.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	-	1	-	-	1	2	-	3
CO2	2	1	1	-	1	-	-	-	-	-	-	1	1	-	3
CO3	2	2	1	-	-	-	-	-	-	-	2	2	-	-	3
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	-	3
CO5	2	2	1	-	-	-	1	-	1	-	2	2	1	-	3

UNIT-I

Digital Logic Circuits: Digital Computers, Logic Gates, Boolean Algebra, Map simplification, Product –of-sums Simplification, Don't –Care Conditions, Combinational Circuits, Half-Adder, Full–Adder, Flip-Flops: SR, D, JK, TFlip- Flops, Edge triggered Flip-Flops, Excitation Tables.

UNIT-II

Digital Components: Integrated circuits, Decoders, Encoders, Multiplexers

Registers: Register with Parallel load, Shift Register, Counters.

Data Representation: Data Types, Number Systems, Octal and Hexadecimal Numbers, Decimal Representation, Complements: (r-1)'s Complement, r's Complement, Subtraction of Unsigned Numbers, Fixed–Point Representation, Floating –Point Representation.

UNIT-III

Central Processing Unit: Computer Registers, General register Organization, Instruction Cycle, Instruction Formats: Three Address Instructions, Two-Address Instructions, One-Address Instructions, Zero-Address Instructions, RISC Instructions, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC): CISC Characteristics, RISC Characteristics, Multi core Processors and their Performance.

UNIT-IV

Input-Output Organization: Peripheral Devices: ASCII Alphanumeric Characters, Input-output Interface: I/O Bus and Interface Modules, Asynchronous Data Transfer: Strobe Control, Handshaking, Asynchronous Communication Interface, First-In-First-Out Buffer, Modes of Transfer: Interrupt-Initiated I/O, Priority Interrupt: Daisy Chaining Priority, Parallel Priority

Interrupt, Priority Encoder, Direct Memory Access(DMA): DMA Controller.

UNIT- V

Memory Organization: Memory Hierarchy, Main Memory: RAM and ROM Chips, Memory Address Map, Memory Connection to CPU, Auxiliary memory: Magnetic Disks, solid state drive and Linear Tape Open Technology, Associative Memory: Hardware Organization, Match Logic, Read and Write Operations, Cache Memory: Associative Mapping, Direct Mapping, Set-Associative Mapping, Virtual Memory: Address Space and Memory Space, Address Mapping using Pages, Associative Memory Page Table, Page Replacement.

Text Books:

1. M.MorrisMano,"ComputerSystemArchitecture",3rdEdition,Pearson Education, 2016.
2. John L. Hennessy, David A. Patterson Morgan Kaufman, "Computer Architecture - A Quantitative Approach", 5th edition,, Elsevier,2012
3. William Stallings, "Computer Organization and Architecture", 9th edition, Pearson Education, 2013

Suggested Reading:

1. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL design", 2ndEdition, McGrawHill, 2009.
2. ZVI Kohavi, "Switching and Finite Automata Theory", 2ndEdition, Tata McGrawHill, 1995.
3. William Stallings, "Computer Organization and Architecture", 8thEdition, PHI.
4. Carl Hamachar, Vranesic, Zaky,"ComputerOrganization",5thEdition, McGraw Hill.

Web Resources:

1. https://nptel.ac.in/courses/117106114Week1%20Slides1.1Introduction.pdf
2. https://ece.gmu.edu/coursewebpages/ECE/ECE545/F10/viewgraphs/ ECE545_lecture1_digital_logic_review.ppt
3. http://www.nptelvideos.in/2012/11/computer-organization.html

20ITC06 DISCRETE MATHEMATICS AND APPLICATIONS

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce Propositional Logic, Proof strategy concepts and gain knowledge in Sets and Functions.
2. To acquire knowledge in Induction, Recursion and Number theory applications.
3. To gain knowledge in Counting, Permutations, Combinations and Solving recurrence relations.
4. To introduce basic concepts of graphs, digraphs and relations and their properties.
5. To familiarize with Algebraic Structures.

Course Outcomes:

Upon completing this course, students will be able to:

1. Symbolize the given sentence using propositional logic and apply the onto and one-to-one functions between the sets.
2. Understand the mathematical induction and apply the modular arithmetic for cryptography and congruence applications.
3. Apply permutations and combinations to handle different types of objects, understand Solving homogeneous and Non-homogeneous recurrence using generating functions.
4. Apply relations and graph concepts for basic problem solving.
5. Demonstrate Algebraic systems and their Properties.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	2	3	-	-	1	1	1	3	3	3
CO2	3	3	2	3	1	2	-	-	-	1	-	1	3	3	3
CO3	3	3	3	3	1	2	2	-	-	1	1	1	3	3	3
CO4	3	3	2	3	1	2	3	-	-	1	-	1	3	3	3
CO5	3	3	2	3	-	2	-	-	-	1	-	1	3	3	3

UNIT-I

The Foundations: Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy

Basic Structures: Sets, Functions, Sequences, Sums, and Matrices: Sets, Set Operations, Functions, Sequences and Summations, Cardinality of Sets, Matrices

UNIT-II

Number Theory and Cryptography: Divisibility and Modular Arithmetic, Integer Representations and Algorithms, Primes and Greatest Common Divisors, Solving Congruences, Applications of Congruences, Cryptography.

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms.

UNIT-III

Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Advanced Counting Techniques: Applications of Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion–Exclusion, Applications of Inclusion–Exclusion.

UNIT-IV

Relations: Relations and Their Properties, *n*-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

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

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. Kenneth H Rosen, "Discrete Mathematics and its applications", 8th Edition, McGraw Hill, 2019.
2. R.K. Bishit, H.S. Dhami, "Discrete Mathematics", Oxford University Press, 2015.

Suggested Reading:

1. J.P.Trembly, R.Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw- Hill, 1997.
2. J. K. Sharma, "Discrete Mathematics", 2nd Edition, Macmillan, 2005.
3. Joel. Mott.AbrahamKandel, T.P.Baker, "Discrete Mathematics for Computer Scientist & Mathematicians", 2nd Edition, Macmillan Prentice Hall.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs37/
2. https://www.coursera.org/learn/discrete-mathematics

20ITC07 JAVA PROGRAMMING AND ENTERPRISE FRAMEWORKS

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To familiarize with fundamentals of object-oriented programming paradigm.
2. To impart the knowledge of string handling, interfaces, packages and inner classes.
3. To acquaint with Exception handling mechanisms and Multithreading.
4. To gain knowledge on collection framework, stream classes.
5. To familiarize web application environment using Servlets and JSP

Course Outcomes:

Upon completing this course, students will be able to:

1. To understand fundamentals of object-oriented programming paradigm.
2. To apply knowledge of string handling, interfaces, packages and inner classes.
3. To implement Exception handling mechanisms and Multithreading.
4. To demonstrate knowledge on collection framework, stream classes.
5. To develop web applications using Servlets and JSP.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	-	-	-	-	-	-	1	-	-	-	-	-
CO2	-	2	1	1	-	-	-	-	-	-	-	-	2	-	-
CO3	-	1	1	1	-	-	-	-	-	-	3	-	2	3	2
CO4	1	2	1	1	-	-	-	-	-	-	3	1	2	-	2
CO5	1	2	1	2	3	-	-	1	3	-	3	1	3	3	2

UNIT-I

Introduction to Java: Objects, Classes, structure a java program, difference between jdk and jre, Java Primitive Types, Basic Operators, Conditional and Logical statements. Defining Classes: Adding Instance Fields and Methods, Constructors, Access Modifiers (Visibility Modes), Object Creation Examples, Method Overloading and Constructor Overloading, Use of static and final keywords, Objects as parameters, Difference between local variable and instance field, importance of Object class.

UNIT-II

Inheritance, Interfaces and Packages in Java: Defining super / sub classes, Abstract classes, Method overriding, Interfaces and new features in latest version. Packages: Defining, Creating and Accessing a Package, importing packages.

Arrays, Strings in Java: How to create and define arrays, Introduction to java.util.Array class, Difference between String &String Buffer classes, String Tokenizer class and Wrapper classes and conversion between Objects and primitives, Autoboxing and unboxing

Inner classes in Java: Types of inner classes, Creating static / non-static inner classes, Local and anonymous inner classes.

UNIT-III

Exception Handling in Java: What are exceptions, Error vs. Exception, usage of try, catch, throw throws and Finally clauses, writing your own exception classes, Difference between checked vs. unchecked Exceptions.
Generics: Need of Generics concept, Generic classes, bounded types, Generic methods and interfaces.
Multithreading in Java: The java Thread Model, How to create threads, Thread class in java, Thread priorities, Inter thread communication, Thread synchronization

UNIT-IV

Collections: Overview of Java Collection Framework, Collection Interfaces – Collection, Set, List, Map, Commonly used Collection classes – Array List, Linked List, Hash Set, Tree Set, Hash Map, Tree Map, legacy and class, Iteration over Collections – Iterator and List Iterator, Enumeration interfaces, differentiate Comparable and Comparator
File Handling: Stream classes, Reader and Writer classes, File and Directory class, How to read user input from keyboard. New Features in java 8 and 9.

UNIT-V

Java Servlets: Overview of Java Servlet API, Servlet Implementation, Servlet Configuration, Servlet Exceptions, Servlet Life cycle, Request and Response methods, Approaches to Session tracking, Servlet Context, Servlet Collaboration.
JSP Basics: Introduction to JSP, Directives, Scripting Elements, Standard Actions.
Databases: Connect servlet to MySQL, Connect JSP to MySQL.
Spring Boot 2.0: Introduction to Spring Boot, Spring Web MVC Application Flow in Spring Boot, Spring Boot Data JPA. **Hybernate:** Advantages of Hibernate compared to JDBC, ORM (Object Relational Mapping), Hibernate architecture, Connecting with Multiple Databases.

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, Tata McGraw Hill Publications, 2020.
2. Kathy Sierra, Bryan Basham, Bert Bates, "Head First Servlets and JSP", 2nd Edition, O'Reilly Media, Inc, 2008.
3. Cay S. Horstmann, Gary Cornell,"Core Java, Volume I— Fundamentals", 8th Edition, Prentice Hall, 2008.
4. Jens Boje, "Spring Boot 2: How To Get Started and Build a Microservice", 3rd Edition, CodeBoje Pubishers.
5. Christian Bauer, Gavin King, and Gary Gregory. "Java Persistence with Hibernate, 2nd Edition", Manning Publications, 2005.

Suggested Reading:

1. Sachin Malhotra, Saurabh Choudhary, "Programming in Java", Oxford University Press, 2nd Edition, 2014.
2. C.ThomasWu, "An Introduction to Object-Oriented Programming with Java", TataMcGraw-Hill, 4th Edition, 2010.

Web Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2
3. https://ocw.mit.edu/courses/electrical-engineering-and-computerscience/6-092-introduction-to-programming-in-java-january-iap-2010/ lecture-notes/

With effect from the Academic Year 2021-22

20ITC08 **DATABASE MANAGEMENT SYSTEMS**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the fundamental concepts of a database system and its role in an organization
2. To acquire knowledge on Database design models, constraints and notations.
3. To familiarize with querying databases using SQL.
4. To acquaint with design and implementation issues of a database system.
5. To discuss the concepts of database security, concurrency and recoverability.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the purpose of database systems and design any domain specific database using E-R model.
2. Design and implement a database using Relational data model, formulate Relational algebra expressions. Use SQL for efficient data retrieval.
3. Access databases from high level languages, define triggers and apply normalization.
4. Understand the concepts of database transactions, locking protocols and concurrency control
5. Efficiently organize and manage data using indexing, hashing, and recovery techniques.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	1	-	-	-	1	1	1	1	3	-	3
CO2	2	1	2	1	2	-	-	-	-	-	1	-	2	-	3
CO3	2	1	2	2	1	-	-	-	-	-	-	-	3	-	3
CO4	2	1	1	1	1	-	-	-	-	-	-	1	1	-	3
CO5	2	1	1	1	1	-	-	-	-	-	-	1	1	-	3

UNIT-I

Introduction: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators and History of Database Systems.

Database Design Using the E-R Model: Overview of the Design Process, The Entity- Relationship Model, Complex Attributes, Mapping Cardinalities, Primary Key, Removing Redundant Attributes in Entity Sets, Reducing E-R Diagrams to Relational Schemas, Extended E-R Features and Entity-Relationship Design Issues,

UNIT-II

Introduction to the Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages and The Relational Algebra.

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database.

Intermediate SQL: Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Index Definition in SQL and Authorization.

UNIT-III

Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, Advanced Aggregation Features.

Relational Database Design: Features of Good Relational Designs, Decomposition using Functional Dependencies, Normal Forms, Functional-Dependency Theory, Algorithms for Decomposition Using Functional Dependencies, More Normal Forms, Atomic Domains and First Normal Form, Database-Design Process.

UNIT-IV

Transactions: Transaction Concept, a Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity.

Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols and Validation-Based Protocols.

UNIT-V

Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management and ARIES.

Indexing and Hashing: Basic Concepts, Ordered Indices, B+ -Tree Index Files, Hash Indices, Multiple-Key Access, Creation of Indices and Bitmap Indices.

Text Book:

1. Abraham Silberschatz, Henry F Korth, S. Sudarshan, "Database System Concepts", 7th Edition, McGraw-Hill International Edition, 2020.

Suggested Reading:

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database System", 6th Edition, Addison-Wesley, 2011.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", 3rd Edition, McGraw-Hill International Edition, 2014.
3. Rick F Vander Lans, "Introduction to SQL", 4th Edition, Pearson Education, 2007.
4. Benjamin Rosenzweig, Elena Silvestrova, "Oracle PL/SQL by Example", 5th Edition, Pearson Education, 2015.

Web Resources:

1. http://db-book.com/
2. https://www.tutorialspoint.com/dbms/
3. https://www.w3schools.in/dbms/
4. http://www.oracle-dba-online.com/sql/oracle_sql_tutorial.htm.
5. http://www.tutorialspoint.com/plsq

20EGM01 INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	-
Credits	No Credits

Course Objectives

1. History of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Various Organs of Governance and Local Administration.

Course Outcomes

Upon completing this course, students will be able to:

1. Understand the making of the Indian Constitution and its features.
2. Identify the difference among Right To equality, Right To freedom and Right to Liberty.
3. Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
4. Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
5. Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-		-	-	-
CO2	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
CO5	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-

UNIT-I

Constitution of India: Constitutional history-Govt of India Act 1909, 1919 and 1935, Constitution making and salient features. Directive Principles of State Policy - Its importance and implementation.

UNIT-II

Scheme of the Fundamental Rights & Duties: The Fundamental Rights - To Equality, to certain Freedom under Article 19, to Life and Personal Liberty Under Article 21. Fundamental Duties - the legal status.

UNIT-III

Union Government and its Administration - Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States.
Parliamentary form of government in India: Executive-President's role, power and position.

UNIT-IV

Legislature and Judiciary: Central Legislature-Powers and Functions of Lok Sabha and Rajya Sabha.
Judiciary: Supreme Court-Functions, Judicial Review and Judicial Activism

UNIT-V

Local Self Government - District's Administration Head (Collector): Role and Importance.
Municipalities: Introduction, Mayor and Role of Elected Representative, CEO of Municipal Corporation.
Panchayati Raj: Introduction, Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Position and Role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and Officials.

Text Books:

1. **Indian Government & Politics**, Ed Prof V RavindraSastry, Telugu Academy, 2nd edition, 2018.
2. **Indian Constitution at Work,** NCERT, First edition 2006, Reprinted- January 2020.

Suggested Reading:

1. **The Constitution of India**, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, **Framing of Indian Constitution**, 1st Edition, 2015.
3. M. P. Jain, **Indian Constitution Law**, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu**, Introduction to the Constitution of India**, Lexis Nexis, 2015.

Web Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

20EGM02 **INDIAN TRADITIONAL KNOWELDGE**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	No Credits

Course Objectives:

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:

Upon completing this course, students 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:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	--	-	1	-	-	3	-	-	-	-	-	-	-	-	-
CO2	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	1	-	2	-	-	-	-	-	2	-	-	-

UNIT-I

Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human literature, 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 India, Science and Scientists of Medieval India, Scientists of 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 Indi**a, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, **The Positive Sciences of the Ancient Hindus**, Motilal Banarasidass, ISBN-10: 8120809254, 1915

Suggested Reading:

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. SubhashKak 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, MotilalBanarsidass Publishers, ISBN-13: 978-8120810990, 2014
11. Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020

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

20ITC09 Java Programming & Enterprise Frameworks Lab

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To gain the fundamental programming knowledge of OOPs.
2. To introduce Exception handing mechanisms in application development.
3. To provide the knowledge of generics and Collections Framework.
4. To Explore the java.io stream, reader and Writer classes
5. To provide the knowledge of Hibernate basics and HQL, Spring boot 2.0

Course Outcomes:

Upon completing this course, students will be able to:

1. To gain the fundamental programming knowledge of OOPs.
2. To use exception handing mechanisms in application development.
3. To apply knowledge of generics and Collections Framework in application development
4. To use the stream, reader and writer classes in applications
5. To build applications using Hibernate and MVC Spring Boot 2.0

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	1	-	-	-	-	-	-	1	-	-	-	-	-
CO2	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1	1	-	-	-	-	-	-	3	-	2	-	2
CO4	-	2	1	1	-	-	-	-	-	-	3	-	-	3	2
CO5	-	2	1	2	3	-	-	-	-	-	3	3	3	3	2

LIST OF PROGRAMS

1. Program(s) to illustrate the concepts of constructor overloading, method overloading, static and final keywords usage.
2. Program(s) to illustrate the concepts of Inheritance, method overriding, super keyword usage, and Dynamic polymorphism.
3. Program(s) to illustrate concept of abstract class & interfaces.
4. Program(s) to demonstrate String handling with String, String Buffer and String Tokenizer classes.
5. Program(s) to demonstrate various types of inner classes, Packages creation and usage.
6. Program(s) to demonstrate concept of exception handling and user defined exceptions.
7. Program(s) to demonstrate concept of Multithreading and Thread synchronization.
8. Program(s) to illustrate the usage of I/O streams.
9. Write program(s) to illustrate List, Set, and Map Implemented classes.

10. Design web application using Servlets/Session management Techniques, JSP and JDBC.
11. Write program to illustrate the HQL from clause, Select clause, Aggregate functions, Avg(), Min(), where clause, group by clause and order by clause.
12. Write a program to demonstrate Spring MVC with Spring Boot.

Case Study I: Write a java program to simulate a simple wallet parking system.

Case Study II: Write a program in Java that will play the popular game of Battleship either against the computer or against another player on a different computer, running a different program.

Case Study III: Develop a web application for attendance management system using servlets and JSP.

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", 8th Edition, Tata McGraw Hill Publications, 2011.
2. Kathy Sierra, Bryan Basham, Bert Bates, Head First Servlets and JSP, 2nd Edition, O'Reilly Media, Inc, 2008.
3. Cay S. Horstman, Gary Cornell: "Core Java, Volume I— Fundamentals", 8th Edition, Prentice Hall, 2008.

Suggested Reading:

1. Sachin Malhotra, Saurabh Chaudhary : "Programming in Java", Oxford UniversityPress,2nd Edition,2014.
2. C.Thomas Wu, "An Introduction to object-Oriented Programming with Java", Tata McGraw-Hill publishing company Ltd.,4th Edition, 2010.

Web Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-092-introduction-to-programming-in-java-january-iap-2010/ lecture-notes/

20ITC10 **DBMS LAB**

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To introduce the basic commands of SQL.
2. To familiarize with query processing.
3. To impart knowledge on functions, procedures and triggers.
4. To introduce exception handling in PL/SQL.
5. To familiarize with design and development of database applications

Course Outcomes:

Upon completing this course, students will be able to:

1. Design and implement database schemas by enforcing integrity constraints.
2. Use SQL for database administration, data manipulation and retrieval.
3. Develop PL/SQL programs and use cursors for the databases.
4. Design triggers for database validation.
5. Handle Exceptions in PL/SQL programs.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	2	-	-	-	3	1	1	-	2	-	2
CO2	1	1	-	-	1	-	-	-	-	-	-	-	1	-	2
CO3	2	1	2	2	1	-	-	-	1	1	-	-	2	-	2
CO4	2	2	2	2	1	-	-	-	1	1	-	-	2	-	2
CO5	2	2	2	2	1	-	-	-	1	1	-	-	2	-	2

LIST OF PROGRAMS

1. Creation of database (Exercising commands like DDL and DML) (Note: use constraints while creating tables).
2. Exercising Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING clause and Creation and dropping of Views.
3. Exercising Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION INTERSECT constructs.
4. Exercising all types of Joins.
5. Demonstration of PL/SQL Blocks and Cursors.
6. Demonstration of Procedures and Functions.
7. Usage of Triggers (BEFORE and AFTER Triggers, Row and Statement level Triggers and INSTEAD OF Triggers).

8. Demonstrate Exception Handling in PL/SQL procedures.
9. Creation of Forms and Generation of SQL reports.
10. Creation of full-fledged database application spreading over to 3 sessions.

Text Books:

1. Rick F Vander Lans, "Introduction to SQL", 4th Edition, Pearson Education, 2007.
2. Benjamin Rosenzweig, Elena Silvestrova, "Oracle PL/SQL by Example", 5th Edition, Pearson Education, 2015.
3. Alan Beaulieu, "Learning SQL", 2nd Edition, O'Reilly, 2009.

Suggested Reading:

1. Albert Lulushi, "Oracle Forms Developer's Handbook", Pearson Education, 2006.

Web Resources:

1. http://www.oracle-dba-online.com/sql/oracle_sql_tutorial.htm
2. https://www.javatpoint.com/pl-sql-tutorial

With effect from the Academic Year 2021-22

20ITC11 **IT WORKSHOP**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:

1. To introduce the basic components of a computer, assembling and disassembling of a PC.
2. To learn the Virtual machine setup, Installation procedure of Operating Systems, Linux commands.
3. To facilitate knowledge on Internet Services, Networking commands, Antivirus tools.
4. To impart knowledge on productivity tools.
5. To acquaint cloud based productivity collaboration tools, typesetting system.

Course Outcomes:

Upon completing this course, students will be able to:

1. Identify the basic components of a computer, gain knowledge on assembling and disassembling of a PC.
2. Implement with Virtual machine setup, Install operating systems and execute Linux commands.
3. Inspect internet connectivity issues and secure a computer from cyber threats.
4. Outline productivity tools and their usage.
5. Make use of cloud based productivity collaboration tools, typesetting system.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1	2	1	-	-	1	1	2	3	3	2
CO2	2	1	2	1	1	2	1	-	1	1	1	2	3	3	2
CO3	2	2	2	1	1	2	1	3	3	1	1	2	2	3	3
CO4	2	2	2	2	3	-	1	-	-	3	2	2	1	-	3
CO5	2	2	2	2	3	-	1	-	3	3	2	2	1	-	3

List of Programs

1. **PC Hardware:** Identification of the peripherals of a computer, block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices, A practice on disassembling the components of a PC and assembling them to back to working condition, Introduction to Memory and Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, Loaders.

2. **Operating System:** Setting up and configuring a new Virtual Machine/ Setting up and configuring an existing Virtual Machine,Exporting and packaging an existing Virtual Machine into a portable format, Installing an Operating System such as Linux on Computer hardware.

3. **Linux Operating System commands:** ls, mkdir, cd, touch, chmod, rm, mv, bc, finger, who, whoami, ps, du, df, echo, cat, tac, rev, more, less, head, tail, nl, cut, paste, wc, sort, uniq, cp, cmp, diff, tr, ln, grep, fgrep, egrep, sed, awk, find, xargs, tee, tar, compress, uncompress, split, uuencode, uudecode, gzip, gunzip, read, expr, test, ping, ssh.
4. **Internet Services:** Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/plugins, Antivirus installation, configuring a firewall, blocking pop-ups, Google search techniques (text based, voice based), alexa website traffic statistics, Email creation and usage, google hangout/skype/gotomeeting video conferencing, archive.org for accessing archived resources on the web, Creating a Digital Profile on LinkedIn, Twitter, Github.

5. **Networking Commands:** ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route.

6. **Productivity Tools:** archival and compression tools**,** scanning and image editing tools**,** photography with digital camera and photo editing tools**,** OCR and text extraction**,** audio players, recording using Mic, editing, podcast preparation**,** video players, recording using webcam/camcorder, editing**,** podcast, screencast, vodcast, webcasting.

7. **Google docs:** Document creation and editing text documents in your web browser.

8. **Google Slides**: Create pitch decks, project presentations, training modules.

9. **Google Sheets:** Handle task lists, create project plans, analyze data with charts and filters.

10. **Google Forms:** Manage event registrations, create quizzes, analyze responses.

11. **Google Calendar:** Keep track of important events, sharing one's schedule, and create multiple calendars.

12. **Latex:** Introduction, Latex basics, sections and chapters, table of contents, cross referencing sections, equations, formatting.

Text Books:

1. Peter Norton, "Introduction to Computers", McGraw Hill Education, 7th edition, 2017.
2. K.L. James, "Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance", PHI Learning, 2013.

Suggested Reading:

1. Scott Mueller's, "Upgrading and Repairing PCs", 20th Edition, Pearson Education, 2012.
2. M V Narayana, G Praveen Babu, "Basics Concepts of Information Technology Workshop", BS Publications, 2010.

Web Resources:

1. VMware, https://www.vmware.com/pdf/VMwarePlayerManual10.pdf
2. Thegeekstuff,https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
3. Podcast, https://en.wikipedia.org/wiki/Podcast
4. Cloud computing, productivity and collaboration tools, software and products offered by Google, https://en.wikipedia.org/wiki/G_Suite
5. G Suite Learning Center ,https://gsuite.google.com/learning-center/products/#!/
6. Overleaf, https://www.overleaf.com/learn/latex/Main_Page

20ITC12 **Mini Projects –I**

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:

1. To enable students learning by doing.
2. To develop capability to analyse and solve real world problems.
3. To inculcate innovative ideas of the students.
4. To impart team building and management skills among students.
5. To instill writing and presentation skills for completing the project.

Course Outcomes:

Upon completing this course, students will be able to:

1. Interpret Literature with the purpose of formulating a project proposal.
2. Plan, Analyse, Design and implement a project.
3. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
4. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time.
5. Prepare and submit the Report and deliver presentation before the departmental Committee.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	2	1	2	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	1	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	-	2	3	3	3	3	3
CO4	2	2	2	3	3	3	3	2	3	3	2	3	2	3	3
CO5	1	2	1	2	3	3	-	-	2	3	-	-	-	3	-

The Students are required to choose a topic for mini project related to the courses of the current semester or previous semester. The student has to implement and present the project as per the given schedule. During the implementation of the project, Personnel Software Process (PSP) has to be followed. Report of the project work has to be submitted for evaluation.

Schedule

S No	Description	Duration
1.	Problem Identification / Selection	2 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation and Testing of the Project	7 weeks
4.	Documentation and Project Presentation	4 weeks

Guidelines for the Award of marks

S No	Description	Max. Marks
1.	Weekly Assessment	20
2.	PPT Preparation	5
3.	Presentation	10
4.	Question and Answers	5
5.	Report Preparation	10

Final Mini Project demonstration and PPT presentation is to be evaluated for the entire class together by all the faculty handling Mini Project for that class.

20ITI01

MOOCs/Training/Internship

Instruction/Demonstration/Training	3-4 Weeks/90 Hours
Duration of Semester End Presentation	--
Semester End Evaluation	60 Marks
Mid Term Evaluation	40 Marks
Credits	2

Prerequisite: Knowledge of basic Sciences

MOOCs/Training/Internship **Objectives:**
This MOOCs/Training/Internship aims to:

1.
2.
3.

MOOCs/Training/Internship Outcomes:
Upon completion of this MOOCs/Training/Internship, students will be able to:

1.
2.
3
4.
5.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

Scheme of Instruction of IV Semester of B.E. – Information Technology as per AICTE Model Curriculum, w.e.f: 2021-22

B.E. – INFORMATION TECHNOLOGY

SEMESTER-IV

S.No	Course code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits L/T
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	20MTC12	Probability and Queueing Theory	3/1	-	3	40	60	4
2	20ITC13	Software Engineering	3	-	3	40	60	3
3	20ITC14	Automata Theory and Compiler Design	3/1	-	3	40	60	4
4	20ITC15	Design and Analysis of Algorithms	3	-	3	40	60	3
5		Professional Elective – I	3	-	3	40	60	3
6	20MBC01	Engineering Economics & Accountancy	3	-	3	40	60	3
7	20CEM01	Environmental Science	2	-	2	-	50	NC
PRACTICALS								
8	20ITC16	Software Engineering Lab	-	2	3	50	50	1
9	20ITC17	Design and Analysis of Algorithms Lab	-	2	3	50	50	1
10	20ADC03	Artificial Intelligence & Machine Learning Tools, Techniques and Applications	-	2	-	50	-	1
11	20ITC18	Mini Project – II	-	2	-	50	-	1
TOTAL			**20/2**	**8**		**440**	**510**	**24**

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

Professional Elective-1		
S.No.	**Subject Code**	**Subject Name**
1.	20ITE01	Digital Image Processing
2.	20ADE01	Data Analysis and Visualization
3.	20ITE02	Mobile Application Development with Android and Kotlin
4.	20ITE03	Fundamentals of Cryptography
5.	20ITE04	Data Warehousing and Data Mining

20MTC12 **PROBABILITY AND QUEUEING THEORY**

Instruction	3 L+1T Hours per week
Duration of Semester End Examination	4 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. Student able to interpretate the continuous probability function
4. Understand the data using the testing of Hypothesis.
5. Able to learn the Queueing model's

Course Outcomes:

On successful completion of this course the students shall be able to

1. Apply the principle of Least Squares approximating for estimating the value
2. Choose the basic probability model's for fitting the Random phenomenon.
3. Analyze the probability function using statistical averages
4. Distinguishing the data using different methods of hypothesis testing.
5. Analyze the Queue model for the probabilistic nature.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	-	-	-	-	1	1	2	-
CO2	2	2	2	-	-	-	-	-	-	-	-	1	1	-	-
CO3	2	2	1	-	-	-	-	-	-	-	-	1	1	-	1
CO4	2	2	1	-	-	-	-	-	-	-	-	1	1	2	2
CO5	2	2	1	-	-	-	-	-	-	-	-	1	1	-	1

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: 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: Large and Small Sample Tests

Parameter and Statistic, Tests of significance, tests of significance for large samples. Tests of significance for single proportion, and difference of proportions. Tests of significance for single mean and difference of means. Small sample test, t-test for single mean and differences of Means. F-test for equality of two population variances.

UNIT-V: Queueing Theory

Introduction-Queueing system-The arrival pattern-The service pattern-The queue discipline, Symbolic Representation of a Queueing Model –Characteristics of Infinite Capacity, Single server Poisson Queue Model Queueing problem-Pure Birth and Death Process-Probability Distribution of Departures(pure death process)-Basic queueing Models-Measures of the (M/M/1):$(\infty/FIFO)$ $model$-Characteristic of Finite Capacity,Single Server Poisson Queue Model III (M/M/1):$(N/FCFS)$ Model.

Text Books:

1. S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. T Veerarajan, Probability, Statistics and Random Processes, 2nd Edition, Tata McGraw-Hill

Suggested Reading:

1. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3rd Ed., Wiley, 1968.
2. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

20ITC13 **SOFTWARE ENGINEERING**

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Describe the various software life cycle models.
2. Explain the concepts of Agile software development concepts.
3. Define the basic structural modelling concepts in UML.
4. Enable the students with UML notations.
5. Acquaint the students with Risk management and Product metrics.

Course Outcomes:

Upon completing this course, students will be able to:

1. Identify the minimum requirements for the development of application.
2. Build a system, component, or process to meet desired needs of a customer.
3. Involve in analysis and design of UML models for various case studies.
4. Acquire thorough knowledge of standard UML notations.
5. Know the risks, formulate and implement software projects.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	-	1	-	-	1	1	-	-
CO2	2	1	1	-	1	-	-	-	-	-	-	1	-	2	-
CO3	1	1	1	-	-	-	-	-	-	-	2	1	1	-	2
CO4	2	1	-	-	-	-	-	-	-	-	-	2	1	-	-
CO5	2	1	1	-	-	-	1	-	1	-	2	1	-	2	2

UNIT-I

Software and Software Engineering: The Nature of Software, Software Engineering. The Software Process, Software Engineering Practice.

A Generic view of Process : Software Engineering -A Layered Technology, A Process frame work, Process Models-Waterfall model, spiral model , The Unified Process, Product and Process, Process Assessment and Improvement, The CMMI ,Introduction to Agile development-Extreme programming.

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Requirements Modelling: Requirements Analysis, Scenario-Based Modelling, Problem Analysis, Software Requirement and specifications.

UNIT-II

UML Introduction: Why we Model, Introducing the UML, Elements of UML-Things Relationships and Diagrams. **Basic Behavioural Modelling**: Interactions, Use Cases, Use Case Diagrams, Interaction diagrams-Sequence diagrams-components of Sequence diagrams, collaboration diagrams-Components of Collaboration diagrams, Activity

diagrams-components of activity diagrams, swim lane diagrams, Case studies on Use Case diagrams, Interaction diagrams.

Advanced Behavioural Modelling: State Chart Diagrams-components of state chart diagrams, Case studies on State chart diagrams.

UNIT-III

Basic Structural Modelling: Classes, Relationships, Diagrams, Class Diagrams. **Advanced Structural Modelling**: Advanced Classes, Advanced Relationships, Interfaces, Components, Case studies on class diagrams.

Quality Concepts: Software Quality, Achieving Software Quality. **Software Quality Assurance:** Background Issues, Elements of Software Quality Assurance, SQA Tasks, The ISO 9000 Quality Standards.

UNIT-IV

Software Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Validation Testing, System Testing. Testing Tools–Rational functional tester, Selenium software testing tool.

Testing Conventional Applications: Software Testing Fundamentals, White-Box Testing, Basis Path Testing, Black–Box Testing, Alpha testing, Beta testing.

UNIT-V

Product Metrics: A Framework for Product Metrics, Size Metrics like LOC, Function points,

Risk Management: Software Risks, Reactive versus Proactive Risk Strategies, Risk Mitigation, Monitoring, and Management, The RMMM Plan.

Text Books:

1. Roger S.Pressman, "Software Engineering: A Practitioners Approach", 7th edition, McGrawHill, 2017.
2. Grady Booch, James Rumbaugh, Ivor Jacobson, "The Unified Modelling Language-User Guide (Covering UML 2.0)", Third Edition, Pearson Education, India, 2017.
3. Pankaj Jalote "An Integrated Approach to Software Engineering ", 3rdedition, Narosa Publishing house, 2008.

Suggested Reading:

1. Martin Fowler, Kendall Scott , "UML Distilled: A Brief Guide to the Standard Object Modelling
2. Language" Addison Wesley, 4th Edition, 2011.
3. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, "Fundamentals of Software Engineering", PHI, 2nd edition.
4. James F.Peters, WitoldPedrycz, "Software Engineering-An engineering Approach".

Web Resources:

1. SEweb - Software Engineering Education Home Page: http://tuvalu.cs.flinders.edu.au/seweb/se-ed/
2. IBM Rational http://www-306.ibm.com/software/rational/uml/
3. Practical UML - A Hands-On Introduction for Developers http://www.togethersoft.com/services/practical_guides/umlonlinecourse/

20ITC14 AUTOMATA THEORY AND COMPILER DESIGN

Instruction	3 L+1THours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To study abstract computing models: Finite Automata, Pushdown Automata and Turning Machines.
2. To learn about various grammars and recognizers for formal languages.
3. To familiarize with decidability and undecidability of computational problems.
4. To acquaint with phases of compiler and parsing techniques.
5. To impart knowledge on intermediate code generation and code optimization.

Course Outcomes:

Upon completing this course, students will be able to:

1. Design deterministic, nondeterministic finite automata and regular expressions.
2. Construct context-free grammars for certain languages, test closure properties, decision properties of CFL's, design PDAs and TMs.
3. Identify recursively enumerable languages, undecidable problems. Understand compiler phases and build top-down, bottom-up parsers.
4. Infer syntax directed translation schemes for the CFGs and develop intermediate code for annotated parse trees.
5. Understand runtime environments, translate intermediate code into target code and apply code optimization.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	2	-	-	-	-	-	-	-	-	-	3
CO2	2	1	1	-	2	-	-	-	-	-	-	-	-	-	2
CO3	1	1	-	1	1	-	-	-	-	-	-	-	2	-	3
CO4	1	1	-	1	1	-	-	-	-	-	-	-	2	-	2
CO5	1	1	-	-	1	-	-	-	-	-	-	-	2	-	3

UNIT-I

Introduction to Finite Automata, the Central Concepts of Automata Theory: Alphabets, Strings and Languages. **Deterministic Finite Automata:** Definition, Notations, Extending the Transition Function, The Language of a DFA, **Nondeterministic Finite Automata:** Definition, The Extended Transition Function, The Language of an NFA, Equivalence of NFA and DFA, Finite Automata with Epsilon-Transitions: €-closure, Extended Transitions and Languages for €- NFA 's, Eliminating €-transitions.

Regular Expression and languages: Definition, Converting DFA 's to Regular Expressions, Converting Regular Expressions to €-NFA, Algebraic Laws for Regular Expressions. The pumping lemma for Regular Languages, Closure Properties of Regular Languages, Decision Properties of Regular Languages, Minimization of DFA's.

UNIT-II

Context Free Grammars and Languages: Definition of Context Free Grammars, Leftmost and Rightmost Derivation, The language of a Grammar, Construction of Parse Trees, Ambiguous Grammars, Inherent Ambiguity.

Normal Forms for CFG's: Definition of CNF, GNF, Pumping Lemma for CFL 's: Applications of Pumping Lemma for CFL 's, Closure Properties of CFL 's, Decision Properties of CFL 's.

Pushdown Automata: Definition of pushdown automaton, The Language of a PDA: Acceptance by Final State, Acceptance by Empty Stack, conversion from CFG to PDA 's, Deterministic Pushdown Automata: Definition.

Introduction to Turing Machines: Definition, Instantaneous Description, The Language of a TM, Extensions to the Basic Turing machine.

UNIT-III

Undecidability: The Diagonalization Language, Recursive Languages, Compliments of Recursive and RE languages, The Universal Language, Undecidable problems about Turing Machines: Reductions, TM's That Accept The Empty Language, Rice's Theorem and Properties of RE languages, Post's Correspondence Problem: Definition of PCP, The Modified PCP.

Introduction to Compilers: Translation process, Major data structures, Boot strapping and porting. **Lexical analysis:** The role of Lexical Analyzer, Input Buffering. **Syntax Analysis:** Top-Down parsing, Bottom-Up parsing, LR Parsing.

UNIT-IV

Syntax Directed Translation: Syntax Directed Definitions, Evaluation Orders for SDDs, Applications of Syntax Directed Translation.

Intermediate code generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow

UNIT- V

Runtime Environments: Storage Organization, Stack Allocation of Space, Access to Non local Data on the Stack, Heap Management.

Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Peephole Optimization, Register Allocation and Assignment.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffery D Ullman, "Introduction to Automata Theory Languages and Computation", 3rd Edition, Pearson Education, 2007
2. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, ―Compilers: Principles, Techniques &Tools‖, 2nd Edition, Pearson Education, 2014.
3. Kenneth C Louden, ―Compiler Construction: Principles and Practice‖, Cengage Learning

Suggested Reading:

1. John C Martin, "Introduction to Language and Theory of Computation", 3rd Edition, TMH, 2003.
2. Mishra K., Chandra sekaran N," Theory of Computer Science (Automata, Languages and Computation)", 3rd Edition, Prentice Hall of India 2008.
3. Keith D Cooper, Linda Torczon, "Engineering a Compiler", 2nd Edition, Morgan Kaufman, 2012.
4. Dick Grune, Kees van Reeuwijk, Henri E. Bal, Ceriel J.H. Jacobs, Koen Langendoen, "Modern Compiler Design", 2nd Edition, Springer, 2012.

Web Resources:

1. http://nptel.ac.in/courses/106106049/
2. http://online.stanford.edu/course/automata-theory
3. http://nptel.ac.in/courses/106108113
4. http://nptel.ac.in/courses/106108052

20ITC15 DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To analyse the performance of various algorithms.
2. To illustrate different paradigms of problem solving.
3. To learn about various algorithm design techniques and illustrates them using a number of well-known problems and applications.
4. To familiarize graph traversal and search techniques.
5. To discuss NP hard and NP complete problems and their applications.

Course Outcomes:

Upon completing this course, students will be able to:

1. Analyze best, average and worst case complexities of algorithms and choose appropriate data structure for designing algorithm.
2. Develop solutions using Divide and Conquer, Greedy techniques.
3. Design algorithms using dynamic programming approach, apply traversal and search techniques.
4. Apply backtracking, branch and bound techniques to solve problems.
5. Identify P, NP, NP-Complete and NP-Hard classes to which an algorithm belongs and design a feasible solution.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	2	2	3	3
CO2	3	3	2	2	-	-	-	-	-	-	-	2	2	3	3
CO3	3	3	2	2	-	-	-	-	-	-	2	2	2	-	3
CO4	3	3	2	2	-	-	-	-	-	-	-	2	2	-	3
CO5	3	3	2	2	-	-	-	-	-	-	-	2	2	3	3

UNIT-I

Introduction: Algorithm Specification, Performance analysis: Space Complexity, Time Complexity, Asymptotic Notation (O, Omega, Theta), Searching and Sorting techniques- Performance Measurement.

Elementary Data Structures: Complexity measures for the Data Structures - Stacks and Queues, Trees, Hashing/Dictionaries, Priority Queues, Sets and Disjoint Set Union.

UNIT-II

Divide and Conquer: The general method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.

Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Optimal Storage on Tapes, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT-III

Dynamic Programming: The General Method, Multistage graphs, All Pair Shortest Paths, Single Source Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, Reliability Design, The Traveling Salesperson Problem.

Traversal and Search Techniques: Breadth First Search and Traversal, Depth First Search and Traversal, Connected Components and Spanning Trees, Biconnected Components and DFS.

UNIT-IV

Backtracking: The General Method, 8-Queens Problem, Graph Colouring, Hamilton cycles, Knapsack Problem.

Branch and Bounds: The Method: Least Cost (LC) Search, The 15 puzzle, FIFO Branch and Bound, LC Branch and Bound, 0/1 Knapsack Problem, Traveling Salesperson Problem.

UNIT-V

NP-Hard and NP-Complete Problems: Basic Concepts: Non-Deterministic Algorithms, the Classes NP Hard and NP Complete. Cook's theorem, NP-Hard Graph Problems: Node Cover Decision Problem, Chromatic Number Decision Problem, Directed Hamiltonian Cycle, Traveling Salesperson Decision Problem, NP Hard Scheduling Problems: Job Shop Scheduling.

Text Books:

1. Ellis Horowitz, SartajSahani, SanguthevarRajasekaran, "Fundamentals of Computer Algorithm, 2nd Edition", Universities Press, 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 2nd Edition, Prentice Hall of India Private Limited, 2006.

Suggested Reading:

1. Levitin A, "Introduction to the Design And Analysis of Algorithms", Pearson Education, 2008.
2. Aho, Hopcroft, Ullman, "The Design and Analysis of Computer Algorithm", Pearson Education, 2000.
3. Parag H.Dave, Himanshu B. Dave, "Design and Analysis of Algorithms", 2nd Edition, Pearson Education, 2014.

Web Resources:

1. http://nptel.ac.in/courses/ 106101060
2. http://nptel.ac.in/courses

20ITE01 **DIGITAL IMAGE PROCESSING**
(Professional Elective – I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the fundamental concepts and applications of digital image processing.
2. To impart knowledge on the image processing concepts: intensity transformations, spatial filtering, Smoothing and sharpening both in spatial and frequency domain.
3. To familiarize the image analysis concepts: morphological image processing, image segmentation, image representation and description, and object recognition.
4. To introduce colour image processing techniques.
5. To understand with various image compression methods.

Course Outcomes:

Upon completing this course, students will be able to:

1. Illuminate the fundamental concepts and applications of digital image processing techniques.
2. Demonstrate intensity transformations, spatial filtering, smoothing and sharpening in both spatial and frequency domains, image restoration concepts.
3. Demonstrate image restoration and morphological image processing methods.
4. Apply object recognition techniques by using image segmentation and image representation & description methods.
5. Illustrate the various colour models and Application of image compression methods.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	-	1	-	-	-	-	1	2	3	3
CO2	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3
CO3	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3
CO4	2	1	1	2	1	-	1	-	-	-	-	1	2	3	3
CO5	2	2	2	1	-	2	1	-	-	1	-	1	2	3	3

UNIT-I

Introduction: Fundamental Steps in Digital Image Processing, Image Sampling and Quantization, Some Basic Relationships between Pixels; **Intensity Transformations:** Some Basic Intensity Transformation Functions, Histogram Processing - Histogram Equalization, Histogram Matching (Specification)

UNIT-II

Spatial Filtering: Fundamentals of Spatial Filtering, Smoothing Spatial Filters; Sharpening Spatial Filters;
Filtering in the Frequency Domain: The 2-D Discrete Fourier Transform and its inverse; The Basics of Filtering in the Frequency Domain; Image Smoothing Using Frequency Domain Filters - Ideal, Butterworth and Gaussian Low pass Filters; Image Sharpening Using Frequency Domain Filters - Ideal, Butterworth and Gaussian High pass Filters.

UNIT-III

Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models; Restoration in the Presence of Noise Only—Spatial Filtering; Periodic Noise Reduction by Frequency Domain Filtering; Estimating the Degradation Function; Inverse Filtering; Minimum Mean Square Error (Wiener) Filtering;
Morphological Image Processing: Preliminaries; Erosion and Dilation; Opening and Closing, The Hit or Miss Transform

UNIT-IV

Image Segmentation: Fundamentals; Points, Line and Edge Detection, Thresholding; Segmentation by Region Growing, Region Splitting and Merging
Feature Extraction: Boundary Pre-processing, Boundary Feature Descriptors, Some Simple Region Descriptors.
Image Pattern Classification: Patterns and Pattern Classes, Pattern Classification by Prototype Matching

UNIT- V

Colour Image Processing: Colour Fundamentals; Colour Models, Pseudo Colour Image Processing, Basics of full Colour Image Processing;
Image Compression: Fundamentals, Huffman Coding, Arithmetic Coding, LZW Coding

Text Book:

1. Rafael C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, 4th Edition, 2020.

Suggested Reading:

1. Vipula Singh, ―Digital Image Processing with MatLab and lab View‖, Elsevier.
2. Thomas B. Moeslund, ―Introduction to Video and Image Processing: Building Real Systems and Applications‖, Springer, 2012.
3. Milan Sonka, Vaclav Halvac and Roger Boyle, ―Image Processing, Analysis, and Machine Vision‖, 2nd Edition, Thomson Learning Publishers.
4. Kenneth R.Castleman, ―Digital Image Processing‖, Pearson Education, 2006.

Web Resource:

1. www.imageprocessingplace.com
2. https://in.mathworks.com/discovery/digital-image-processing.html
3. https://imagemagick.org/
4. https://nptel.ac.in/courses/117105079/

20ADE01 **DATA ANALYSIS AND VISUALIZATION**
(Professional Elective – I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To Introduce the Numpy library in Python to support storage and operations on large multi-dimensional arrays and matrices
2. To Introduce large collection of mathematical functions to operate on multidimensional sequential data structures
3. To Demonstrate the functionality of the Pandas library in Python for open source data analysis and manipulation
4. To Demonstrate Data Aggregation, Grouping and Time Series analysis with Pandas
5. To Introduce the Matplotlib library in Python for resting static, animated and interactive visualizations

Course Outcomes:

Upon completing this course, students will be able to:

1. Efficiently store and manipulate dense data in arrays with Numpy
2. Apply high level mathematical functions to aggregate, broadcast, index and sort multidimensional arrays.
3. Create Series and DataFrame objects to operate on datasets.
4. Perform Data cleaning, transformation, merging, aggregation on datasets.
5. Apply 2-D and 3-D plotting techniques on datasets

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	1	1	-	2	-	2	-	3	-
CO2	-	2	-	1	-	-	1	1	-	2	-	2	-	3	-
CO3	1	3	2	2	3	-	1	1	-	1	-	2	3	3	3
CO4	3	3	2	3	3	-	1	1	-	1	-	3	3	3	3
CO5	1	1	1	1	-	-	1	1	-	2	-	2	-	-	-

UNIT-I

Introduction to Numpy: Data types in Python - Fixed type arrays, creating arrays, array indexing, array slicing, reshaping arrays, array concatenation and splitting, Universal Functions, Aggregations, Broadcasting rules, Comparisons, Boolean Arrays, Masks, Fancy Indexing, Fast Sorting using np.sort and np.argsort, partial sorting - partitioning with K-nearest neighbors, Creating Structured Arrays, Compound types and Record Arrays.

UNIT- II

Introduction to Pandas: Series Object, DataFrame Object, Data Indexing and Selecting for Series and DataFrames, Universal Functions for Index Preservation, Index Alignment and Operations between Series and DataFrames, Handling missing data, Operating on Null values, Hierarchical Indexing.

UNIT-III

Combining Datasets: Concat, Append, Merge and Joins, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance functions - query() and eval()

UNIT-IV

Inferential Statistics - Normal distribution, Poisson distribution, Bernoulli distribution, z-score, p-score, One-tailed and two-tailed, Type 1 and Type-2 errors, Confidence interval, Correlation, Z-test vs T-test, F-distribution, Chi-square distribution, the chi-square test of independence, ANOVA, data mining, titanic survivors dataset analysis

UNIT-V

Visualization with Matplotlib : Simple Line plots, Scatter plots, Visualizing errors, Density and Contour plots, Histograms, Binnings, Multiple subplots, Three-dimensional plotting with Matplotlib, Geographic data with Basemap, Visualization with Seaborn.

Text Books:

1. Jake VanderPlas, "Python Data Science Handbook", O'Reilly Media, 2016.
2. Samir Madhavan, "Mastering Python for Data Science", Packt Publishing, 2015.

Web Resources:

1. https://www.coursera.org/learn/python-data-analysis?specialization=data-science-python
2. https://www.coursera.org/learn/python-plotting

20ITE02 MOBILE APPLICATION DEVELOPMENT WITH ANDROID AND KOTLIN
(Professional Elective – I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Introduce the Kotlin Programming Language for Mobile Application Development
2. Demonstrate the development of basic mobile applications on android operating system
3. Demonstrate the Android Application Architecture
4. Introduce basic app design guidelines as well as styles, themes and material design
5. Demonstrate the publishing of a mobile app on Google Play

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the benefits of using Kotlin for Mobile application development
2. Understand the android project structure
3. Understand activity and fragment life cycles
4. Apply various styles, themes and material design to apps
5. Apply best practices to prepare and publish apps on Playstore

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	1	2	-	2	-	-	-	1	-	-	2	3	-
CO2	-	2	1	2	-	2	-	-	-	-	-	-	1	3	-
CO3	-	2	1	2	-	2	-	-	-	-	-	-	2	3	3
CO4	-	2	1	2	-	2	-	-	-	-	-	-	2	3	-
CO5	-	2	2	2	3	2	-	-	3	-	-	1	2	3	3

UNIT-I

Introduction to Kotlin, Basic expressions, Control flow statements, null safety, Functions, passing functions as arguments, simple lambdas

Object oriented programming in Kotlin, Classes and Objects, Constructors, Visibility modifiers, Subclasses and Inheritance, Interfaces, Data classes, Singleton class enums, Pairs, Triples, Collections and Extensions in Kotlin

UNIT-II

Installing Android Studio, Android app project, deploying app on emulator or device, image resources and click handler, view layouts, adding libraries to module gradle file, layouts using XML and layout editor, app interactivity, Constraint Layout, Data binding, Fragments, Navigation graphs, Navigational paths, Options menu, Safe Args plugin, External activity,

UNIT-III

Activity and Fragment life cycles, Android lifecycle library, configuration changes, Android App Architecture, Classes of Lifecycle, View Model and View Model Factory, Live Data and Live Data observers, Data binding with View Model and Live Data, Live Data Transformations.

Room Persistence library, Coroutines, Recycler View, Data binding with Recycler View, Retrofit library for web services, Moshi library for parsing JSON response, loading and displaying images from the internet, filtering data from the internet, Offline cache and repository, Work Manager, Background workers and periodic Worker Request

UNIT-IV

Basic App design, Styles and Themes, Material Design, best practices for app design

Permissions, App performance, Security, Handling user data, Compliance with personal data policies, logs, encryption of sensitive data, External storage, IP networking

UNIT-V

Firebase, Firebase analytics, Firebase notifications, Firebase database, App monetization, In-app purchases, Subscriptions, Advertising using Admob

Generate Signed APK, Preparing app for release, Google Play filters, Google Play developer console, Alpha and beta tests on Google Play, Pre-launch reports and Publishing

Text Books / Online Resources:

1. Android Development with Kotlin by Google
2. Android Development with Kotlin online videos

20ITE03 FUNDAMENTALS OF CRYPTOGRAPHY
(Professional Elective – I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce fundamental concepts of computer security and cryptography.
2. To familiarize with the concepts of block ciphers and symmetric encryption.
3. To provide knowledge on asymmetric key cryptography and key exchange.
4. To acquaint basic structure of cryptographic hash functions and message authentication codes.
5. To impart knowledge on digital signatures, key distribution, user authentication.

Course Outcomes:

Upon completing this course, students will be able to:

1. Demonstrate the key security concepts, security attacks and cryptography techniques.
2. Analyze block ciphers, symmetric encryption algorithms.
3. Describe the operations of asymmetric key cryptography and key exchange.
4. Comprehend cryptographic hash functions, message authentication codes.
5. Inspect the digital signature process, key distribution, user authentication.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	3	1	1	1	-	1	1	2	3	3
CO2	2	3	3	2	1	3	1	1	1	1	1	1	2	3	3
CO3	2	3	3	2	1	3	1	1	1	1	1	1	2	3	3
CO4	2	3	3	2	1	3	1	1	1	1	1	1	2	3	3
CO5	2	3	3	2	1	3	1	1	1	1	1	1	2	3	3

UNIT-I

Introduction: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, Attack surfaces and Attack Trees, A Model for Network Security.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.

UNIT-II

Block Ciphers and Data Encryption Standard: Traditional Block Cipher Structure, The Data Encryption Standard, DES Example, The Strength of DES, Block Cipher Design Principles, Multiple Encryption, Triple DES.

Advanced Encryption Standard: Finite Field Arithmetic**,** AES Structure, AES Transformation functions, AES Key Expansion, AES Example, AES Implementation.

UNIT-III

Asymmetric Key Cryptography: Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie- Hellman key

exchange, ElGamal Cryptographic System, Elliptical Curve Arithmetic, Elliptical Curve Cryptography, pseudorandom number generation based on an Asymmetric cipher.

UNIT-IV

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining ,Secure Hash Algorithm.

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of Macs, MACs Based on Hash Functions HMAC, Security of HMAC.

UNIT-V

Digital Signatures: Digital Signature**,** ElGamalDigital Signature Scheme**,** NIST Digital Signature Algorithm.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption,Distribution of Public Keys, X.509 Certificates, Public Key Infrastructure.

User Authentication: Kerberos, Federated Identity Management.

Text Book:

1. William stallings,"Cryptography And Network Security Principles and Practice", Pearson Education, Seventh Edition,2017.

Suggested Reading:

1. V.K.Jain, "Cryptography and Network Security", First Edition, Khanna Book Publishing,2013.
2. Behrouz A Forouzan, "Cryptography and Network Security", Second Edition, Tata McGraw Hill, 2010.

Web Resources:

1. Foundations of Cryptography, https://nptel.ac.in/courses/106/106/106106221/
2. Cryptography and Network Security, https://nptel.ac.in/courses/106/105/106105162/

20ITE04 **DATA WAREHOUSING AND DATA MINING**
(Professional Elective – I)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the concepts of Data Warehouse and Data Mining.
2. To familiarize different kinds of data and various preprocessing techniques.
3. To study different frequent pattern discovery methods.
4. To learn various classification and clustering techniques.
5. To introduce the concept of outlier analysis.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the concepts and issues of data mining, apply preprocessing techniques.
2. Build multidimensional data model and perform OLAP operations, generate association rules.
3. Evaluate various models for classification and prediction.
4. Analyze advanced classification methods and clustering techniques.
5. Understand outlier detection and real time applications of data mining.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	-	-	-	-	1	1	1	2	3	2
CO2	2	1	2	2	-	-	-	-	-	1	-	1	3	3	2
CO3	3	3	2	2	2	-	1	-	-	-	1	1	3	3	2
CO4	2	3	2	3	2	-	1	-	-	-	1	1	3	3	2
CO5	2	1	1	2	1	-	1	-	-	-	1	1	1	3	2

UNIT-I

Introduction: Data mining, Kinds of data, Kinds of pattern, Major issues in data mining. **Getting to know your data:** Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity. **Data Preprocessing:** An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT-II

Data Warehousing and Online Analytical Processing: Data Warehouse - Basic Concepts, Data Warehouse Modeling - Data Cube and OLAP, Data Warehouse Design and Usage: A Business Analysis Framework for Data Warehouse Design, Data Warehouse Design Process, Data Warehouse Usage for Information Processing. **Mining Frequent Patterns, Associations and correlations:** Basic Concepts, Frequent Item Set Mining Methods, Interesting patterns, Pattern Evaluation Methods. **Advanced Pattern Mining**: Pattern Mining in Multilevel and Multidimensional Space.

UNIT-III

Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification,

Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Introducing Ensemble Methods, Bagging, Boosting, Random Forests, Improving Classification Accuracy of Class Imbalanced Data.

UNIT-IV

Classification: Advanced Methods: Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Lazy Learners (or Learning from Your Neighbors), Other Classification Methods. **Cluster Analysis:** Basic Concepts and Methods: Cluster Analysis, Partitioning Methods, Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods, DBSCAN, Evaluation of Clustering, Clustering graph and network data.

UNIT- V

Outlier Detection: Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches. **Data Mining Trends and Research Frontiers:** Mining Complex Data Types: Mining Sequence Data: Mining Other Kinds of Data, Data Mining Applications, Data Mining and Society, Data Mining Trends.

Text Book:

1. Han J, Kamber M, Jian P, "Data Mining: Concepts and Techniques", 3rd Edition, Elsevier, 2012.

Suggested Reading:

1. Pang-Ning Tan, Michael Steinback, Vipin Kumar, "Introduction to Data Mining", Pearson
2. Education, 2008.
3. M. Humphires, M.Hawkins, M.Dy, "Data Warehousing: Architecture and Implementation", Pearson Education, 2009.
4. Anahory, Murray, "Data Warehousing in the Real World", Pearson Education, 2008.
5. Kargupta, Joshi, et al, "Data Mining: Next Generation Challenges and Future Directions", Prentice Hall of India Pvt. Ltd, 2007.

Web Resource:

1. https://hanj.cs.illinois.edu/bk3/
2. https://www.kdnuggets.com/
3. http://archive.ics.uci.edu/ml/index.php

20MBC01 ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

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:

Upon completing this course, students 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:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	1	1	1	1	1	1	-	-	2	-	1
CO2	2	2	2	2	-	1	1	1	-	1	-	1	1	-	-
CO3	1	2	1	2	2	-	2	1	-	1	-	-	2	1	-
CO4	2	2	1	2	2	1	1	3	-	1	-	-	-	-	-
CO5	1	3	1	2	1	1	2	-	-	1	2	1	-	-	-

Unit-I

Introduction to Managerial Economics: Introduction to Economics and itsevolution - 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 andDiscounted 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 Reading:

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. A. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

20CEM01 **ENVIRONMENTAL SCIENCE**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	-
Credits	No Credits

Course Objectives:

1. Identify environmental problems arising due to over utilization of natural resources and understand the importance of use of renewable energy sources
2. Become aware about the importance of eco system and interlinking of food chain.
3. Identify the importance of biodiversity in maintaining ecological balance.
4. Learn about various attributes of pollution management and waste management practices.
5. Contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes:

Upon completing this course, students will be able to:

1. Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and affects of over utilisation.
2. Understand the concept of ecosystems and realise the importance of interlinking of food chains.
3. Contribute for the conservation of bio-diversity.
4. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
5. Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	3	-	-	-	-	1	1	-	-
CO2	1	-	-	-	-	-	2	1	-	-	-	1	1	-	-
CO3	1	-	-	-	-	-	2	1	-	-	-	1	1	-	-
CO4	1	-	-	-	-	1	2	1	-	-	-	1	1	-	-
CO5	1	-	-	-	-	1	2	1	-	-	-	1	2	-	-

UNIT- I

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT- II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT-III

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT- IV

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT- V

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.
2. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria& Sons, 2009.

Suggested Reading:

1. C. S. Rao," Environmental Pollution Control Engineering", Wiley, 1991.
2. S. S. Dara, "A Text Book of Environmental Chemistry &Pollution Control", S. Chand Limited, 2006

20ITC16 **SOFTWARE ENGINEERINGLAB**

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. Describe use case models that capture requirements of a software system.
2. Illustrate Dynamic models of a software system.
3. Build class diagrams that model a software system.
4. Acquaint with Activity and swimlane models.
5. Familiarize with analysis and design models.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Interpret user requirements using the UML notation.
2. Illustrate Dynamic models of a software system.
3. Analyze and develop class diagrams that model a software system.
4. Develop Activity and swimlane models.
5. Outline analysis and design models.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	1	1	-	-	1	-	1	-
CO2	2	1	1	-	1	-	-	1	-	-	-	1	-	-	-
CO3	1	1	1	-	-	2	-	-	-	-	2	1	1	-	2
CO4	3	1	-	-	-	-	-	1	-	-	-	2	2	-	-
CO5	2	1	-	-	-	2	1	-	1	-	2	1	-	-	2

List of Programs

1. Construct Use case diagrams for the following
    a. Diagram editor.
    b. Library information system.
    c. Banking system.
2. Construct Sequence diagrams for the following.
    a. Mobile phone.
    b. Use case student register for a course.
    c. Diagram editor.
3. Construct Collaboration diagrams for the following
    a. Use case librarian issues books to student.
    b. Mobile phone.
    c. Diagram editor.
4. Construct class diagrams for the following
    a. Diagram editor.
    b. Library information system.

c. Banking system

5. Construct Activity diagrams for the following.
    a. ATM transaction.
    b. Ticket machine.
    c. Sales order processing.
6. Construct Swim lane diagrams for the following.
    a. Account.
    b. CD player.
    c. ATM machine.
7. Case Studies**:**

    Prepare SRS, develop Analysis and design models for
    a. Passport automation system
    b. Credit card processing
    c. BPO management system
    d. E-book management system
    e. Recruitment system
8. Study of selenium web testing tool.
    a. Selenium IDE
    b. Selenium RC
9. Creating test cases for web pages using Selenium IDE.
    a. Recording and adding commands in a test
    b. Saving the recorded test
    c. Executing the recorded test
10. Creating test cases for GUI based desktop application.

Text Books:

1. Grady Booch, RobertA. Maksimchuk, "Object - Oriented Analysis and Design with Applications", Addision-Wesley, 3 rd Edition, ISBN No: 9780201895513, 2007.
2. Martina Seidl , Marion Scholz , Christian Huemer, GertiKappel "UML @ Classroom: An Introduction to Object-Oriented Modeling", Springer; 2015th edition, ISBN-10: 3319127411, (March 9, 2015)

Suggested Reading:

1. Martin Fowler, Kendall Scott, "UML Distilled**:** A Brief Guide to the Standard Object Modeling Language" Addison Wesley, 4th Edition, 2011.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli,"Fundamentals of Software Engineering", PHI,2nd Edition.
3. Unmesh Gundecha , Carl Cocchiaro ," Learn Selenium: Build data-driven test frameworks for mobile and web applications with Selenium Web Driver 3", ISBN : 183898304X, Packt Publishing (July 18, 2019)

Web Resources:

1. SEweb - Software Engineering Education Home Page:http://tuvalu.cs.flinders.edu.au/seweb/se-ed/
2. IBM Rationalhttp://www-306.ibm.com/software/rational/uml/
3. Practical UML - A Hands-On Introduction for Developers http://www.togethersoft.com/services/practical_guides/umlonlinecourse
4. https://www.udemy.com/course/selenium-automation-testing-for-beginners/

20ITC17 DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	2 Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To introduce Divide and Conquer algorithmic strategy.
2. To familiarize Greedy Algorithms.
3. To introduce Dynamic programming algorithms.
4. To gain knowledge of connected and biconnected components.
5. To introduce Backtracking technique.

Course Outcomes:

Upon completing this course, students will be able to:

1. Implement Divide and Conquer Algorithms.
2. Build solutions using Greedy technique.
3. Apply Dynamic programming algorithms to solve problems.
4. Implement connected and biconnected components algorithms.
5. Design solutions using Backtracking technique.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3	3
CO2	3	3	2	2	1	-	-	-	-	-	-	2	2	3	3
CO3	3	3	2	2	1	-	-	-	-	-	2	2	2	-	3
CO4	3	3	2	2	1	-	-	-	-	-	-	2	2	-	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	2	3	3

List of Programs

1. Implement Binary Search Tree Operations.
2. Find Maximum and Minimum elements from a given list of elements using Divide and Conquer technique.
3. Implement Merge sort algorithm for sorting a list of integers in ascending order.
4. Implement greedy algorithm for job sequencing with deadlines.
5. Implement Prim's algorithm to generate minimum cost spanning tree.
6. Implement Kruskal's algorithm to generate minimum cost spanning tree.
7. Implement Dijkstra's algorithm for the Single source shortest path problem.
8. Implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
9. Implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.
10. Check whether given graph having connected components or not.
11. To find articulation points of a given graph..
12. Implement backtracking algorithm for the N-queens problem.
13. Implement backtracking algorithm for the Hamiltonian Cycle problem.
14. Implement backtracking algorithm for the Graph Coloring problem.
15. Implement Least Cost Branch and Bound for the 0/1 Knapsack problem

Note: All the programs can be implemented using Java Programming.

Text Books:

1. Ellis Horowitz, SartajSahani, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithm", 2nd Edition, Universities Press, 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 2nd Edition, Prentice Hall of India Private Limited, 2006.

Suggested Reading:

1. Levitin A, "Introduction to the Design And Analysis of Algorithms", Pearson Education, 2008.
2. Goodrich M.T.,RTomassia, "Algorithm Design foundations Analysis and Internet Examples", John Wiley and Sons, 2006.
3. Base Sara, Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson, 3rd Edition, 1999.

Web Resources:

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://nptel.ac.in/courses/ 106101060
4. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html

20ADC03 ARTIFICIAL INTELLIGENCE & MACHINE LEARNING TOOLS, TECHNIQUES AND APPLICATIONS

Instruction	2 Hours per week
CIE	50 Marks
Credits	1

Course Objectives:

1. To introduce fundamental concepts in AI
2. To demonstrate simple AI applications using Natural Language Processing, Audio engineering & Speech
3. To demonstrate simple AI applications using Computer Vision, pattern recognition and machine learning.
4. To present various modeling and formulation techniques to solve problems using AI techniques.
5. To introduce state-of-art AI tools and techniques to solve problems faced by Engineers in design and analysis.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the importance of AI.
2. Understand concepts of Machine Learning algorithms and their limitations.
3. Develop Chatbots based on the requirements.
4. Analyse complex problems involving image processing, such as quality control, visual surveillance, multimodal human-machine interfaces, and image compression.
5. Understand the application of Reinforcement Learning.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	1	1	-	2	-	2	-	3	-
CO2	-	2	-	1	-	-	1	1	-	2	-	2	-	3	-
CO3	1	3	2	2	3	-	1	1	-	1	-	2	3	3	3
CO4	3	3	2	3	3	-	1	1	-	1	-	3	3	3	3
CO5	1	1	1	1	-	-	1	1	-	2	-	2	-	-	-

List of Programs

1. **Overview of AI, AI project lifecycle**
    a. Design/Construct the workflow of a general AI project using draw.io

2. **Teachable Machine** - To introduce Machine Learning Models, Computer Vision, Natural Language Processing
    a. Train a Machine Learning model to recognise a Person or Object including gestures
    b. Train a Machine Learning model to recognise various sound bites
    c. Train a Machine Learning model to recognise speech

3. **AI with App Inventor** - To introduce Image Classification, Audio Classification, Facial Recognition, Reinforcement Learning(Markov Models)
    a. Develop an app to recognise objects using Image Classification
    b. Train a Machine Learning model to identify different facial expressions using webcam
    c. Develop an Expression Match app using the trained ML model for facial expressions
    d. Develop a Voice Authentication app that uses a trained audio model of the user using audio classification to recognise the user's voice to authenticate.
    e. Develop a Rock-Paper-Scissors game that uses Reinforcement Learning (Markov Models) to learn from the patterns in the user's game choices

4. **Amazon Lex** - To introduce Automatic Speech Recognition(Speech to Text), Natural Language Understanding(intent of text), Conversational AI agents
    a. Develop a conversational chatbot to automatically recognise speech, understand the intent of the user and generate a response accordingly using Amazon Lex

5. **Wolfram Technology Framework** - To introduce Supervised Learning(Classification, Prediction, Sequence Prediction), Unsupervised Learning(Feature Extraction, Clustering), Neural Networks, Model Deployment
    a. Design a program using the Wolfram Language to Classify Data(Numbers, Images, Colors) using automatic model selection.
    b. Design a program using the Wolfram Language to Predict the price of a house from a housing prices dataset using Regression.
    c. Design a program using the Wolfram Language to demonstrate Vector Encoding based Feature Extraction and Clustering for a dog image dataset.
    d. Construct a neural network from an image dataset and explore the hidden layers along with their outputs using the Wolfram Language

Web Resources:

1. https://teachablemachine.withgoogle.com/v1/
2. https://appinventor.mit.edu/explore/ai-with-mit-app-inventor
3. https://aws.amazon.com/lex/
4. https://www.wolfram.com/wolfram-u/machine-learning-zero-to-AI-60-minutes/
5. https://www.coursera.org/learn/ai-for-everyone

20ITC18 **Mini Project –II**

Instruction	2 Hours per week
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To enable students learning by doing.
2. To develop capability to analyse and solve real world problems.
3. To inculcate innovative ideas of the students.
4. To impart team building and management skills among students.
5. To instill writing and presentation skills for completing the project.

Course Outcomes:

Upon completing this course, students will be able to:

1. Interpret Literature with the purpose of formulating a project proposal.
2. Plan, Analyse, Design and implement a project using SDLC model.
3. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
4. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time.
5. Prepare and submit the Report and deliver presentation before the departmental Committee.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	2	1	2	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	1	2	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	-	2	3	3	3	3	3
CO4	2	2	2	3	3	3	3	2	3	3	2	3	2	3	3
CO5	1	2	1	2	3	3	-	-	2	3	-	-	-	3	-

The Students are required to choose a topic for mini project related to the courses of the current semester or previous semester. The student has to implement and present the project as per the given schedule. During the implementation of the project, Personnel Software Process (PSP) has to be followed. Report of the project work has to be submitted for evaluation.

Schedule

S No	Description	Duration
1.	Problem Identification / Selection	2 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation and Testing of the Project	7 weeks
4.	Documentation and Project Presentation	4 weeks

Guidelines for the Award of marks

S No	Description	Max. Marks
1.	Weekly Assessment	20
2.	PPT Preparation	5
3.	Presentation	10
4.	Question and Answers	5
5.	Report Preparation	10

Final Mini Project demonstration and PPT presentation is to be evaluated for the entire class together by all the faculty handling Mini Project for that class.