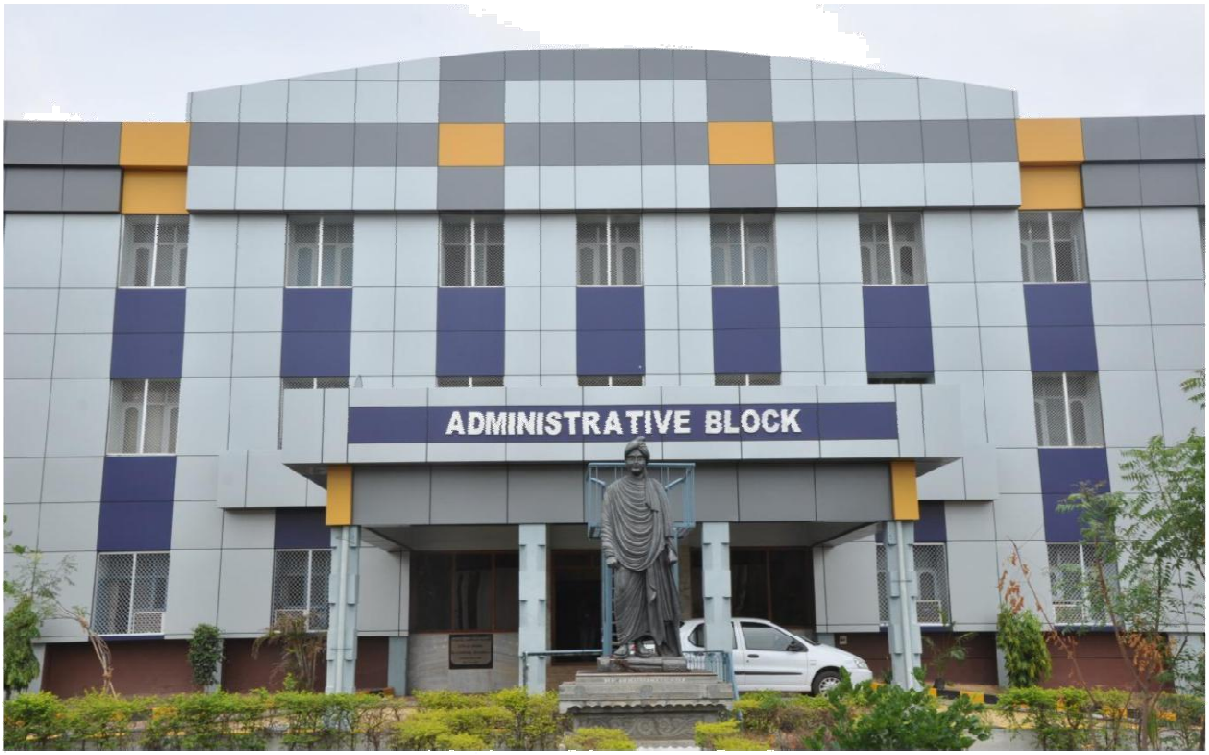


# Scheme – 2020

## Department of Emerging Technologies in Computer Science

### G. Pulla Reddy Engineering College (Autonomous): Kurnool

## Accredited by NBA of AICTE and NAAC of UGC

## Affiliated to JNTUA, Anantapuramu

# Scheme and Syllabus for II, III & IV Year of FOUR YEAR B.Tech. Degree Course in

# CSE (Data Science)

**(With Effect from the Batch Admitted in 2020-21)**

**COMPUTER SCIENCE AND ENGINEERING(DS)**
**FOUR YEAR B.TECH DEGREE COURSE**
**Scheme of Instruction and Examination**
**(Effective from 2020-2021)**

**III Semester CSE (DS)** **(Scheme-2020)**

| S.No | Category | Course Title | Credits | Scheme of Instruction periods/week | | | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T/D | P | End Exam Marks | Internal Assessment Marks | Total Marks |
| **I** | **Theory** | | | | | | | | |
| 1. | BSC | Digital Logic Design | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 2. | PCC | Java Programming | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 3. | PCC | Advanced Data Structures | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 4. | PCC | Database Systems | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 5. | PCC | Computer Architecture & Organization | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 6. | MC | Constitution of India | 0 | 2 | 0 | 0 | 0 | 100 | 100 |
| **II** | **Practical** | | | | | | | | |
| 7. | PCL | Java Programming Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| 8. | PCL | Advanced Data Structures Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| 9. | PCL | Database Systems Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| 10. | SC | Soft Skills | 2 | 0 | 0 | 4 | 60 | 40 | 100 |
| | | | 21.5 | | | | | | |

**IV Semester CSE (DS)** **(Scheme-2020)**

| S.No | Category | Course Title | Credits | Scheme of Instruction periods/week | | | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T/D | P | End Exam Marks | Internal Assessment Marks | Total Marks |
| **I** | **Theory** | | | | | | | | |
| 1. | PCC | Operating Systems | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 2. | PCC | Foundations of Data Science | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 3. | PCC | Algorithm Design and Analysis | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 4. | PCC | Mathematical Foundations of Computer Science | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 5. | HSSC | Managerial Economics & Principles of Accountancy | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 6. | SC | Python Programming | 2 | 1 | 0 | 2 | 60 | 40 | 100 |
| **II** | **Practical** | | | | | | | | |
| 7. | PCL | Operating Systems Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| 8. | PCL | Foundations of Data Science Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| 9. | PCL | Algorithm Design and Analysis Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| | | | 21.5 | | | | | | |

# DIGITAL LOGIC DESIGN (DLD)

| III Semester : Common for CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CM201 | BSC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand number conversions, Error detection and correction mechanisms.

**CO2:** Apply axioms and theorems of Boolean Algebra for minimization of Boolean functions.

**CO3:** Apply Karnaugh map and Tabulation method to obtain minimal SOP and POS.

**CO4:** Implement combinational circuits: Encoders, Decoders, Multiplexers, ROM, PLA.

**CO5:** Design Sequential circuits using Flip-flops and sequential logic.

**CO6:** Design registers and counters.

## UNIT – I

**Introduction to Number System & Codes**:
The Decimal, Binary, Octal, Hexadecimal Number System, Number Base Conversions, Complements, Binary Arithmetic in Computers, Weighted Binary codes, Non Weighted Binary codes, Error Detecting Codes, Error Correcting Codes, Parity Checking.

**Boolean Algebra & Minimization of Boolean Functions:**
Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic gates.

## UNIT – II

**Simplification of Boolean Functions:**
The Map Method, Two, Three, Four, Five and Six variable maps, Product of Sums Simplification, NAND and NOR Implementations, Other two-Level Implementations, Don't Care Conditions, The Tabulation Method, Determination of Prime Implicants, Selection of Prime Implicants.

## UNIT – III

**Combinational Logic Circuits:**
Introduction, Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive-or and Equivalence Functions. Combinational Logic with MSI & LSI: Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, Multiplexers, Read Only Memory (ROM), Programmable Logic Array (PLA).

## UNIT – IV

**Sequential Logic Circuits:**
Introduction, Flip Flops, Triggering of Flip Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip Flop Excitation Tables, Design Procedure, Design of Counters, Design with State Equations.

## UNIT – V

**Introduction to Registers:**
Registers - Registers with parallel load, Sequential Logic Implementation, Shift Registers - Serial Transfer, Bi-directional Shift Register with parallel load, Serial Addition. Counters: Ripple Counters -

Binary Ripple Counter, BCD Ripple Counter, Synchronous Counters - Binary Counter, Binary Up-Down Counter, Johnson Counter.

**Text Books:**

1. M.Morris Mano , Digital Logic and Computer Design, Pearson Education, IV Edition, 2016

**Reference Books:**

1. ZviKohavi [4 rd Edition], Switching and Finite Automata Theory, TMH.
2. F.J.Hill and G.R.Peterson , [4th Edition], Introduction to switching theory and logic Design.
3. Donald D. Givone [4rd Edition], Digital Principles and Applications, Tata McGraw Hill.
4. Digital Logic Design 4th Edition, by Brian Holdsworth, Clive Woods.

**Web References:**

1. https://nptel.ac.in/courses/106105185

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# JAVA PROGRAMMING (JP)

| III Semester : Common for CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CM202 | PCC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand Object Oriented Programming concepts.

**CO2:** Demonstrate the concepts of Inheritance, Packages and Interfaces.

**CO3:** Understand String handling methods and Exception handling mechanism.

**CO4:** Comprehend Multithreading and Java Data Base Connectivity.

**CO5:** Understand Collection interfaces and Collection classes.

## UNIT – I

**Object Oriented concepts:**
Overview of Java, Java buzzwords, Data types, Arrays, Operators, Control Statements.
Introduction to Classes-Classes and Objects, Methods, Constructors, Reading Console input, Writing Console output, this keyword, Garbage collection, finalize and Wrapper classes.

## UNIT – II

**Inheritance:** Inheritance basics, super key word, Method overloading, Dynamic method dispatch, Abstract classes and final key word.
**Packages:** Defining a package, Access protection, Importing packages.
**Interfaces:** Defining an interface and Implementing interfaces.

## UNIT – III

**String Handling:**
String constructors, String methods-Character extraction, String comparison, Searching strings and Modifying strings. StringBuffer class and its methods. StringBuilder class and its methods.
**Exception Handling:**
Introduction, Types of Exceptions, try, catch, throw, throws and finally. Java built-in exceptions, Creating customized exceptions.

## UNIT – IV

**Multithreading:**
Java thread model, Creating a thread- Extending Thread class and Implementing Runnable interface, Thread class methods, Thread priorities, Synchronization and Inter Thread Communication.
**JDBC:** JDBC Drivers, Driver Manager, Connection, Statement, ResultSet and PreparedStatement.

## UNIT – V

**Collections Framework:**
Collection Interfaces- List, Set, Sorted Set, Queue, Deque.
Collection Classes-Array List, Linked List, Hash Set, Linked Hash Set ,Tree Set, Priority Queue and Array Deque. Accessing a Collection using an Iterator, The For-Each Alternative to Iterators

**Text Books:**

1. Java The Complete Reference, Herbert Schildt, TATA McGraw-Hill, Eleventh Edition, 2019.
2. Programming with Java, E Balaguruswamy, A Primer, TATA McGraw-Hill, Sixth Edition, 2019.

**Reference Books:**

1. Thinking in Java, Bruce Eckel, Pearson Education, Fourth Edition, 2008.
2. Java How to Program, Early Objects, H.Deitel and P.Deitel, Global Edition, 2017

**Question Paper Pattern:**

**Sessional Exam:**

The Question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The Question paper shall consists of three sections with Two Questions (EITHER/OR type) in each section. The student shall answer one question from each section.

**EndExam:**

The Question paper for end examination shall be for 60 marks. The Question paper shall consists of five units with Two Questions (EITHER/OR type) in each unit. Each of these questions may contain sub questions and the student shall answer one question from each unit. Each question carries 12 marks.

# ADVANCED DATA STRUCTURES (ADS)

| III Semester : Common for CSE, CST, CSE(AIML) & CSE(DS) | | | | | Scheme : 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CS202 | PCC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1½ Hrs | | | | | End Exam Duration: 3 Hrs | | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Illustrate the applications of Linked Lists, Stacks and Queues.

**CO2:** Comprehend the operations performed on Binary Search Tree and AVL Tree.

**CO3:** Understand the Heap Operations and Applications.

**CO4:** Organize the data using Hashing Techniques for efficient Searching.

**CO5:** Understand Operations on Special Trees and String searching algorithms.

## UNIT – I

**Linear Data Structures-Applications:**
Applications of Linked lists- Polynomial manipulation.
Applications of Stacks- Recursion, Quick sort, Polish notations, Conversion of infix notation to postfix notation, Postfix expression evaluation.
Applications of Queues- Breadth First Search.

## UNIT – II

**Non Linear Data Structures:**
Operations on Binary Search Trees- Insertion, Deletion and Traversals.
AVL Trees and their operations, Threaded Binary Trees.

## UNIT – III

**Priority Queues (Heaps):**
Simple Priority Queues- Using arrays and linked lists, Binary Heaps- Max heap, Min heap, Applications of Binary heap- Heap Sort. d-heaps, Leftist Heaps, Skew Heaps and Binomial Queues.

## UNIT – IV

**Hashing Techniques:**
Hashing Definition, Hash functions, Open Hashing (Separate Chaining), Closed Hashing (Open Addressing) - Linear Probing, Quadratic Probing, Double Hashing. Rehashing and Extendible Hashing.

## UNIT – V

**Special Trees:**
Splay Trees, B-Trees and their operations.
**String Searching Algorithms:**
Brute-Force algorithm, Boyer-Moore algorithm and Rabin Karp algorithm.

**Text Books:**

1. Jean Paul Tremblay and Paul G.Sorensen, An introduction to Data Structures with Applications, TMH, 2007
2. Robert Sedgewick, Algorithms in C, Addison-Wesley Publishing Company, 2016.

**Reference Books:**

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C [Second Edition], Pearson, 2005
2. Debasis Samanta, Classic Data Structures- [Second Edition] , PHI Publications, 2009.
3. N. Kasi Viswanath, Data Structures through C++, Lakshmi Publications.

**Question Paper Pattern:**

**Sessional Exam:**

The Question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The Question paper shall consists of 3 sections with Two Questions (EITHER/OR type) in each section. The student shall answer one question from each section.

**End Exam:**

The Question paper for end examination is for 60 marks. The Question paper shall consists of 5 units with Two Questions (EITHER/OR type) in each unit. Each of these questions may contain sub questions and the student shall answer one question from each unit. Each question carries 12 marks.

# DATABASE SYSTEMS (DBS)

| III Semester : Common for CSE, CST, CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CS203 | PCC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

CO1: Understand the concepts of Database Management Systems and Entity Relationship Modeling.

CO2: Use SQL commands to create, retrieve, update, and delete data from the Data bases.

CO3: Comprehend the concepts of Normalization techniques and Indexing.

CO4: Understand the properties of Transactions in a Database System.

CO5: Understand Concurrency Control techniques and Recovery System.

## UNIT – I

**Introduction**: Introduction to DBMS, Purpose of Database Systems, Database System Applications, View of Data, Data Models, Database Users, Database Architecture.

**Entity-Relationship Model:** Basic Concepts, Cardinality of Relationship, ER Diagram Notations, Entity-Relationship Diagrams, Extended E-R Features, Modeling using ER Diagrams, Reduction of an E-R Schema to Tables.

## UNIT – II

**Relational Query Languages**: Relational Algebra, SQL, Data Definition Language Commands, Data Manipulation Language Commands and Data Control Language Commands, Candidate Key, Primary key, Foreign key, Select Clause, Where Clause, Logical Connectivity's – AND, OR, Range Search, Pattern Matching, Order By, Group By, Set Operations – Union, Intersect and Minus, Aggregate Functions, Join Operations.

**PL/SQL:** Control Structures, Procedures, Functions, Triggers and Cursors.

## UNIT – III

**Relational Database Design:** Features of Good Relational Database Designs, Decomposition, Normalization, Functional Dependency, Types of Normal Forms - First Normal Form, Second Normal Form, Third Normal Form, Boyce Codd Normal Form (BCNF), Fourth Normal Form and Fifth Normal Form.

**Indexing and Hashing:** Basic Concepts, Ordered Indices, Multilevel Indices, Secondary Indices, Static Hashing and Dynamic Hashing.

## UNIT – IV

**Transactions:** ACID properties, Transaction States, Implementation of Atomicity and Durability, Concurrent Executions.

**Serializability:** Conflict Serializability, View Serializability, Recoverability – Recoverable and Non Recoverable Schedules, Cascade less Schedules, Testing for Serializability.

## UNIT – V

**Concurrency Control:** Lock-Based Protocols – Locks, Granting of Locks, The Two-Phase Locking Protocol, Timestamp-Based Protocols – Timestamps, The Timestamp-Ordering Protocol, Thomas Write Rule, Deadlock handling – Deadlock Prevention, Deadlock Detection and Recovery.

**Recovery System:** Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Shadow Paging Technique.

## Text Books:

1. Database System Concepts, Abraham Silberschatz, Henry F. Korth and S. Sudarshan, McGraw Hill, 7 th Edition, 2019.

2. SQL, PL/SQL, Ivan Bayross, 4th Edition, 2020.

## Reference Books:

1. Principles of Database and Knowledge – Base Systems, J. D. Ullman, Vol. 1, 2016.

2. Fundamentals of Database Systems. R. Elmasri and S. Navathe, 7th Edition, 2017.

3. Data Base Management Systems, Raghu Ramakrishna and Johnannes Gehrke, McGraw Hill, 3rd Edition, 2014.

## Question Paper Pattern:

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# COMPUTER ARCHITECTURE & ORGANIZATION (CAO)

| III Semester : Common for CSE(AIML) & CSE( DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CM203 | PCC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the design of a basic computer.

**CO2:** Acquire the concepts of basic programming, design of Micro Programmed control unit.

**CO3:** Understand the Internal working of CPU, Pipelining and Vector Processing.

**CO4:** Illustrate the basic Computer Arithmetic operations, Input Output Organization.

**CO5:** Understand the concepts of Memory system and Secondary Storage devices.

## UNIT – I

**Basic Computer Organization and Design**

Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle,Memory Reference Instructions, Input/output and Interrupt, Complete Computer Description, Design of Basic Computer.

## UNIT – II

**Programming The Basic Computer**

Introduction, Machine Language, Assembly Language, The Assembler, Programming Arithmetic andLogic Operations.

**Micro Programmed Control**

Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

## UNIT – III

**Central Processing Unit**

Introduction, General Register Organization, Stack Organization, Instruction Formats, AddressingModes, Data Transfer and Manipulation, Program Control, RISC and CISC.

**Pipeline and Vector Processing**

Parallel Processing, Pipelining, Arithmetic and Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

## UNIT – IV

**Computer Arithmetic**

Introduction, Addition and Subtraction, Multiplication, Division algorithms.

**Input/output Organization**

Peripheral Devices, Input/output Interface, Asynchronous Data Transfer, Modes of Transfer, PriorityInterrupt, DMA.

## UNIT – V

**The Memory System**

Basic Concepts, Semiconductor RAM memories, Read-Only memories, Speed, Size and Cost, CacheMemories -Mapping Functions, Virtual Memories, Secondary Storage.

**Text Books:**

1. M. Morris Mano [2011], [3rd Edition], Computer system architecture, Pearson Education, 2011

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# CONSTITUTION OF INDIA (CI)

| III Semester : Common for all Branches | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| MC201 | MC | 2 | 0 | 0 | 0 | 100 | 0 | 100 |

**Course Outcomes:** At the end of the course the student will be able to

**CO1:** Understand the formation and principles of Indian Constitution.

**CO2:** Understand structure and functions of Union government and State executive. Duties of President, Vice president, Prime Minister, Governor, Chief Minister cabinet and State legislature.

**CO3:** Understand constitutional amendments of 42, 44,74,76,86 and 91. Central-State relations, President rule.

**CO4:** Understand Indian social structure and languages in India. Rights of women, SC, ST and then weaker section.

**CO5:** Understand the structure of Judiciary, Role and functions of Supreme Court, High court and Subordinate courts, Judicial review.

## UNIT - I

Historical back ground – Significance of Constitution – Making of the constitution – Role of the Constituent Assembly –Salient features – Preamble –Citizenship – Procedure for amendment of Constitution –Fundamental rights – Derivative Principles of state policy – Elections in India.

## UNIT - II

***Union Executive:*** Structure of the Union Government & its functions – President – Vice-President – Prime Minister – Cabinet – Parliament.

***State Executive:*** Structure and functions – Governor – Chief Minister – Cabinet – State Legislature.

## UNIT - III

Central-State Relations, President's Rule – Constitutional Amendments [42, 44, 74, 76, 86 & 91] – Constitutional functionaries – Working of Parliamentary system in India.

## UNIT - IV

Indian Social Structure – Languages in India – Political Parties & Pressure groups – Rights of Women – S.Cs, S.Ts & other weaker sections.

## UNIT - V

***Judiciary:*** Structure, Organisation of Judiciary – Independence of the Judiciary – Role and functions of Supreme Court, High Courts & Sub ordinate Courts – Judicial Review.

**Text Books :**


1. Durga Das Basu, *Introduction to the Constitution of India*, Wadwa& Company
2. Macivel, Page, *An Introduction Analysis* Society
3. M.V. Pylee, *Indian Constitution*, S. Chand Publications
4. Subhash C Kashyap, *Our Constitution*, National Book Trust of India.
5. Dr. S.M.Rajan ,*Constitutional Law of India*


**Reference Books :**

| |
|---|
| 1. *The Constitution of India*, By the Ministry of Law and Justice, The Govt. of India. |
| 2. C. KashyapSubhasah, *Constitutional Law of India* |
| 3. M.P.Jain, *Indian Constitution Law* |
| 4. H.M. Seervai, *Constitutional Law of India* |
| **Web References:** |
| 1. https://www.india.gov.in/my-government/constitution-india |

# JAVA PROGRAMMING LAB (JP(P))

| **III Semester : Common for CSE(AIML) & CSE( DS)** | | | | | | **Scheme : 2020** | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| **CM204** | **PCL** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| | | **0** | **0** | **3** | **1.5** | **40** | **60** | **100** |
| **Sessional Exam Duration: 2 Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :** At the end of the course students will be able to

**CO1:** Implement Method overloading and Constructor overloading.

**CO2:** Implement Inheritance, Packages and Interfaces concepts.

**CO3:** Implement String handling and Exception handling.

**CO4:** Implement multithreading and collections.

***List of Experiments***

1. Programs on Method overloading and Constructor overloading.
2. Program to implement Multilevel and Hierarchical Inheritance.
3. Program to implement Packages with access protection.
4. Program to implement Multiple inheritance using interfaces.
5. Programs on String Handling methods.
6. Programs to implement built-in exceptions and customized exceptions.
7. Programs to implement Synchronization and Inter Thread Communication in Multi-threading.
8. Programs to implement Array List, Linked List and Hash Set collections.

# ADVANCED DATA STRUCTURES LAB (ADS(P))

| **III Semester : Common for CSE,CST, CSE(AI/ML) & CSE(DS)** | | | | | | **Scheme : 2020** | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| **CS205** | **PCL** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| | | **0** | **0** | **3** | **1.5** | **40** | **60** | **100** |
| **Sessional Exam Duration: 2 Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Implement the applications of Linked lists, Stacks and Queues.

**CO2:** Implement Binary Search Tree and AVL Tree operations.

**CO3:** Implement Hashing Techniques.

**CO4:** Implement String searching algorithms.

***List of Experiments***

1. Application of Linked List : Addition of two polynomial equations.
2. Conversion of Infix expression to Postfix expression
3. Evaluation of Postfix Expression
4. Quick Sort (Recursion).
5. Application of Queue: Breadth First Search Graph traversal technique.
6. Insertion, Deletion and Traversal operations on a Binary Search Tree.
7. Insertion and Traversal operations on an AVL Tree.
8. Application of Binary Heap: Heap Sort.
9. Implementation of Hashing Techniques - Linear Probing, Quadratic Probing and Separate Chaining method.
10. Implementation of Brute force String searching technique.

# DATA BASE SYSTEMS LAB (DB(P))

| III Semester :Common for CSE , CST, CSE(AIML) & CSE( DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CS206 | PCL | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| Sessional Exam Duration: 2 Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :**At the end of the course the student will be able to

**CO1:** Understand the concepts of Database Management Systems and Entity Relationship Modeling

**CO2:** Use SQL commands to create, retrieve, update, and delete data from the Data bases.

**CO3:**. Comprehend the concepts of Normalization techniques and Indexing.

**CO4:** Understand the properties of Transactions in a Database System.

**CO5:** Understand Concurrency Control techniques and Recovery System.

***List of Experiments***

1. Perform DDL, DML and DCL commands.
2. Design and create a University Library Database using ER diagram and Schema diagram.
3. Design and create a University database consisting of the following tables Department, Course, Instructor and Student using ER Modeling and Schema Diagram.
4. Create various tables like Branch, Account, Depositor, Customer, Loan and Borrower for a Banking system with constraints using a Schema diagram.
5. Perform various SQL queries on Select clause, Where clause, Pattern matching, Order by, and Group by.
6. SQL Queries on Set operations, Aggregate functions and Join operations.
7. PL/SQL program using Control Structures.
8. Program to implement Procedures and Functions.
9. Program to implement Cursors
10. Program to implement Triggers.

# SOFT SKILLS LAB (SS(P))

| III Semester: Common for all branches | | | | | | Scheme: 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| SCCM01 | SC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| Sessional Exam Duration: 2 Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes:** At the end of the course students will be able to

**CO1:** : Communicate effectively and enhance their interpersonal relationship building skills with renewed self confidence

**CO2:** Work together in teams and accomplish objectives in a cordial atmosphere

**CO3:** Face interviews, GDs and give presentations

**CO4:** Understand and develop the etiquette necessary to present themselves in a professional setting

**CO5:** Learn the Principles of Personal effectiveness

List of Activities

1. Ice breaking Activities, Principles of Time and Stress Management
2. Art of speaking
3. Art of writing - Essay / Picture / Story
4. Business etiquette - Telephone and email
5. Presentation Skills - Power point making
6. Group Discussion – Objectives and Skills tested in a GD, types of GD, Dos and don'ts & practice
7. Team work - Drama / Skit / Role play
8. Paper / Poster Presentation
9. Problem Solving by lateral thinking puzzles
10. Know your General Awareness / Knowledge – Quiz
11. Principles of Personal excellence
12. Interview Skills

**Reference Books :**


1. Stephen R. Covey, “The Seven Habits of Highly Effective People”, Pocket Books Publishers, London
2. Priyadarshani Patnaik, “Group Discussion and Interview Skills with VCD”, Foundation Books
3. Sangeeta Sharma &Binod Mishra, “Communication Skills for Engineers and Scientists”, PHI Learning Private Limited.
4. Shiv Khera, “You Can Win”, MacMillan India Publishers, New Delhi

# OPERATING SYSTEMS (OS)

| IV Semester : Common for CSE, CST, CSE(AI&ML), CSE(DS) & CSBS | | | | | Scheme : 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CS208 | PCC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | End Exam Duration: 3 Hrs | | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Acquaint with the basics of the Operating System and their different structures.

**CO2:** Comprehend the process management policies, CPU Scheduling and Process synchronization techniques

**CO3:** Understand Deadlocks and their Handling mechanisms, file management system.

**CO4:** Analyze memory management schemes and allocation policies.

**CO5:** Demonstrate Input / Output related Software/Hardware and Disk scheduling strategies

## UNIT – I

**Introduction:** Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.

**Processes:** Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.

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

## UNIT – II

**Process Scheduling:** Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

**Scheduling algorithms:** Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multi processor scheduling: Real Time scheduling: RM and EDF.

**Inter-process Communication:** Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem, Barber's shop problem

## UNIT – III

**Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

**Concurrent Programming:** Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

**File Management:** Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed ), Free-space

management (bit vector, linked list, grouping), directory implementation(linear list,hash table), efficiency and performance.

## UNIT – IV

**Memory Management:** Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction.

**Virtual Memory:** Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU)

## UNIT – V

**I/O Hardware:** I/O devices, Device controllers, Direct Memory Access, Principles of I/O.

**Disk Management:** Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.

**Case study:** UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, UNIX system calls.

## Text Books:

1. Operating System Concepts Essentials. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne

## Reference Books:

1. Operating Systems: Internals and Design Principles. William Stallings.
2. Operating System: A Design-oriented Approach. Charles Patrick Crowley.
3. Operating Systems: A Modern Perspective. Gary J. Nutt.
4. Design of the Unix Operating Systems. Maurice J. Bach.
5. Understanding the Linux Kernel, Daniel Pierre Bovet, Marco Cesati.

## Question Paper Pattern:

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# FOUNDATIONS OF DATA SCIENCE (FDS)

| IV Semester : CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CD201 | PCC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

CO1: Understand the basic concepts of data science.

CO2: Understand the Numpy and Pandas libraries.

CO3: Implement Data cleaning, preparation and data wrangling on datasets.

CO4: Understand the data visualization techniques using Matplotlib and Seaborn.

CO5: Understand the methods to interpret time series data.

## UNIT – I

**Introduction to Data Science:** Need for data science, What is data science, Data science process, Business Intelligence and data science, Prerequisites for data scientist, Components of data science, Tools and skills needed, Statistics for Data science: Data types, Variable types, Statistics, Data analytics lifecycle.

## UNIT – II

**NumPy:** A multidimensional array object, Universal functions: Fast element-wise Array functions, Data Processing using arrays, File input and output with arrays, Linear algebra, pseudorandom number generation**.**

**Data Exploration with Pandas:** Process of exploring data, Introduction to Pandas data structures, Essential functionality, Summarizing and computing descriptive statistics, Hierarchical Indexing, Reading and writing data in text format, Binary data formats.

## UNIT – III

**Data Cleaning, Preparation And Data Wrangling:** Handling Missing Data, Combining and merging Datasets, Reshaping and Pivoting, Data transformation, String manipulation.

## UNIT – IV

**Data Visualization With Matplotlib:** Plotting and visualization- A brief matplotlib API primer, Plotting in Pandas, Other python visualization tools- Seaborn, Data aggregation and Group operations- GroupBy mechanics, Data aggregation, Apply: General split-apply-combine.

## UNIT – V

**Time Series Analysis:** Date and time data types and tools, Time series basics, Date ranges, Frequencies and shifting. Time zone handling, Resampling and frequency Conversion, Time Series Plotting.

**Text Books**


1. Sanjeev J.Wagh, Manisha S.Bhende, Anuradha D.Thakare , Fundamentals of Datascience
2. Wes McKinney, Python for Data Analysis, O'Reilly, 2nd Edition, 2017.

**Reference Books:**


1. Sinan Ozdemir, Principles of Data Science, Packt Publishers, 2nd Edition, 2018.
2. Rachel Schutt, Cathy O'Neil,*Doing Data Science: Straight Talk from the Frontline*,O'Reilly, 2014.


**Web Resources:**

- https://swayam.gov.in/nd1_noc19_cs60/preview
- https://towardsdatascience.com/
- https://www.w3schools.com/datascience/
- https://github.com/jakevdp/PythonDataScienceHandbook
- https://www.kaggle.com

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# ALGORITHMS DESIGN AND ANALYSIS (ADA)

| IV Semester : Common for CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CM206 | PCC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Analyze the performance of algorithms.

**CO2:**.Comprehend Divide and conquer technique to solve problems.

**CO3:** Apply Greedy method to solve problems.

**CO4:** Apply Dynamic programming technique to solve problems.

**CO5:** Understand Tree traversal, Graph traversal and Backtracking techniques.

**CO6:** Understand Branch and Bound technique and Lower bound theory.

## UNIT– I

**Introduction:** What is an Algorithm? Performance Analysis: Space &Time Complexities, Asymptoticnotations.

**Divide and Conquer:** General method, Binary search, Finding Maximum and Minimum, Merge sort,Quick sort, Strassen's Matrix Multiplication.

## UNIT– II

**Greedy Method :** The General Method, Knapsack Problem, Tree Vertex splitting, Job Sequencing withDeadlines, 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 Pairs Shortest Paths, OptimalBinary Search Trees, String Editing problem, 0/1-Knapsack, Reliability Design, The Travelling Salesperson Problem.

## UNIT– IV

**Basic Traversal and Search Techniques**: Techniques for Binary Trees, Techniques for Graphs, Bi-connected Components and DFS

**Backtracking:** The General Method, The 8-Queens Problem, Sum of Subsets, Graph Coloring, andHamiltonian cycles.

## UNIT – V

**Branch and Bound:** The Method, 15 Puzzle problem, Job Sequencing with Deadlines, Travelling Salesperson problem.

**Lower Bound Theory**: Comparison Trees, Oracles and Adversary Arguments, Techniques for Algebraicproblems.

**Text Books:**

1. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaz Sahni & Sanguthevar Rajasekaran, Galgotia Publications Second Edition

2. Introduction to the Design and Analysis of Algorithms by Anany Levitin, Third Edition, Pearson Education, 2012.

**Reference Books:**

1. Algorithm Design by Jon Kleinberg, Eva Tardos, Pearson Education Seventh Impression
2. Introduction to Algorithms by Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Third Edition, PHI Learning Private Limited, 2012.
3. Data Structures and Algorithms by Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Pearson Education, Reprint 2006.
4. Algorithms Design and Analysis by Harsh Bhasin, Oxford university press, 2016.
5. Design and Analysis of Algorithms by S. Sridhar, Oxford university press, 2014.

**Question Paper Pattern:**

**Sessional Examination :**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (MFCS)

| **III Semester: Common for CSE( AIML) & CSE( DS)** | | | | | | **Scheme: 2020** | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| **CM207** | **PCC** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| | | **3** | **0** | **0** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration 1½ Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes:** At the end of the course the student will be able to

**CO1:** Understand the mathematical representation of statements using connectives, normal forms, equivalence and implications.

**CO2:** Calculate number of possible outcomes of elementary combinatorial processes.

**CO3:** Solve homogenous and Inhomogeneous recurrence relations using substitution method and generating functions

**CO4:** Understand the concept of Planar graphs, Hamiltonian graphs, Euler graphs, Spanning trees and Binary trees.

**CO5:** Understand the association between the elements of sets using Digraphs and Warshall's Algorithm.

## UNIT – I

**Mathematical Logic**: Statements & Notation, Connectives, Well Formed Formulas, Equivalence & implications, Duality law, other connectives.

**Normal forms**: Normal Forms-Principle Disjunctive Normal form, Principle conjunctive Normal form, Theory of inference for statement calculus

## UNIT – II

**Elementary Combinatorics**: Permutations & Combinations, Enumeration of Combinations and Permutations without repetition, Combinations with repetition, Principle of Inclusion-Exclusion.

## UNIT – III

**Recurrence Relations**: Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The method of Characteristic Roots, Solutions of Inhomogeneous Recurrence Relations.

## UNIT – IV

**Graphs**: Basic Concepts, Isomorphism and Sub graphs, Trees and Their Properties, Spanning Tress-Depth First search and Breadth First search, Minimal Spanning Trees, Binary Trees, Planar and Non planar Graphs, Euler's Formula, Hamiltonian Graphs, Chromatic Numbers.

## UNIT – V

**Relations and Digraphs**: Introduction, Properties of Binary Relations, Equivalence Relations, Digraphs, partially ordered sets, Special elements of POSET, Hasse Diagram, Transitive Closure, Warshall's algorithm.

**Text Books:**

1.Trembly.J.P and Manohar.R [2011], Discrete mathematical structures with applications to computer science, Mc-Graw-Hill International Editions

2. Joe L.Mott, Abraham Kandel and Theodore P.Baker [2008], [2nd Edition], Discrete Mathematics forComputer Scientists and Mathematicians, PHI.

**Reference Books:**

1. Dr. S.Chandrasekharaiah, Mathematical foundations of computer science, -Prism books Pvt.Ltd.

2. Ralph P.Grimaldi [2006], [5th Edition], Discrete and Combinational Mathematics-An Applied Introduction, Pearson Education.

3. Liu [2004], Elements of discrete mathematics, McGraw-Hill.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY (MEPA)

| IV Semester: Common for CE , EEE CSE( AIML) & CSE( DS) | | | | | | Scheme: 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| HU201 | HSSC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes:** At the end of the course students will be able to

**CO1:** Understand the nature and scope of managerial economics and the concepts of demand analysis.

**CO2:** Understand the significance of demand elasticity and the concepts of demand forecasting.

**CO3:** Understand the concepts of production and cost analysis and different market structures and their competitive situations.

**CO4:** Understand the concept and significance of capital budgeting.

**CO5:** Understand the principles and significance of accountancy and preparation of final accounts.

## UNIT– I

**Introduction to Managerial Economics & Demand**

Managerial Economics- Definition, Nature and Scope of Managerial Economics Demand Analysis- Meaning, Types of Demand, Demand Determinants, Law of Demand and its exceptions, Nature and Types of Demand, Law of Diminishing Marginal Utility, Indifference curve

## UNIT– II

**Elasticity of Demand and Demand Forecasting**

Elasticity of Demand-Types of elasticity of demand, measurement, factors influencing and significance of elasticity of demand Demand forecasting– Importance, Factors, Purposes, Methods of Demand forecasting.

## UNIT– III

**Theory of Production & Cost Analysis and Market Structures**

Production Analysis- Meaning, Isoquants & Isocosts, The law of diminishing Marginal Returns, Law of Returns to Scale, Internal and External Economies of scale, Optimum combination of inputs and Producer's equilibrium Cost Analysis– Cost concepts, Cost output relationship for Short Run and Long Run

Break Even Analysis– Its Importance, Limitations and Managerial uses Market Structures- Types and features of different market structures, Perfect Competition, Monopoly – Monopolistic and Oligopolistic, Price output determination in case of perfect competition and Monopoly.

## UNIT– IV

**Capital and Capital Budgeting**

Introduction, definition; significance of Capital Budgeting, Complications involved in capital budgeting decisions, Need for capital budgeting decisions, Steps in Capital budgeting, Methods of Capital budgeting, Traditional methods, Payback period and Accounting rate of return methods, Discounted Cash flow methods- Net present value method, Internal Rate of

return method and Profitability index method.

## UNIT– V

**Introduction to Financial Accountancy**

Principles of Accountancy- Introduction, Double Entry System of Book Keeping, Journal, Ledger, Preparation of Trial balance. Preparation of Final Accounts- Trading Account, Profit & Loss Account, and Balance Sheet with adjustments, Final Accounts, problems.

**Text Books :**

1. A.R. Aryasri A.R. Aryasri, Managerial Economics and Financial Analysis,McGrawHill Education
2. Varshiney and Maheswari, Managerial Economics, Sultan Chand & Co, New Delhi

**Reference Books :**

1. Vanita Agarwal, Managerial Economics, Pearson Education.
2. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Thomson.
3. S.P.Jain and K.L.Narang, Financial Accounting.

**Web References:**

1. www.springer.com/us/book/9780387970486

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# PYTHON PROGRAMMING (PYP)

| IV Semester : Common for CSE, CST, CSE(AIML) & CSE(DS) & CSBS | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| SCCS01 | SC | 1 | 0 | 2 | 2 | 40 | 60 | 100 |
| Sessional Exam Duration : 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the python programming constructs, operators and expressions.

**CO2:** Apply the concepts of functions, decision and control structures to solve problems.

**CO3:** Apply the core data structures String, List, Tuple, Set and Dictionaries to solve problems.

**CO4:** Understand the concepts of exception handling and modules.

**CO5:** Apply Object Oriented Programming concepts to solve real life problems.

## UNIT – I

**Introduction to Python Programming:** Overview of Programming Languages, History of Python, Installing Python, Executing Python Programs, Commenting in Python, Internal Working of Python.

**Basics of Python Programming:** Python Character Set, Token, Python Core Data Type, I/O functions, Assigning Value to a Variable, Multiple Assignments, Writing Simple Programs in Python, Formatting Number and Strings, Python Inbuilt Functions.

**Operators and Expressions:** Operators and Expressions, Arithmetic Operators, Operator Precedence and Associativity, Changing Precedence and Associativity of Arithmetic Operators, Translating Mathematical Formulae into Equivalent Python Expressions, Bitwise Operator, The Compound Assignment Operator.

## UNIT – II

**Decision Statements:** Boolean Type, Boolean Operators, Using Numbers with Boolean Operators, Using String with Boolean Operators, Boolean Expressions and Relational Operators, Decision Making Statements, Conditional Expressions.

**Loop Control Statements:** The while Loop, The range() Function, The for Loop, Nested Loops, The break Statement, The continue Statement.

**Functions:** Syntax and Basics of a Function, Use of a Function, Parameters and Arguments in a Function, The Local and Global Scope of a Variable, The return Statement, Recursive Functions, The Lambda Function.

## UNIT – III

**Strings:** The str class, Basic Inbuilt Python Functions for String, The index[] Operator, Traversing String with for and while Loop, Immutable Strings, The String Operators, String Operations.

**Lists:** Creating Lists, Accessing the Elements of a List, Negative List Indices, List Slicing [Start: end], List Slicing with Step Size, Python Inbuilt Functions for Lists, The List Operator, List Comprehensions, List Methods, List and Strings, Splitting a String in List, Passing List to a Function, Returning List from a Function.

**Tuples, Sets and Dictionaries:** Introduction to Tuples, Sets, Dictionaries.

## UNIT – IV

**Exceptions:** Difference between an error and Exception, Detecting and Handling Exceptions,

Raising Exceptions, Assertions, Built-in Exceptions, User Defined Exceptions
**Modules:** Defining module, namespacing, Importing modules and module attributes, from. Import statement, Module built-in functions, Introduction to Packages.

## UNIT – V

**Object-Oriented Programming: Class, Objects and Inheritance:** Defining Classes, The Self parameter and Adding Methods to a Class, Display Class Attributes and Methods, Special Class Attributes, Accessibility, The __init__ Method (Constructor), Passing an Object as Parameter to a Method, __del__() (Destructor Method), Class Membership Tests, Method Overloading, Operator Overloading, Inheritance, The Object Class.

**Text Books:**

1. Programming and problem solving with Python by Ashok Namdev Kamthane, Amit Ashok Kamthane (2018): McGraw Hill Education (India) Private Limited.
2. Core Python Programming, Wesley J. Chun, First Edition December 14, 2000, Publisher: Prentice Hall PTR.

**Reference Books:**

1. Python -The Ultimate Beginner's Guide! , Andrew Johansen,2016

**Web References:**

1. https://www.tutorialspoint.com/python3/
2. https://docs.python.org/
3. https://realpython.com/

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

**Laboratory:**

1. Implement operations on numbers.
2. Implement decision making and looping statements.
3. Demonstrate the concept of functions.
4. Demonstrate the working of core data structures.
5. Demonstrate the creation and importing of modules.
6. Implement exception handling concepts.
7. Demonstrate Object-Oriented Programming concepts.

# OPERATING SYSTEMS LAB (OS(P))

| IV Semester : Common for CSE, CST, CSE(AIML), CSE(DS) & CSBS | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CS213 | PCL | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| Sessional Exam Duration: 2 Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the Unix commands and vi editor.

**CO2:** Implement threads and scheduling concepts.

**CO3:** Implement inter-process communication, deadlock avoidance and deadlock detection.

**CO4:** Implement the shared memory concepts.

**CO5:** Implement the memory management techniques.

***List of Experiments (Using C language)***

1. Basic UNIX commands.
2. Shell programming using vi editor.
3. Program for implementation of thread and multi threads.
4. Program for implementation of Scheduling Algorithms.
5. Program for implementation of Inter Process Communication
6. Program for implementation of Deadlock Avoidance and Deadlock Detection.
7. Program for implementation of Shared memory.
8. Program for implementation of Semaphores.
9. Program for implementation of Memory Management.
9. Program for implementation of Indexing and Hashing.

# FOUNDATIONS OF DATA SCIENCE LAB (FDS(P))

| IV Semester : CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CD202 | PCL | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| Sessional Exam Duration: 2 Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Implement operations on Arrays using Numpy

**CO2:** Implement programs using Pandas and Matplotlib

**CO3:** Perform programs using Date and Time Data types.

***List of Experiments***

1. Python Environment setup to work with Datascience
2. NumPy: Arithmetic Operations on Arrays
3. Generate Pseudo Random numbers using various methods in NumPy
4. Perform Linear search, binary search using NumPy arrays.
5. Loading and extracting data from different dataframes
6. Pandas: Program to deal with missing data by reading data from a file.
7. Implement data wrangling functions on raw data
8. Matplotlib: Visualize data by plotting a scatter plot.
9. Program to visualize data using pie and bar graphs.
10. Implement programs on Date and Time Data Types

# ALGORITHMS DESIGN AND ANALYSIS LAB (ADA(P))

| IV Semester: Common for CSE(AIML) & CSE( DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CM209 | PCL | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| Sessional Exam Duration: 2 Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course students will be able to

**CO1:** Apply Divide and Conquer and Greedy methods for problem solving.

**CO2:** Apply Dynamic Programming Technique to solve problems.

**CO3:** Apply Backtracking and Branch and Bound Techniques for problem solving.

***List of Experiments***

1. Implement Binary Search algorithm using Divide and Conquer Technique.
2. Implement Merge Sort algorithm using Divide and Conquer Technique.
3. Implement Knapsack using Greedy Technique.
4. Implement Job Sequencing with Deadlines using Greedy Technique.
5. Implement Kruskal's algorithm for finding minimum cost spanning tree using Greedy Technique.
6. Implement All pairs shortest paths problem using Dynamic Programming Technique.
7. Implement Travelling Sales Person problem using Dynamic Programming Technique.
8. Implement Depth First Search Algorithm.
9. Implement N Queens's problem using Backtracking technique.
10. Implement Travelling Sales Person problem using Branch and Bound Technique.

**V Semester CSE (DS)** **(Scheme-2020)**

| S.No | Category | Course Title | Credits | Scheme of Instruction periods/week | | | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | End Exam Marks | Internal Assessment Marks | Total Marks |
| **I** | **Theory** | | | | | | | | |
| 1. | PCC | Theory of Computation | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 2. | PCC | Computer Networks | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 3. | PCC | Statistics for Data Science | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 4. | PCC | Software Engineering | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 5. | PEC | Professional Elective - I | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 6. | OEC | Open Elective - I | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 7. | MC | Professional Ethics | 0 | 2 | 0 | 0 | 0 | 100 | 100 |
| **II** | **Practical** | | | | | | | | |
| 8. | PCL | Computer Networks Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| 9. | PCL | Statistics for Data Science Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| 10. | SC | Multimedia and Application Lab | 2 | 0 | 0 | 4 | 60 | 40 | 100 |
| 11. | **INT** | Summer Internship – I | 1.5 | 0 | 0 | 0 | 0 | 100 | 100 |
| | | | 24.5 | | | | | | |

**VI Semester CSE (DS)** **(Scheme-2020)**

| S.No | Category | Course Title | Credits | Scheme of Instruction periods/week | | | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | End Exam Marks | Internal Assessment Marks | Total Marks |
| **I** | **Theory** | | | | | | | | |
| 1. | PCC | Compiler Design | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 2. | PCC | Data Analytics | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 3. | PCC | Foundations of Machine Learning | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 4. | PEC | Professional Elective – II | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 5. | OEC | Open Elective – II | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 6. | MC | Essence of Indian Traditional Knowledge | 0 | 2 | 0 | 0 | 0 | 100 | 100 |
| **II** | **Practical** | | | | | | | | |
| 7. | PCL | Compiler Design Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| 8. | PCL | Data Analytics Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| 9. | PCL | Machine Learning Lab | 1.5 | 0 | 0 | 3 | 60 | 40 | 100 |
| 10. | SC | Android App development Lab | 2 | 0 | 0 | 4 | 60 | 40 | 100 |
| | | | 21.5 | | | | | | |

# THEORY OF COMPUTATION (TOC)

| V Semester : Common for CST ,CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CT301 | PCC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :**At the end of the course the student will be able to

**CO1:** Design the finate automata for a given regular language.

**CO2:** Understand the regular expressions and pumping lemma of regular languages.

**CO3:** Understand the regular grammar, Context Free Grammar and pumping lemma for CFL.

**CO4:** Design push down automata and context free grammar for a given context free language.

**CO5:** Design the Turing Machine for the given formal language and understand the undecidability.

## UNIT – I

**Basics of Languages and Automata:** Alphabets, Strings and operations on Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Representation of Automata, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata.

## UNIT – II

**Regular Expression (RE):** Regular expression (RE) Definition, Operators of regular expression and their precedence, identity rules for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages

**Automata with output:** Moore and Mealy machine, Equivalence of Moore and Mealy Machine.

## UNIT – III

**Grammar:** Classification of Grammar, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

## UNIT – IV

**Push Down Automata (PDA):** Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

## UNIT – V

**Turing Machines (TM):** Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Different types of Turing Machine, TM as Computer of Integer functions, Universal TM, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP.

**Text Books:**

1.Hopcroft and Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education, 3rd edition, 2006

**Reference Books:**

1. Martin J. C., “Introduction to Languages and Theory of Computations”, TMH, 4th edition, 2010
2. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Pub. House, 2011
3. Papadimitriou, C. and Lewis, C. L., “Elements of the Theory of Computation”, PHI, 1997

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# COMPUTER NETWORKS (CN)

| V Semester: Common for CST, CSE(AIML) & CSE(DS) | | | | | | Scheme: 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CT302 | PCC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes:** At the end of the course students will be able to

**CO1:** Understand Data Communication Systems, Network models and itsProtocols

**CO2:** Understand concepts of Transmission media and techniques of Data link layer.

**CO3:** Understand the routing strategies for an IP based networking infrastructure.

**CO4:** Study of congestion control and internetworking concepts.

**CO5:** Understand connection establishment and services provided by TCP and UDP

## UNIT– I

***Introduction***: Data communications, Networks, Protocols and standards, The OSI Model – Layered architecture, Layers in OSI Model, TCP/IP Protocol Suite, Addressing – Physical addresses, Logical addresses, Port Addresses.
Transmission Media: Analog and digital signals, Digital signals –Bit rate, Bit length, Transmission of digital signals, Transmission Impairments – Attenuation, Distortion and Noise, Performance – Bandwidth, Throughput, Latency, Jitter.

## UNIT– II

***Data Link Layer:*** Error detection – Introduction, Block coding – error detection, error correction, hamming distance and minimum hamming distance, CRC codes, Checksum.

## UNIT– III

***Network layer:*** Design Issues: store-and-forward, Services of transport layer, Connection less and Connection oriented services
***Routing Algorithms:*** The optimality principle, shortest path routing, Flooding, Distance vector and Link state, Multicast Routings.

## UNIT– IV

***Congestion Control:*** Principles, congestion prevention policies, congestion control in virtua circuits and datagram subnets, load shedding, jitter control.
***Internetworking:*** Tunneling, Internet work routing, Fragmentation. The IP protocol, IP address, Gateway routing protocols: OSPF, BGP.

## UNIT– V

***Transport Layer:*** UDP, TCP- service model, protocol, segment header, connection management, Transmission Policy.
***Application Layer:*** The DNS Name Space, Resource Records, Name Servers.

**Text Books :**

1. Behrouz A. Forouzan [2006][4th Edition], Data communications and Networking, MGH.
2. Andrew S. Tenenbaum [2007], [4th Edition], Computer Networks, Pearson Education.

**Reference Books :**

1. William Stallings ,Data and Computer Communications, Seventh Edition or Eighth Edition
2. An Engineering Approach to Computer Networks, S.Keshar, [II Edition], Pearson Education.
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F, Keith W.Ross, [V Edition], Pearson Education.
4. Computer networks and internets, Douglas E Comer [6th Edition], Pearson Education.

**Web References:**

1.https://www.tutorialspoint.com/data_communication_computer_network/index.htm

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# STATISTICS FOR DATA SCIENCE (SDS)

| V Semester : CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CD301 | PEC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Analyze data using Exploratory Data Analysis methods.

**CO2:** Apply sampling Distributions on Data for making inferences, or conclusions, about large amounts of data.

**CO3:** Demonstrate statistical experiments to compare the outcomes of various testing methods.

**CO4:** Implement the various significance testing methods.

**CO5:** Implement the ANOVA significance method for data science.

## UNIT – I

**Exploratory Data Analysis**:

Elements of Structured Data, Rectangular Data, Estimates of Location, Estimates of Variability, Exploring the Data Distribution, Exploring Binary and Categorical Data, Correlation, Exploring Two or More Variables.

## UNIT – II

**Data and Sampling Distributions:**

Random Sampling and Sample Bias, Selection Bias, Sampling Distribution of a Statistic, The Bootstrap, Confidence Intervals, Normal Distribution, Student's t-Distribution, Binomial Distribution, Chi-Square Distribution, F-Distribution, Poisson Distributions.

## UNIT – III

**Statistical Experiments:**

A/B Testing, Hypothesis Tests, Resampling, Permutation Test, Example: Web Stickiness, Exhaustive and Bootstrap Permutation Tests, Permutation Tests: The Bottom Line for Data Science.

## UNIT – IV

**Significance Testing 1:**

Statistical Significance and p-Values: p-Value , Alpha, Type 1, and Type 2 Errors ,Data Science and p-Values, t-Tests, Multiple Testing, Degrees of Freedom.

## UNIT – V

**Significance Testing 2:**

ANOVA: F-Statistic, Two-Way ANOVA, Chi-Square Test: A Resampling Approach , Relevance for Data Science ,Sample Size,

**Text Books:**

1. Practical Statistics for Data scientists ,2nd Edition by Peter Bruce, Andrew Bruce, Peter Gedeck

**Reference Books:**

1. Think Stats Probability and Statistics for Programmers by Allen B. Downey
2. Advanced Engineering Mathematics by Erwin Kreyszig

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# SOFTWARE ENGINEERING (SE)

| V Semester : Common for CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CM302 | PCC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the Process Models

**CO2:** Analyze and translate end-user requirements into system and software requirements

**CO3:** Understand the concepts of UML, and structure the requirements in a Software Requirements Document (SRD).

**CO4:** Identify strategies of testing problems and will be able to develop a simple testing report.

**CO5:** Estimate project risk and Project metrics

## UNIT – I

**Introduction to Software Engineering:** The evolving role of software, changing nature of software, software myths. A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI)

**Process models:** The waterfall model, incremental process models, evolutionary process models, the unified process.

## UNIT – II

**Software Requirements:** Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

**Requirements engineering process:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

## UNIT – III

**Design Engineering:** Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

## UNIT – IV

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

## UNIT – V

**Metrics for Process and Products**: Software measurement, metrics for software quality. Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

**Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

**Text Books:**

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

**Reference Books:**

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# PROFESSIONAL ETHICS (PE)

| V Semester: Common for all Branches | | | | | | Scheme: 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| MC104 | MC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 2 | 0 | 0 | 0 | 100 | 0 | 100 |

**Course Outcomes:** At the end of the course students will be able to

**CO1:** Understand the importance of Ethics & Human Values and become Humane.

**CO2:** Know the moral autonomy and uses of Ethical theories.

**CO 3:** Know the responsibilities of the Engineer towards the society.

**CO 4:** Assess environmental issues to take Protective measures to evade risks.

**CO 5:** Determine various roles of Engineer and help them make the world a better place.

## UNIT-I

**HUMAN VALUES**

Morals – Values - Ethics – Morals vs Laws - Integrity - Work Ethics - Respect for Others -Peaceful Life - Honesty - Courage - Valuing Time- Empathy - Character - Spirituality

## UNIT-II

**ENGINEERING ETHICS:** Definition of Engineering Ethics - Varieties of Morals - Types ofInquiry – Kohlberg's Theory –Gilligan's Theory - Consensus & Controversy - Models of Professional Roles - Customs and Religion - Uses of Ethical Theories

## UNIT-III

**ENGINEERING AS SOCIAL EXPERIMENTATION:** Engineering as Social Experimentation

- Engineers as responsible experimenters - Codes of Ethics - A balanced Outlook on Law -The Challenger case study

## UNIT-IV

**SAFETY, RESPONSIBILITIES & RIGHTS:** Safety and Risk - Risk Benefit Analysis and Reducing Risk - Collegiality and Loyalty - Respect for Authority - Confidentiality - OccupationalCrime - Professional Rights - Employee Rights - Intellectual Property Rights (IPR)

## UNIT-V

**GLOBAL ISSUES**

Multinational Corporations - Environmental Ethics - Computer Ethics -Engineers as Managers - Consulting Engineers - Moral Leadership - Sample Code of Ethics like ASME,ASCE, IEEE, Institute of Engineers, Indian Institute of Materials Management, IETE etc.,

**Text Books:**

1. Jayashree Suresh, B.S.Raghavan, "Human Values and Professional Ethics", S. ChandPublications

**Reference Books:**

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York., 1996

2. Charles D.Fleddermann , "Engineering Ethics", prentice Hall, New Mexico., 1999.

# COMPUTER NETWORKS LAB (CN(P))

| **V Semester :** Common for **CST, CSE(AIML) & CSE(DS)** | | | | | | **Scheme : 2020** | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **CT303** | **PCL** | **0** | **0** | **3** | **1.5** | **40** | **60** | **100** |
| **Sessional Exam Duration: 2 Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :** At the end of the course the student will be able to

CO1: Understand the network models using packet tracer.

CO2: Implement the error detection, routing and congestion techniques.

CO3: Implement real time applications.

***List of Experiments***

1. Study of basic network command and Network configuration commands.
2. Create a network models using packet tracer.
3. Perform an Initial Switch Configuration using packet tracer.
4. Investigate the TCP-IP and OSI Models using packet tracer.
5. Implement Cyclic Redundancy Code.
6. Implement Dijkstra's algorithm to find the best path.
7. Implement the Distance vector routing algorithm.
8. Implement congestion control using leaky bucket algorithm.
9. Implement Domain name server.
10. Implement client server model.

## STATISTICS FOR DATA SCIENCE LAB (SDS(P))

| V Semester : CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CD302 | PCL | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| Sessional Exam Duration: 2 Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Implement Exploratory Data Analysis Techniques.

**CO2:** Implement Sampling Distributions of Data.

**CO3:** Implement Statistical Experiments and Significance testing.

***List of Experiments using Python or R***

1. Location Estimation of Population Data Set.
2. Variability Estimation of State population Data set.
3. Visualize or Explore the Data Distributions.
4. Find Relationship between Binary and Categorical data.
5. Implement Co-relation matrix for a Data set.
6. Predict Bank loan defaults using Sampling Distribution of a Statistics.
7. Find the Normal distribution of a variable.
8. Implement Binomial distribution of variable.
9. Implement ANNOVA Tests.
10. Implement Chi-Square Tests.

## MULTIMEDIA AND APPLICATIONS LAB (MAA (P))

| V Semester : Common for CSE,CST,CSE(AIML),CSE(DS) & CSBS | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| SCCS02 | SC | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| Sessional Exam Duration: 2Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course students will be able to

**CO1:** Design the web based multimedia components

**CO2:** Create time-based and interactive multimedia components.

**CO3:** Create Animation Projects from its Conceptual Stage to the final Product.

**CO4:** Apply Audio and Video Production Techniques to an Animation Project.

### *List of Experiments*

1. Design a web page to display student education details in a tabular format.
2. Write an HTML code to display the CV on a web page.
3. Design a Registration Form which includes a multimedia content. On submitting the form, the user should navigate to Home page.
4. Write an HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
5. Design a web page which includes text, graphics, sound, video, and animation create your Institute website, Department Website and Tutorial website for specific subject.
6. Procedure to create an animation to change a Circle into a Square using flash.
7. Procedure to create an animation for a Boy playing with a Football.
8. Procedure to create an animation to show the ripple effect.
9. Procedure to create a scene to show the sunrise and sunset (using multiple layers and motion tweening)
10. Procedure to Create an animation for bus, car race in which both starts from the same origin point and the car winning the race.
11. Procedure for creating a Banner using Photoshop.
12. Procedure for creating a Audio file using free open source tools.
13. Procedure for creating a video: Editing, Mixing, Adding Sound to a video.
14. Procedure for Editing an Image using Photoshop/free open source tool.
15. Procedure for working with text using Microsoft power point.

| ***Additional Experiments*** |
| --- |
| **1.** Procedure to create an Animation to indicate a ball bouncing on the steps. |
| **2.** Procedure to create a simulation Animation of Moving Clouds. |
| **3.** Procedure to draw the fan blades and to give proper Animation. |
| **4.** Procedure to create an Animation with the following features:<br>*Letters should Appear one by one<br>*The fill color of the text should change to a different color after the display of full word |
| **5.** Procedure to simulate a ball hitting another ball. |

# COMPILER DESIGN (CD)

| VI Semester : Common for CSE, CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CS306 | PCC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the phases of compiler and lexical analyzer.

**CO2:** Construct the parse trees using Top down and bottom up parsing methods.

**CO3:** Build a type system, syntax directed translation and symbol table.

**CO4:** Develop intermediate code generation and code optimization techniques.

**CO5:** Understand target code generation using flow graph and DAG representation Three address code.

## UNIT – I

**Introduction:** Language Processors, Phases of compiler, Phases vs Passes, Frontend and backend of compiler, Compiler vs Interpreter, Compiler construction Tools.

**Lexical Analysis:** Introduction to Lexical Analyzer, Role of lexical analyzer, Specialized Input buffering Techniques, Specification of tokens, Recognition of tokens, A language for specifying Lexical analyzer, Design of Lexical analyzer generator.

## UNIT – II

**Syntax Analysis:** Role of parser, Context free grammars, Derivations, Parse Tree, Writing a Grammar, Left most and rightmost Derivations, Elimination of left recursion, Left factor a grammar.

**Top Down Parsing**: Introduction, Top Down Parsing, Recursive decent parser, Predictive parser, Non Recursive predictive parser, First and Follow Functions, Construction of LL parsing Table.

**Bottom up parsing:** Shift reduce parsing using stack, Handles, Operator precedence parsing, Construction Precedence Table, SLR parser, LR(0) items, Constructing SLR parsing Table.

## UNIT – III

Semantic Analysis: Role of Semantic Analyzer, Type Checking, Type conversions, Type system, Type expressions, Basic Types and Constructor Types, a simple type checker, equivalence of type expressions. Run time environments: Activation Trees, Control Stacks, Storage Organization, Rum time memory, Activation Records, Storage Allocation Strategies - Static Allocation, Stack Allocation, Heap Allocation.

## UNIT – IV

**Intermediate Code Generation:** Intermediate languages, Threes address code - Postfix notations, Syntax trees, Directed Acyclic graphs, Translation into Three Address Code,

Implementation of three address code-Quadruples, Triples,Indirect Triples.

**Code Optimization:** Criteria for code improving transformations, An Organization for an Optimizing Compiler, Principal sources of code optimization-Common sub expressions, Copy propagation, Dead code elimination,Loop Optimizations, Peephole optimization, Optimization of basic blocks.

## UNIT – V

**Code Generation:** Issues in the design of code generator, Target machine, Basic blocks and flow graphs, Next use information, A simple code generator, DAG representation of basic blocks, Generating code from DAG- Labeling Algorithm.

**Text Books:**

1. *Compilers: Principles, Techniques and Tools*, Second Edition, PHI, V. Aho, R. Sethi and J. Ullman.

**Reference Books:**

1. *Lex & Yacc*, Levine R. John, Tony Mason and Doug Brown

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# DATA ANALYTICS (DA)

| VI Semester : CSE (DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CD303 | PCC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand fundamentals of data science analytics.

**CO2:** Use data plotting and visualization tools.

**CO3:** Understand the statistical data analysis.

**CO4:** Understand the importance of social media analytics.

**CO5:** Interpret the working of Big Data Analytics tools.

## UNIT – I

**Fundamentals of Data Science:** Introduction to data science, Why learn data science?, Data analytics lifecycle, Types of data analysis, Data science tools.

**Data Preprocessing:** Introduction to data preprocessing, Data types and forms, Possible data error types, Various data preprocessing operations.

## UNIT – II

**Data Plotting and Visualization**: Introduction to data visualization, Visual encoding, Data visualization software, Data visualization libraries, Basic data visualization tools, Specialized data visualization tools.

## UNIT – III

**Statistical Data Analysis**: Role of statistics in data science, Kinds of statistics- Descriptive Statistics, Inferential statistics- Hypothesis testing, Parametric hypothesis testing.

## UNIT – IV

**Social Media Analytics**: Overview of social media analytics, Seven layers of social media analytics, Social media analytics cycle, Key social media analytics methods, Accessing social media data, Challenges to social media analytics.

## UNIT – V

**Big Data Analytics:** An overview of Big Data, Hadoop, HDFS (Hadoop Distributed File System), Map Reduce, Classification of Analytics

**Text Books:**


1. Dr. Gypsy Nandi, Dr. Rupam Kumar Sharma, Data Science Fundamentals and Practical Approaches: Understand Why Data Science is the Next, FIRST EDITION 2020, BPB Publications.
2. Big Data and Analytics by SeemaAcharya,Wiley Publication,2015


**Reference Books:**


1. JesúsRogel-Salazar, Data Science And Analytics With Python, CRC Press Taylor & Francis Group, 2017.
2. DataAnalysis from Scratch with Python, PetersMorgan, AI Sciences

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# FOUNDATIONS OF MACHINE LEARNING (FML)

| VI Semester : Common for CSE , CST & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CS308 | PCC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand machine learning Systems and Data preprocessing techniques

**CO2:** Analyze performance measures of a Digital Image Classifier

**CO3:** Build Training Models on Linear Regression, Logistic Regression

**CO4:** Understand the core concepts and working of Support Vector Machines, Decision trees.

**CO5:** Illustrate Ensemble methods and Unsupervised Learning algorithms

## UNIT – I

***Machine Learning Landscape***

Introduction, Types of Machine Learning Systems, Challenges, Testing and Validating

Data Preprocessing for Machine Learning :Working with Pandas and Numpy, Handling Missing Values, Understanding Data with Visualization

## UNIT – II

***Classification***

MNIST, Training a Binary Classifier, Performance measures – Accuracy using Cross Validation, Confusion Matrix, Precision, Recall,F1_score, Precision-Recall Trade off, K-Nearest Neighbor Classification. Naive Bayes Classification – Naïve Bayes Classifier

## UNIT – III

***Training Linear Models***

Linear Regression-Normal Equation, Gradient Descent, Stochastic Gradient Descent, Batch Gradient Descent, Polynomial Regression, Regularized Linear Models – Lasso, Ridge, Elastic Net.

Logistic Regression- Estimating Probabilities, Training Cost Function, Decision Boundaries, Softmax Regression

## UNIT – IV

***Support Vector Machines***

Linear SVM classification, Nonlinear SVM classification, SVM Regression ***Decision Trees*** Training and visualizing a Decision tree, Making predictions, Estimating Class probabilities, Computational complexity, Gini Impurity or Entropy, Regularization of Hyper parameters

## UNIT – V

***Ensemble Learning and Random Forests***

Voting classifiers, Bagging and pasting, Random patches and Random sub spaces, Random forests

***Unsupervised Learning Techniques***

Clustering algorithms - K-Means, DB Scan

**Text Books:**

1. Aurelian Geron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to build Intelligent Systems", OReilly Publications, First Edition, 2017
2. Ethem Alpaydin," Introduction to Machine Learning", The MIT Press, Third Edition, 2014

**Reference Books:**

1. Tom M.Mitchell, "Machine Learning", Mc Graw Hill Education, Indian Edition, 2013
2. Oliver Theobald, "Machine Learning for Absolute Beginners", Second Edition, 2017
3. Machine Learning with python Tutorial Point.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (EITK)

**VI Semester**: Common for all Branches | **Scheme:2020**

| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| MC105 | MC | 2 | 0 | 0 | 0 | 100 | 0 | 100 |

**Course Outcomes:** At the end of the course students will be able to

**CO1:** Understand the concept of Traditional knowledge and its importance.

**CO2:** Explain the need and importance of protecting traditional knowledge.

**CO 3:** Illustrate the various enactments related to the protection of traditional knowledge.

**CO 4:** Interpret the concepts of Intellectual property to protect the traditional knowledge.

**CO 5:** Understand the traditional knowledge in different sectors.

### UNIT-I

**INTRODUCTION TO TRADITIONAL KNOWLEDGE**

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

### UNIT-II

**PROTECTION OF TRADITIONAL KNOWLEDGE**

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

### UNIT-III

**LEGAL FRAME WORK AND TK**

A. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, The Protection of Plant Varieties and Farmers' Rights Act, 2001 (PPVFR Act).
B. The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

### UNIT-IV

**TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY**

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

### UNIT-V

**TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS**

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in

| |
|---|
| agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK. 139. |
| **TextBooks:** |
| **1.** 'Traditional Knowledge System in India' by Amit Jha, 2009. |
| **ReferenceBooks:** |
| **1.** 'Traditional Knowledge System and Technology in India' by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012. |
| **2.** 'Traditional Knowledge System in India' by Amit Jha Atlantic publishers, 2002. |
| **3.** 'Knowledge Traditions and Practices of India' by Kapil Kapoor and Michel. |
| **Web References:** |
| 1. www.youtube.com/watch?v=LZP1StpYEPM |
| 2. https://nptel.ac.in/courses/121106003 |

# COMPILER DESIGN LAB (CD(P))

| VI Semester : Common for CSE, CSE( AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **CS309** | **PCL** | **0** | **0** | **3** | **1.5** | **40** | **60** | **100** |
| **Sessional Exam Duration: 2 Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :**At the end of the course the student will be able to

**CO1:** Implement DFA and Lexical Analyzer.

**CO2:** Construct parse trees using Top down and Bottom up parsing methods.

**CO3:** Implement Intermediate code generation.

***List of Experiments***

1. Implementation of DFA to accept strings ending with abc.
2. Implementation of Lexical Analyzer.
3. Implement Elimination of Left Recursion.
4. Implementation of Finding a Left Factoring.
5. Implementation of First and Follow functions.
6. Implementation of Non-Recursive Predictive Parser.
7. Implementation of Shift Reduce parsing using stack.
8. Implementation of Operator Precedence Parsing.
9. Implementation of Stack Allocation Strategy.
10. Implementation of Intermediate Code Generation.

# DATA ANALYTICS LAB (DA(P))

| VI Semester : CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CD304 | PCL | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| Sessional Exam Duration: 2 Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Perform Preprocessing Operations on given dataset

**CO2:** Implement Data Visualization Techniques

**CO3:** Implement different types of Hypothesis Testing and Probability Distributions

**CO4:** Perform operations on HDFS

***List of Experiments***

1. Implement various methods to handle missing values
2. Demonstrate the concept of Equal Width Binning in Histograms.
3. Implement the python code for Outlier Detection and removal.
4. Implement various data transformation methods.
5. Demonstrate the data visualization techniques using Matplotlib.
6. Implement various Descriptive statistics measures.
7. Implement the Python code for different types of Hypothesis Testing.
8. Implementation of Hadoop Shell Commands on files.
9. Implementation of word count Example using Hadoop Map Reduce
10. Implement a Map Reduce Program to analyse weather data.

# MACHINE LEARNING LAB (ML(P))

| VI Semester : Common to CSE, CST & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CS311 | PCC | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 0 | 0 | 3 | 1.5 | 40 | 60 | 100 |
| Sessional Exam Duration:2 Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Apply Data Pre-processing techniques using Numpy and Pandas

**CO2:** Build binary classifier on Image Dataset

**CO3:** Implement Classification and Regression Models

**CO4:** Apply Ensemble Learning and Clustering techniques

***List of Experiments***

1. Working with Numpy
2. Working with Pandas
3. Build a digit image classifier on MNIST dataset.
4. Implement KNN Classifier
5. Implement Naïve Bayes Classifier
6. Implement Simple Linear Regression model
7. Implement Support Vector machines on IRIS Dataset
8. Perform Training and Visualizing a decision tree
9. Apply Ensemble Learning
10. Implement K-Means Clustering Algorithm

# ANDROID APP DEVELOPMENT LAB (AAD(P))

| VI Semester : Common for CSE, CST, CSE(AIML) ,CSE(DS) & CSBS | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **SCCS03** | **SC** | **0** | **0** | **4** | **2** | **40** | **60** | **100** |
| **Sessional Exam Duration: 2 Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Install and configure Android application development tools.

**CO2:** Design and develop user Interfaces for the Android platform.

**CO3:**. Save state information across important operating system events.

**CO4:** Apply Java programming concepts to Android application development.

***List of Experiments***

1. Installation of Android studio.
2. Development of Hello World Application
3. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button
4. Create a screen that has input boxes for User Name, Password, Address, Gender(radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout)
5. Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity
6. Design an android application Send SMS using Intent
7. Create an android application using Fragments
8. Design an android application Using Radio buttons
9. Design an android application for menu.
10. Create a user registration application that stores the user details in a database table.

**VII Semester CSE (DS)** **(Scheme-2020)**

| S.No | Category | Course Title | Credits | Scheme of Instruction periods/week | | | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T/D | P | End Exam Marks | Internal Assessment Marks | Total Marks |
| **I** | **Theory** | | | | | | | | |
| 1. | PEC | Professional Elective-III | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 2. | PEC | Professional Elective-IV | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 3. | PEC | Professional Elective-V | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 4. | OEC | Open Elective-III | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 5. | OEC | Open Elective-IV | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| 6. | HSSEC | Universal Human Values-2 | 3 | 3 | 0 | 0 | 60 | 40 | 100 |
| **II** | **Practical** | | | | | | | | |
| 7. | SC | Angular Lab | 2 | 0 | 0 | 4 | 60 | 40 | 100 |
| 8. | **INT** | Summer Internship - II | 3 | 0 | 0 | 0 | 0 | 100 | 100 |
| | | | 23 | | | | | | |

**VIII Semester CSE (DS)** **(Scheme-2020)**

| S.No | Category | Course Title | Credits | Scheme of Instruction periods/week | | | Scheme of Examination Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T/D | P | End Exam Marks | Internal Assessment Marks | Total Marks |
| I | INT | Internship | 6 | 0 | 0 | 0 | 0 | 100 | 100 |
| II | PROJ | Project Work | 6 | 0 | 0 | 0 | 60 | 40 | 100 |
| | | | 12 | | | | | | |

## UNIVERSAL HUMAN VALUES- 2 (UHV-2)

| VII Semester : Common to all branches | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| HSSEC701 | HSSEC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1 ½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

**CO2:** Understand the harmony in the human being, family, society and nature/existence

**CO3:** Strengthen of self-reflection.

**CO4:** Develop a commitment and courage towards implementing Human values

### UNIT – I

**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

Purpose and motivation for the course, recapitulation from Universal Human Values. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

### UNIT - II

**Understanding Harmony in the Human Being - Harmony in Myself**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

### UNIT – III

**Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship**

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

## UNIT - IV

**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all- pervasive space. Holistic perception of harmony at all levels of existence.Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

## UNIT - V

**Implications of the above Holistic Understanding of Harmony on Professional Ethics**

Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics. **a**. Ability to utilize the professional competence for augmenting universal human order. **b**. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems. **c**. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: **a.** At the level of individual: as socially and ecologically responsible engineers, technologists and managers **b**. At the level of society: as mutually enriching institutions and organizations. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

## Text Books


1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2.R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics",2nd Revised Edition, Excel Books,New Delhi, 2019. ISBN 978-93-87034-53-2


## Reference Books


1.Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.

2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"

5. E. FSchumacher. "Small is Beautiful"

6. Slow is Beautiful –Cecile Andrews

7. J C Kumarappa "Economy of Permanence"

8. Pandit Sunderlal "Bharat Mein Angreji Raj"

9. Dharampal, "Rediscovering India"

10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland(English)

13. Gandhi - Romain Rolland (English)


## Web References:

1. https://nptel.ac.in/courses/109/104/109104068/

2. https://aktu.ac.in/hvpe/ResourceVideo.aspx

## Question Paper Pattern:

**Internal Assessment:** The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

## ANGULAR LAB (AR(P))

**VII Semester : Common for CSE, CST, CSE(AIML) & CSE(DS)** — **Scheme : 2020**

| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| SCCS04 | SC | 0 | 0 | 4 | 2 | 40 | 60 | 100 |

**Sessional Exam Duration 2 Hrs** — **End Exam Duration: 3 Hrs**

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the Angular and its working

**CO2:** Implementing components and templates

**CO3:** create single page and custom route applications

**CO4:** Build applications that can get data from server

**CO5:** Implement available and create user defined libraries

### *List of Experiments*

1. Knowing the Editor
2. Implementing components
3. Implementing Templates
4. Creating routing applications
5. Displaying a list
6. Adding Services
7. Adding Navigation
8. Getting data from a Server
9. Using Published Libraries
10. Creating User Defined Libraries

# List of Open Electives - OEC-I & OEC-II

| Open Elective Courses (OEC-I) | |
|---|---|
| **S.No** | **Course Title** |
| 1. | Optimization Techniques |
| 2. | Remote Sensing & GIS |
| 3. | Introduction to JAVA |
| 4. | Internet of Things |
| 5. | Scientific Programming with Python |
| 6. | Introduction to Database Systems |
| 7. | Ethical Hacking |
| 8. | Entrepreneurship Development |
| 9. | Introduction to Information Systems |
| 10. | Neural Networks & Fuzzy Logic |

| Open Elective Courses (OEC-II) | |
|---|---|
| **S.No** | **Course Title** |
| 1. | Renewable Energy Sources |
| 2. | Industrial Safety |
| 3. | Web Technologies |
| 4. | Introduction to Cyber Security |
| 5. | Nano Technology |
| 6. | Disaster management |
| 7. | Project management |
| 8. | Advanced Information Systems |
| 9. | Product Lifecycle Management |
| 10. | Industry 4.0 |

| OPTIMIZATIONTECHNIQUES (OT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **V Semester : B.Tech** | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **Total** |
| **OEC301** | **OEC - I** | **3** | **0** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration:1.5 Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes:** At the end of the course the student will be able to

**CO1:** Understand the concepts of Optimization and solve linear programming problems

**CO2:** Solve the engineering problems using Integer programming technique

**CO3:** Solve the engineering problems using Kuhn tucker conditions and Lagrangean multiplier method

**CO4:** Solve the engineering problems using dynamic programming technique

**CO5:** Apply non-traditional optimization techniques to solve engineering problems.

**UNIT - 1**

**Optimization:** Introduction, Historical Development, Engineering Applications of Optimization, Classification of Optimization problems.

**Linear Programming Problems:**
Simplex method, Big-M method, Sensitivity Analysis, Duality, Dual simplex method, Interpretation.

**UNIT-2**

**Integer Programming Technique:**

Simple applications of integer programming, solution methods of integer programming-Branch and Bound Algorithm, Cutting Plane Algorithm

**UNIT-3**

**Classical Optimization Techniques:**

Single variable optimization with and without constraints, multi – variable optimization with and without constraints, methods of Lagrange multipliers, Kuhn-Tucker conditions

**UNIT-4**

**Dynamic Programming Technique:**

Elements of dynamic programming model, Back ward recursive equation, Applications of Dynamic
Programming to Linear programming and Capital budgeting.

**UNIT-5**

**Genetic Algorithm:**

Introduction, Difference between Genetic Algorithm and Traditional Methods, Simple Genetic Algorithms, Similarity Templates (Schemata), Genetic algorithm operators – selection, crossover and mutation. Simple applications of GA.

**Evolutionary Algorithms:**

Evolutionary Algorithums: Ant colony algorithm, Tabu search algorithm and Particle swam optimization algorithm.

**TextBooks:**

1.Rao S.S, -Optimization, Wiley Eastern, New Delhi, 1995

2. S.D. Sarma, -Operations Research, Kedarnath Ramnath & Co

3. David E.Goldberg,-Genetic Algorithms, Pearson Education

**ReferenceBooks:**

1. HamdyA.Taha, -Operations Research, Prentice Hall of India.

2. Kalyanmoy Deb,-Optimization for Engineering Design, Prentice Hall, New Delhi, 2000

**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

| REMOTE SENSING & GIS (RSGIS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **V Semester: B.Tech.** | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| **OEC302** | **OEC-I** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **Total** |
| | | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration:1.5 Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :**At the end of the course the student will be able to

**CO1:** Understand the Photogrammetry, EDM and Total station surveying principles to solve surveying problems using appropriate tools and techniques.

**CO2:** Understand the concepts of remote sensing and interpretation methods.

**CO3:** Understand the importance of maps, concept of map projections.

**CO4:** Understand the concept of GIS and its applications, different data models, spatial analysis.

**CO5:** Understand the principles used in GNSS and Drone surveying, data collection methods, error in observations and corrections.

## UNIT – I

***Aerial Photogrammetry:***Stereoscopy– 3-D Model – Height determination using Parallax Bar– Digital Elevation Model (DEM) – Slope.

***Land Surveying:*** Various Levels – Levelling methods–Total Station– EDM– Working principle – Parts of Total Station – Capabilities and applications of Total Station– Traversing – Triangulation and Trilateration.

## UNIT - II

***Remote Sensing:*** Basic concept– Electromagnetic spectrum– Spectral signature – Resolutions –Spectral. Spatial, Temporal and Radiometric – Platforms and Sensors – Remote Sensing Data Products – PAN – Multispectral, Microwave, Thermal, Hyper spectral– Visual and digital interpretation methods.

## UNIT – III

***Maps:*** Importance of maps to engineering projects – Types of maps– Scales and uses– Plotting accuracy – Map sheet numbering – Coordinate systems – Cartesian and geographical, map projections,mapdatum–MSL,Geoid, Spheroid,WGS-84.

## UNIT – IV

***GIS:*** Introduction– Data Sources – Data Models and Data Structures– Algorithms, DBMS – Creation of Databases (spatial and non-spatial) – Spatial analysis – Interpolation –Buffer, Overlay – Terrain Modelling and Network analysis.

***Remote Sensing and GIS Applications:*** Land use / Land cover classification – Rainfall-runoff studies – Flood and drought impact assessment and monitoring – Regional and urban planning and management – GIS based highway alignment.

## UNIT - V

***GNSS:*** Principle used – Components of GNSS– Data collection methods – DGPS – Errors in observations and corrections.

***Drone Surveying:***Working principle – Benefits of drones in surveying – Applications – Interior and exterior drone surveying – Calculation of length, area and stockpile volume**.**

**Text Books:**

1. M. Anji Reddy, *Text Book of Remote Sensing and Geographic Information System*, BSPublication.
2. Lo C.P. &Yeung A.K.W., *Concepts and Techniques of GIS*, Prentice-Hall of India, New Delhi.
3. Thomas Lillesand, Ralph W Kiefer and Jonathan Chipman, *Remote Sensing and Image Interpretation*, John Wiley & Sons, India.
4. Hofmann-Wellenhof, Lichtennegger and Wasle, *GNSS: Global Navigation Satellite Systems*, Springer -Verlag Wein, New York.

**Reference Books:**

1. B.Bhatta, *Remote sensing and Geographic Information System*, Oxford Publications.
2. Siddiqui M.A.,*Introduction to Geographical Information System*, ShardaPustakBhavan, Allahabad.
3. Curran, Paul J,*Principles of Remote Sensing*, Longman, London.
4. Floyd F Sabins Jr.,*Remote Sensing Principles and Interpretation*, Freeman and Co., San Francisco.

**Web References:**

1. https://nptel.ac.in/courses/105/101/105101206/
2. https://nptel.ac.in/courses/105107155
3. https://nptel.ac.in/courses/105/107/105107194/

**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

## INTRODUCTION TO JAVA (ITJ)

| V Semester : B.Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC303 | OEC- I | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand fundamentals of oops concepts, input and output

**CO2:** Understand the classes and objects.

**CO3:** Understand the Inheritance and interfaces

**CO4:** Understand the string handling methods

**CO5:** Understand the exception handling

### UNIT – I

**Object oriented concepts:** Fundamentals, Overview of Java, Data types, variables, Operators, control statements, Reading console input, writing console output, arrays.

### UNIT – II

**Introducing Classes:** Class fundamentals, declaring objects, introducing methods, Constructors, this keyword, finalize

### UNIT – III

**Inheritance:** Inheritance basics, using super, method overriding, abstract class, using final with inheritance, Interfaces: Defining interface, implementing interface

### UNIT – IV

**String Handling:** String constructors, Special string operations, character extraction, string comparison, searching strings, modifying strings. StringBuffer class and its methods.

### UNIT – V

**Exception Handling:** Fundamentals, exception types, try, catch, throw, throws, finally. Java built-in exceptions, creating your own exception subclasses.

**Text Books :**


1. Herbert Schildt [2008], [9th Edition], The Complete Reference Java2, TATA McGraw-Hill.
2. E Balaguruswamy [2007], [3 rd Edition], Programming with Java, A Primer, TATA McGraw- Hil.


**Reference Books :**


1. Bruce Eckel [2008], [2nd Edition], Thinking in Java, Pearson Education.
2. H.M Dietel and P.J Dietel [2008], [6th Edition], Java How to Program, Pearson Ed.


**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## INTERNET OF THINGS (IoT)

**V - Semester : B.Tech** | **Scheme : 2020**

| Course Code | Course Category | Hours/Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC304 | OEC-I | 3 | - | - | 3 | 40 | 60 | 100 |

**Sessional Exam Duration : 1 ½ Hrs Hrs** | **End Exam Duration: 3 Hrs**

**Course Outcomes :** At the end of the course the student will be able to

CO1: Understand the basic knowledge of Internet of things and its design

CO2: Understand the purpose of sensors and Actuators in IoT

CO3: Analyze Various IoT Protocols

CO4: Design IoT Projects Using Arduino

CO5: Understand Raspberry-Pi Processor and Raspbian Operating Systems

### UNIT – I

**Introduction to IoT**:

Definition and Characteristics of IoT, Physical Design and Logical Design, IoT Enabling Technologies, IoTLevels and Deployment Templates, IoT Vs M2M

### UNIT – II

**Sensing and Actuation:**

Definition of Sensor, Sensor features, Resolution, Classes, Different types of sensors, Actuator, Differenttypes of Actuators, purpose of Sensors and Actuators in IoT

### UNIT – III

**Wireless Technologies and Data Transmission for IoT:**

Wi-Max, Wi-Fi (802.11), Bluetooth/Bluetooth smart,Zigbee/Zigbee smart, Cellular, NFC,Serial Transmission, RS-232, RS-485, I2C Inter-Integrated Circuit, Ethernet, CAN bus, USB, Firewall, SerialATA, Parallel Transmission

### UNIT – IV

**Building IoT with Arduino**:Arduino IDE, Programming of Arduino, Interfacing LED, switch,potentiometer, Sensors, LCD, Bluetooth, Wi-Fi, ,GPS, RFID with Arduino

### UNIT –V

**Raspberry Pi :**

Linux basics, Linux File system, Navigating the File system, Text Editors, Accessing Files, Permissions , Processes, Linux Graphic user Interface , Raspberry Pi Processor, Raspberry Pi Vs Arduino, Operating system benefits, Raspberry Pi Set up, Configuration,

**Text Books :**


1. ArsheepBahga , Vijay Madisetti ,Internet of Things: A Hands-On Approach Paperback,2015
2. Rajkumar Bhuyya ,Internet of Things : Principles and Paradigms,2016.
3. Adeel Javed , Building Arduino Projects for the Internet ofThings,Apress,2016.

4. Wolfram Donat, Learn Raspberry-Pi with Python, Apress,2016

**Web References:**

1. https://nptel.ac.in/courses/106105166/
2. https://onlinecourses.nptel.ac.in/noc17_cs22/course
3. https://nptel.ac.in/courses/108108098/4
4. https://onlinecourses.nptel.ac.in/noc19_ee28

**Question Paper Pattern:**

**Sessional Exam:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Exam:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks

| SCIENTIFIC PROGRAMMING WITH PYTHON (SPY) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **V Semester: B.Tech** | | | | | | **Scheme: 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **OEC305** | **OEC - I** | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration: 1½ Hrs** | | | | | | **End Exam Duration:3 Hrs** | | |

**Course Outcomes:** At the end of the course student will be able to

**CO1:** Understand programming with mathematical formulas.

**CO2:** Apply the concepts of Loops, lists, Functions and Branching.

**CO3:** Work with Input, Error Handling and Modules.

**CO4:** Learn to visualize mathematical functions and mathematical calculations.

**CO5:** Work on Dictionaries and Strings.

**CO6:** Apply the concepts of Object Oriented Programming.

## UNIT– I

**Getting Started with Python:** The First Example: Hello, World!, Different Ways to Use Python.
**Computing with Formulas:** Programming Simple Mathematics, Variables and Variable Types, Formatting Text Output, Importing Modules, Pitfalls When Programming Mathematics.

## UNIT– II

**Loops and Lists:** Loops for Automating Repetitive Tasks, Boolean Expressions, Using Lists to Store Sequences of Data, Iterating Over a List with a for Loop, Nested Lists and List Slicing, Tuples.
**Functions and Branching:** Programming with Functions, Function Arguments and Local Variables, Default Arguments and Doc Strings, If-Tests for Branching the Program Flow, Functions as Arguments to Functions, Solving Equations with Python Functions, Writing Test Functions to Verify our Programs.

## UNIT– III

**User Input and Error Handling:** Reading User Input Data, Flexible User Input with eval and exec, Reading Data from Files, Writing Data to Files, Handling Errors in Programs, Making Modules.

## UNIT– IV

**Arrays and Plotting:** NumPy and Array Computing, Plotting Curves with Matplotlib, Plotting Discontinuous and Piecewise-Defined Functions, Making a Movie of a Plot, More Useful Array Operations.
**Dictionaries and Strings:** Dictionaries, Example: A Dictionary for Polynomials, Example: Reading File Data to a Dictionary, String Manipulation.

## UNIT– V

**Classes:** Basics of Classes, Protected Class Attributes, Special Methods, Example: Automatic Differentiation of Functions, Test Functions for Classes, Example: A Polynomial Class.
**Object-Oriented Programming:** Class Hierarchies and Inheritance, Example: Classes for Numerical Differentiation, Example: Classes for Numerical Integration.

**Text Books :**

1. Joakim Sundnes, Introduction to Scientific Programming with Python, Springer Open, 2020.

**Reference Books :**

1. Christian Hill, Learning Scientific Programming with Python, Cambridge University Press, 2 edition, 2020.

**Web References:**

1. https://www.tutorialspoint.com/scipy/index.htm
2. https://realpython.com/
3. https://www.w3schools.com/python/scipy/index.php

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## INTRODUTION TO DATABASE SYSTEMS (IDBS)

| V Semester : B.Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC306 | OEC - I | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the concepts of Database Management Systems and Entity Relationship Modelling.

**CO2:** Use SQL commands to create, retrieve, update, and delete data from the Data base.

**CO3:** Comprehend the concepts of Normalization techniques

**CO4:** Understand the properties of Transactions in a Database System.

**CO5:** Understand Concurrency Control techniques and Recovery System.

### UNIT – I

**Introduction:** Introduction to DBMS, Purpose of Database Systems, Database System Applications, View of Data, Data Models, Database Users, Database Architecture.
**Entity-Relationship Model**: Basic Concepts, Cardinality of Relationship, ER Diagram Notations, Entity-Relationship Diagrams, Modeling using ER Diagrams, Reduction of an E-R Schema to Tables

### UNIT – II

**Relational Query Languages:** SQL, Data Definition Language Commands, Data Manipulation Language Commands and Data Control Language Commands, Candidate Key, Primary key, Foreign key, Select Clause, Where Clause, Logical Connectivity's – AND, OR, Range Search, Pattern Matching, Order By, Group By, Set Operations – Union, Intersect and Minus, Aggregate Functions, Join Operations.

### UNIT – III

**Relational Database Design:** Features of Good Relational Database Designs, Decomposition, Normalization, Functional Dependency, Types of Normal Forms - First Normal Form, Second Normal Form, Third Normal Form, Boyce Codd Normal Form (BCNF)

### UNIT – IV

**Transactions:** ACID properties, Transaction States, Implementation of Atomicity and Durability, Concurrent Executions.
**Serializability :** Conflict Serializability, View Serializability

### UNIT – V

**Concurrency Control:** Lock-Based Protocols – Locks, Granting of Locks, The Two-Phase Locking Protocol.
**Recovery System:** Failure Classification, Log-Based Recovery, Shadow Paging Technique

**Text Books:**

1. Database System Concepts, Abraham Silberschatz, Henry F. Korth and S. Sudarshan, McGraw Hill, 7 th Edition, 2019.

**Reference Books:**

1. Principles of Database and Knowledge – Base Systems, J. D. Ullman, Vol. 1, 2016.
2. Fundamentals of Database Systems. R. Elmasri and S. Navathe, 7th Edition, 2017.
3. Data Base Management Systems, Raghu Ramakrishna and Johnannes Gehrke, McGraw Hill, 3rd

Edition, 2014.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## ETHICAL HACKING (EH)

| V Semester : B.Tech | | | | | Scheme : 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC307 | OEC - I | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | End Exam Duration: 3 Hrs | | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the basics of security and ethical hacking.

**CO2:** Understand about foot printing and types of attacks in social engineering.

**CO3:** Understand about sniffers, hijacking and DoS attacks.

**CO4:** Understand the importance of web server hacking, database hacking and SQL Injection.

**CO5:** Understand about Wireless technologies, intrusion detection and firewalls.

### UNIT – I

**Introduction to Ethical Hacking:** Introduction, Security fundamentals, Security testing, Hackers and Crackers description, Ethical Hackers.
Technical Foundations of Hacking: The Hacking process, Information Security Systems and the Stack.

### UNIT – II

**Foot printing:** Information Gathering Methodology , OS Fingerprinting, Fingerprinting Services, Enumeration, System Hacking.
**Social Engineering:** Social Engineering, Malware threats, Vulnerability analysis.

### UNIT – III

**Sniffers:** Passive sniffing, Active sniffing, ARP,ARP poisoning and MAC flooding, tools for sniffing, wire shark, sniffing and spoofing countermeasures.
**Session Hijacking:** Transport layer Hijacking**,** Application layer Hijacking, Session Hijacking Tools.
**Denial of Service:** DoS attack techniques, Distributed DoS, DDoS tools.

### UNIT – IV

**Web Server Hacking:** HTTP protocol, scanning web servers, Banner grabbing and Enumeration, Web server, DoS/ DDoS and DNS attacks.
**Database Hacking:** Introduction to SQL and SQL injection and categories, Finger printing, UNION Exploitation technique, Boolean in SQL injection attacks, Out-of band exploitation, exploring the time-delay SQL injection technique, Stored procedure SQL injection and mitigations,SQL injection hacking tools.

### UNIT – V

**Wireless Technologies, Mobile Security:** Mobile device operation and security, Wireless LAN's-Basics, Wireless LAN frequencies and signalling, Wireless LAN security.
**IDS -** Intrusion Detection and Prevention Systems. Firewalls and Honey pots.

**Text Books:**

1. Micheal Gregg,"Certified Ethical Hacker (CEH) Cert Guide",Pearson education, 2020.

**Reference Books:**

1. EC-Council,"Ethical Hacking and Countermeasures(CEH)",CENGAGE Learning, 2020.
2. Sai Satish,"Hacking Secrets Part-1",Indian Servers,2018.
3. David Litchfield,Chris Anley"The Database Hackers Handbook:Defending Database Servers",

Wiley.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## ENTREPRENEURSHIP DEVELOPMENT (EDP)

| V Semester: B.Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| OEC308 | OEC - I | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1 ½ Hrs | | | | | | End Exam Duration : 3 Hrs | | |

**Course Outcomes**: At the end of the course, students will be able to

**CO1:** Analyse the role of entrepreneurship in economic development

**CO2:** Understand rural entrepreneurship and small enterprises

**CO3:** Examine the project reports

**CO4:** Understand the ownership structure of company and women entrepreneurship in India

**CO5:** Understand the support by specified institutions for entrepreneurship development

### UNIT – I

**Entrepreneur:** Concept of an entrepreneur; Definition of an entrepreneur; Types of entrepreneurs; Characteristics of an entrepreneur.

**Entrepreneurship:** Introduction; Elements of entrepreneurship; Six important segments of entrepreneurship environment; Advantages of entrepreneurship; Barriers to entrepreneurship; Role of entrepreneurship in economic development.

### UNIT – II

**Rural Entrepreneurship:** Meaning; Need; Retrospection of rural industrialization in India; Problems of rural entrepreneurship; Development plan for rural entrepreneurship.

**Small Enterprises:** Definition of SSI; Types, Characteristics of SSI; Role of SSI in economic development; Problems faced by SSI.

### UNIT – III

**Project Planning:** Project Identification; Project Selection; Project Report – Contents & Formulation; Methods of Project Appraisal – Market Feasibility, Technical Feasibility, Financial Feasibility and Economic Feasibility.

### UNIT – IV

**Ownership Structures:** Sole Proprietorship; Partnership; Company; Co-operative; Selection of appropriate ownership structure.

**Women Entrepreneurship in India:** Introduction; Policies and Schemes for Women Entrepreneurs; Factors Influencing the Women Entrepreneurship; Types of Women Entrepreneurs; Challenges for Women Entrepreneur.

### UNIT – V

**Institutional Finance:** Commercial banks; Other Financial Institutions – IFCI, IRBI, SFC, SIDC & EXIM Bank.

**Institutional Support:** Need; Support to Small Entrepreneurs – DICs, Industrial infrastructure corporation, and National institute for MSME, Incubation Centers (Government and private).

**Text Books:**

Prof. Satish C. Ailawadi & Mrs. Romy Banerjee, “Principles of Entrepreneurship”, Everest

Publishing House.
S. S. Khanka, “Entrepreneurial Development”, S. Chand, New Delhi.
Robert D. Hisrich, Michael P. Peters, Dean A. Sheperd, “Entrepreneurship”, McGraw-Hill,6 ed.

**Reference Books:**

Poornima M. Charantimath, “Entrepreneurship Development and Small Business Enterprises”, 2e, Pearson.
Arya Kumar, “Entrepreneurship”, 4 e, Pearson.
Ram Chandran, “Entrepreneurial Development”, Tata McGraw Hill, New Delhi

**uestion Paper Pattern:**

**ssional Exam :**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

| INTRODUCTION TO INFORMATION SYSTEMS (IIS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **V Semester : B.Tech** | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **OEC309** | **OEC-I** | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration 1½ Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the concepts of Computer architecture and functionalities of System Software.

**CO2:** Understand the page replacement and CPU Scheduling Algorithms

**CO3:** Understand the phases of software development life cycle and process models.

**CO4:** Design ER model for real life scenarios

**CO5:** Apply SQL commands to create, update, modify and retrieve data from the data bases.

**CO6:** Apply normalization techniques to normalize the database

## UNIT – I

**Fundamentals of Computers & Computer Architecture:** Introduction, Organization of a small computer, Central Processing Unit, Execution cycle, Instruction categories, measure of CPU performance, Memory, Input/output devices, BUS, addressing modes

**System Software:** Assemblers, Loaders and linkers, Compilers and interpreters.

## UNIT – II

**Operating System:** Introduction, Memory management schemes, Page replacement algorithms, Process management, CPU scheduling algorithms.

**Software engineering:** Software engineering: Introduction to Software engineering, Life cycle of a software project, software Development models.

## UNIT – III

**Relational Database Management System:** Introduction to DBMS, the database technology, data models, Database Users.

**Entity Relationship (E-R) Modeling:** Introduction, Notations, Modeling E-R Diagrams, Case Studies, Merits and Demerits of E-R modeling.

## UNIT – IV

**Structured Query Language (SQL):** Introduction to SQL, Data types, Data Definition language commands, Data Manipulation Language Commands and Data control Language Commands, Candidate Key, Primary key, Foreign key, Select Clause, Where Clause, Logical Connectives – AND, OR, Range Search, Pattern Matching, Order By, Group By, Set Operations – Union, Intersect and Minus, Aggregate Functions, Join Operations

## UNIT – V

**Normalization:**

Introduction, Need for Normalization, Process of Normalization, Types of Normal Forms (1NF, 2 NF,3 NF & BCNF), Merits and Demerits of Normalization.

**Text Books:**

2. Campus Connect Foundation Program – Computer Hardware and System Software Concepts, Programming Fundamentals- Vol. – 1, INFOSYS
3. Campus Connect Foundation Program – Relational Database Management System, Client Server Concepts, Introduction to Web Technologies - Vol. – 4, INFOSYS
4. Henry F. Korth& Abraham Silberschatz, - Data Base System Concepts, 5th Edition, 2005, Mc Graw hill

**Reference Books:**

1. M. Morris Mano [2011], [3 rd Edition], Computer system architecture, Pearson Education, 2011.
2. Sommerville [2008], [7th Edition], Software Engineering, Pearson education.
3. Raghu Ramakrishna and Johannes Gehrke [2003], [3rd Edition], Data Base Management Systems, TATA McGraw Hill
4. Tanenbaum [2000], Modern Operating System, Pearson Education

**Web References:**

1. https://www.w3schools.com/sql/
2. https://www.geeksforgeeks.org/dbms/
3. https://www.tutorialride.com/software-engineering/software-engineering-tutorial.htm

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

| NEURAL NETWORKS AND FUZZY LOGIC (NNFL) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **V Semester: B.Tech** | | | | | | **Scheme: 2020** | | |
| **Course Code** | **Course Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **OEC310** | **OEC- I** | **3** | **0** | **0** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration: 1 ½ Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes: At the end of the course the student will be able to**

CO1: understand the basic concepts of Neural networks

CO2: analyze Supervised Learning feedback networks

CO3: analyze Unsupervised Learning feedback networks.

CO4: understand concepts of fuzzy logic and fuzzy set theory

CO5: To apply the knowledge of Neural Networks & fuzzy logic to real time systems.

## UNIT – I

**Introduction to Neural Networks and its Basic Concepts**

Biological neurons and McCulloch and Pitts models of neuron, Types of activation functions, Neural networks architectures, Linearly separable and linearly non-separable systems and their examples, Features and advantages of neural networks over statistical techniques, Knowledge representation, learning process, error-correction learning, concepts of supervised, learning, and unsupervised learning..

## UNIT – II

**Supervised Learning Neural Networks**

Single layer perceptron and multilayer perceptron neural networks, their architecture, Back propagation algorithm, generalized delta rule, learning factors, step learning, Momentum learning, Concept of training, testing and cross-validation data sets for design and validation of the Networks

## UNIT – III

**Unsupervised Learning Neural Networks**

Competitive Learning networks, kohenen self-organizing networks, K-means and LMS algorithms, RBF neural network and its structure, Hybrid training algorithm for RBF neural networks, Comparison of RBF and MLP networks Learning, Hebbian learning, Hopfield networks.

## UNIT – IV

**Fuzzy logic**

Basic Fuzzy logic theory, sets and their properties, Operations on fuzzy set, Fuzzy relation and operations on fuzzy relations and extension principle, Fuzzy membership functions and linguistic variables, Fuzzy rules and fuzzy reasoning, Fuzzification and defuzzification and their methods, Fuzzy inference systems

## UNIT – V

**Applications of Neural Networks & Fuzzy systems**

*Applications of Neural Networks*: Pattern classification, Handwritten character recognition, Face recognition, Image compression and decompression

*Applications of Fuzzy Logic & Fuzzy System*: Fuzzy pattern recognition, Fuzzy image processing, Simple applications of Fuzzy knowledge-based controllers like washing machines, traffic

regulations, and lift control

**Text Books :**

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, John Wiley and sons, 3/e, 2010.
2. S. Haykin, Neural Networks, A Comprehensive Foundation, Pearson Education Inc.3/e, 2008.
3. Jacek. M. Zurada, -Introduction to Artificial Neural Systems, Jaico Publishing House, 2006.
4. LaureneFausett, Fundamentals of Neural Networks-Architectures, algorithms and applications, Pearson Education Inc., 2004.
5. J.S.R. Jang, C.T. Sun, E. Mizutani,, -Neuro Fuzzy and Soft Computing - A computational Approach to Learning and Machine Intelligence, Pearson Education Inc., 2002.
6. Bart Kosko, Neural networks and Fuzzy Systems, Pearson Education

**Reference Books :**

1. T.Pradeep, Nano: The Essentials Understanding Nano Science and Nano Technology, Tata McGraw Hill, 2013.
2. Richard Booker and earl Boyson, Nanotechnology: The Fun and Easy Way to Explore the Science of Matters Smallest Particle, Wiley Publications, 2011.

**Web References:**

1. S. Rajsekaran and G. A. VijaylakshmiPai, Neural Networks, Fuzzy Logic, and Genetic Algorithms, PHI
2. N. Sivanandam, S. Sumathi, and S. N. Deepa, Introduction to Neural Network Using MATLAB11, Tata McGraw-Hill Publications
3. S.N.Sivanandam. M.Pau1Raj, - Introduction to Artificail Neural Networks, Vikas Publication House Pvt.Ltd, NewDelhi

**Question Paper Pattern:**

**Sessional Exam:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Exam:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions and the student should answer any one question from each unit. Each Question carries 12 marks.

# RENEWABLE ENERGY SOURCES (RES)

| VI Semester B.Tech | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/ Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC311 | OEC - II | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1 ½ Hrs | | | | | End Exam Duration : 3 Hrs | | | |

**Course Outcomes :** At the end of the course students will be able to

**CO1:** Understand various sources of energy and solar geometry.

**CO2:** Describe the process of harnessing solar energy in the form of heat.

**CO3:** Explore basic terms of wind and the extraction of energy from wind.

**CO4:** Understand the technologies involved in extraction of biomass energy and geothermal Energy.

**CO5:** Understand Tidal, Wave and Ocean energy conversion methods and concepts of emerging technologies.

## UNIT – I

**Introduction and Energy Conservation**: Classification of energy sources-Importance of renewable energy sources and energy chain-Principles of energy conservation –Energy conservation opportunities. World energy status & Energy Scenario in India.

**Fundamentals of Solar Energy:** Extra-terrestrial and terrestrial radiation- Solar constant and solar radiation geometry- time and day length-Estimation of monthly average daily total radiation on horizontal surface and tilted Solar surface-Measurements of radiation data. Basic principle & classification of PV cell

## UNIT – II

**Solar Thermal Systems:** Solar collectors & its classification - Solar water heating-solar passive space heating and cooling systems-Solar refrigeration system – Solar thermal power generation-Solar Distillation-solar drier-solar pond.

## UNIT – III

**Wind Energy:** Origin of wind-nature of winds-Applications of wind power –energy estimation of wind – power extraction from wind-Betz limit-Components of wind turbine- horizontal axis wind turbine & vertical axis wind turbine -Types of blades

## UNIT – IV

**Biomass Energy:** Photosynthesis process- Biomass conversion technologies- Biogas production - Types of digester- Factors affecting the digester performance – Biomass liquefaction – Biomass to ethanol production.

**Geothermal Energy:** Types of geothermal energy resources-Energy

conversion through geothermal energy resources-Environmental consideration

## UNIT – V

**Ocean Thermal Energy Conversion:** Principle of OTEC- Anderson and Claude cycles, Tidal and Wave energy conversion methods
**Emerging Technologies:** Principle of magneto hydro dynamics, Fuel cell, Hydrogen energy

**Text Books:**

1. B.H. Khan, Non-conventional Energy Sources, 3rd edition TMH Publishers, New Delhi
2. G.D Rai, Non-conventional Energy Sources, Khanna Publishers, New Delhi

**Reference Books:**

1. Suhas P.Sukhatme., Solar energy: Principles of thermal collection and storage, Tata McGraw Hill publishing Co. Ltd
2. S. Rao and Paulekar, Energy Technology, Khanna Publishers, New Delhi
3. H. P. Garg, J. Prakash, Solar energy fundamentals and applications, Tata McGraw Hill publishing Co. Ltd

**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

# INDUSTRIAL SAFETY (IS)

| VI Semester | B.Tech | | | | Scheme : 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours /Week | | | Credits | Maximum Marks | | |
| OEC312 | OEC - II | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| | | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1½ Hrs | | | | | End Exam Duration : 3 Hrs | | | |

**Course Outcomes**: At the end of the course, students will be able

**CO1:** To understand the principles of safety management including safety audit, safety education and accident investigation

**CO2:** To understand the causes and implication of fire and explosion and the preventive measures

**CO3:** To understand machine and construction safety assessment and safeguarding methods

**CO4:** To understand the effect of toxic substances and hazardous chemicals

**CO5:** To understand the modes of electrical hazards and safety measures in electrical and information technology industries

## UNIT –I

**Safety in Engineering Industry-** Safety need, General hazards and control measures in engineering industry, Four significant industrial disasters happened in the world ( Bhopal, Chernobyl, Flixborough, Rana plaza ),Safety audit- procedure

**Accident Investigation-** Learning from accident, Layered investigations, Investigation process and summary

## UNIT –II

**Fire Safety:** The fire triangle, Explosions, Distinction between fire and explosions, Flammability characteristics of liquids and vapours, Fire protection techniques, Fire extinguishers, Fire hazard and analysis, Prevention of fire, Steps after occurrence of fire, Fire detection, Fire alarmand firefighting systems, Explosion proof equipment and instruments

## UNIT –III

**Machine Safety:** Machine guarding, Machine guarding assessment, Safeguarding machines and equipment, Guards, Safeguarding devices, Other potential safeguards

**Construction Safety:** Scope, Safety in -Underground works, Above ground works, Under waterworks, Demolition works.

## UNIT –IV

**Chemical Safety:** Hazardous chemicals, Definition of a hazardous chemical, Toxic effects, Working with toxins, Storing hazardous chemicals, Process hazards, Transportation of hazardous chemicals, Chemical waste management, Hazardous chemical emergency procedures, Worker contamination, Chemicals and worker health

## UNIT – V

**Electrical Safety:** Electrical dangers, Electrical pathways, Static electricity, Result of electrical contact, Shockversus electrocution, Electrical burns, Handling electrical hazards, Controlling electrical hazards, Training, Safety and Health program

**IT Industry Safety:** Hazardous in IT industry, General precautions, Employer's responsibility, Employees responsibilities, Office ergonomics, Computer workstation – health & safety tips, Laptop safety precautions

**Text Books:**


1. L. M. Deshmukh. Industrial Safety and Management. McGraw Hill Education (India)
2. D. A. Crowl and J. F. Louvar, Chemical Process Safety (Fundamentals with Applications), Prentice Hall, 2011.
3. Reese, Charles D. Industrial Safety and Health for People-oriented Services. CRC Press, 2008.
4. M. P. Poonia, S. C. Sharma. Industrial Safety and Maintenance Management. Khanna Book Publishing, 2019.

**Reference Books:**


1. Reese, Charles D. Industrial Safety and Health for Infrastructure Services. CRC Press, 2009.
2. R. K. Jain, Sunil S. Rao, Industrial Safety and Health and Environment Management Systems, Khanna Book Publishing, 2000.
3. K. U. Mistry. Fundamentals of Industrial safety and Health, Siddharth Prakashan Publisher,2008.


**Question Paper Pattern:**

**Sessional Exam :** The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

| WEB TECHNOLOGIES (WT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VI Semester : B.Tech** | | | | | **Scheme : 2020** | | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| **OEC313** | **OEC - II** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| | | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration : 1½ Hrs** | | | | | **End Exam Duration: 3 Hrs** | | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Design a Web Page using Text Formatting Tags, Hyperlinks

**CO2:** Develop a webpage with Images, Tables Hyperlinks, Lists, CSS.

CO3: Design dynamic web pages using JavaScript

**CO4:** Design a Form using HTML Forms & Controls

**CO5:** Understand the basic concepts of PHP and database connection using XAMPP Server.

## UNIT – I

**HTML5:** Overview of HTML5 and other web technologies, HTML5 and its essentials, Fundamentals of HTML5,Working with Text and organizing Text in HTML, Working with Links and URLs.

## UNIT – II

**Images:** Working with Images, Image Maps, Creating Tables, Frames

**CSS:** Overview of CSS, Backgrounds and Color Gradients in CSS, Fonts and Text Styles, List Styles, Table Layouts,

## UNIT – III

**JavaScript**: Overview of java script, Functions, Events, Java script Objects, Working with Browser Objects, Document Object, Document Object Model, Validation, Errors, Exception Handling in JavaScript.

## UNIT – IV

**Forms:** What's a Form? What Controls are available? Creating a Form and adding HTML Controls, Submitting Data from forms, Customizing Controls in CSS, Form validation using Java Script, Interactive Elements.

## UNIT – V

**Introduction to PHP:** Installing and Configuring PHP: Building PHP with Apache on Windows, The Basics of PHP scripts. The Building blocks of PHP: Variables, Data Types, Operators and Expressions, Constants. Creating Forms, Accessing Form Input with User defined Arrays, Combining HTML and PHP code on a single Page, XAMPP Server configuration.

**Text Books:**


1. HTML5 Black Book, 2nd Edition, Dreamtech Press, 2016.
2. Deitel and Deitel and Nieto, ―Internet and World Wide Web - How to Program‖, Prentice Hall, 5th Edition, 2011.
3. Julie C. Meloni, PHP MySQL and Apache, SAMS Teach yourself, Pearson Education (2007).


**Reference Books:**


1. Web Technologies, Uttam K. Roy, Oxford Higher Education., 1st edition, 10th impression, 2015.
2. Robert Pattinson, Beginners Guide for HTML and CSS Web Design and Web Development,2018
3. Jeffrey C and Jackson, ―Web Technologies A Computer Science

PerspectivePearsonEducation, 2011.
4. Gopalan N.P. and Akilandeswari J., —Web Technology, Prentice Hall of India, 2011.

**Web References:**

1. https://www.tutorialspoint.com/Html/index.htm
2. https://www.w3.org/Style/CSS/
3. https://www.w3schools.com/php/

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## INTRODUCTION TO CYBER SECURITY (ICS)

| VI Semester : B.Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **OE314** | **OEC- II** | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration 1½ Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Discriminate and analyze the problems in cybercrime.

**CO2:** Identifying different classes of attacks.

**CO3:** Synthesize cybercrime issues on wireless and mobile devices.

**CO4:** Use and apply modern cyber forensics tools.

**CO5:** Analyze the computer forensic problems for feasible solutions.

### UNIT – I

**Introduction to Cybercrime**: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.

### UNIT – II

**Cyber offenses**: How Criminals Plan Them– Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber café and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

### UNIT – III

**Cyber crime Mobile and Wireless Devices**: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones. Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

### UNIT – IV

**Tools and Methods Used in Cybercrime**: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing.

### UNIT – V

**Cyber Security: Organizational Implications:** Introduction, Cost of Cyber crimes and IPR issues, Web threats for Organizations, Security and Privacy Implications. **Social media marketing:** Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

**Text Books:**


1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, Sunit Belapure, Wiley.
2. Principles of Information Security, Micheal E.Whitman and HerbertJ. Mattord, Cengage Learning.

**Reference Books:**


1. Information Security,Mark Rhodes, Ousley, MGH.
2. CyberSecurityEssentials,JamesGraham,RichardHowardandRyanOtson,CRCPress.


**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## NANO TECHNOLOGY (NNT)

| VI - Semester: B.Tech | | | | | Scheme: 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Category | Hours/ Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC315 | OEC-II | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1 ½ Hrs | | | | | End Exam Duration: 3 Hrs | | | |

**Course Outcomes: At the end of the course the student will be able to**

CO1: Understand the principles behind nanotechnology and nanomaterials

CO2: Analyze the fabrication, characterization, and manipulation of nanomaterials,

CO3: Understand about metal nano particle based sensors

CO4: Analyze about nano wire based sensors.

CO5: Understand Sensors Based on Nanostructures of Metal Oxides

### UNIT – I

***Introduction to Nanotechnology:***

Definition of nanotechnology; main features of nanomaterials; types of nanostructures (0D, 1D, and 2D structures); nanocomposites; and mainchemical/physical/electrical/optical properties of nanomaterials. Methods for characterizing the nanomaterials: Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), and Spectroscopy.

### UNIT – II

***Introduction to Sensors' Science and Technology:***

Definition of sensors; main elements of sensors; the parameters used for characterizing the performance of sensors: accuracy, precision, sensitivity, detection limit, dynamic range, selectivity, linearity, resolution, response time, hysteresis, and life cycle.

### UNIT –III

***Metal nano particle-based Sensors:***

Definition of nano particle; features of nano particles; and production of nano particles by physical approach (laser ablation) and chemical approaches (Brust method, seed-mediated growth, etc.). Quantum Dot Sensors. Definition of quantum dot; fabrication techniques of quantum dots;

### UNIT – IV

***Nanowire-based Sensors:***

Definition of nanowires; features of nanowires; fabrication of individual nanowire by top-down approaches and bottom-up approaches; and fabrication of nanowire arrays (fluidic channel, blown bubble film, contact printing, spray coating, etc.).Carbon Nanotubes-based Sensors: Definition of carbon nanotube; features of carbon nanotubes; synthesis of carbon nanotubes.

### UNIT - V

***Sensors Based on Nanostructures of Metal Oxide:***

Synthesis of metal oxide structures by dry and wet methods; types of metal oxide gas sensors (0D, 1D, and 2D); defect chemistry of the metal oxide sensors; sensing mechanism of metal-oxide gas sensors; and porous metal-oxide structures for improved sensing applications.

**Text Books :**

1. Varghese Thomas and Balakrishna K M , Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials, Atlantic Publishers and

Distributers(P) Ltd, 2012.

2. G.Mohan Kumar, Nanotechnology: Nanomaterials and Nano devices, Narosa Publications,2016.

**Reference Books :**

1. T.Pradeep, Nano: The Essentials Understanding Nano Science and Nano Technology, Tata McGraw Hill, 2013.

. Richard Booker and earl Boyson, Nanotechnology: The Fun and Easy Way to Explore the Science of Matters Smallest Particle, Wiley Publications, 2011.

**Web References:**

1.https://nptel.ac.in/courses/118102003

2. online courses.nptel.ac.in/noc19_mm21/preview

3. online courses nptel.ac.in/noc22_ch11/preview

**Question Paper Pattern:**

**Sessional Exam:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Exam:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions and the student should answer any one question from each unit. Each Question carries 12 marks.

| DISASTER MANAGEMENT (DM) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VI Semester :B.Tech.** | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| **OEC316** | **OEC-II** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **Total** |
| | | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration:1.5Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :**At the end of the course the student will be able to

**CO1:** Understand the definitions and terminologies used in disaster management.

**CO2:** Understand the types and categories of disasters.

**CO3:** Understand the impact of disasters on socio-economic and environment.

**CO4:** Plan for disaster risk reduction, mitigation and management strategies.

**CO5:** Understand the relationship between development and disasters.

## UNIT – I

***Introduction:*** Concepts and definitions: disaster, hazard, vulnerability, risks, severity, frequency and details, capacity, impact, prevention, mitigation.

## UNIT - II

***Disasters:*** Disasters classification

***Natural Disasters:*** Floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.,

***Manmade Disasters:*** Industrial pollution – Artificial flooding in urban areas – Nuclear radiation – Chemical spills – Transportation accidents – Terrorist strikes, etc. – Mountain and coastal areas.

## UNIT – III

***Disaster Impacts:*** Disaster impacts –Environmental, physical, social, ecological, economic, political, etc., Health - psycho-social issues – Demographic aspects–Hazard locations – Global and national disaster trends – Climate change and urban disasters.

## UNIT – IV

***Disaster Risk Reduction:***

***Disaster Management Cycle - its phases:*** Prevention, mitigation, preparedness, relief and recovery – Risk analysis, vulnerability and capacity assessment – Early warning systems.

***Post-Disaster Environmental Response***(i.e. water, sanitation, food safety, waste management, disease control, security, and communications)**:** Role and responsibilities of government, community, local institutions, NGOs and other stakeholders – Policies and legislation for disaster risk reduction – Activities of National Disaster Management Authority.

## UNIT - V

***Disasters, Environment and Development:***Factors affecting vulnerability such as impact of developmental projects and environmental modifications – Sustainable and environmental friendly recovery – Reconstruction and

development methods.

**Text Books:**

1. PradeepSahni, *Disaster Risk Reduction in South Asia*, PHI, New Delhi.
2. Ghosh G.K., *Disaster Management*, APH Publishing Corporation.
3. Singh B.K., *Handbook of Disaster Management Techniques &Guidelines*, Rajat Publication.
4. V. K. Sharma, *Disaster Management*, National Centre for Disaster Management, IIPE, Delhi,

**Reference Books:**

1. A Status Report Publication of the Govt. of India, Ministry of Home Affairs, National Disaster Management Division, *Disaster Management in India.*
2. A. S. Arya, AnupKaranth, and Ankush Agarwal, *Hazards, Disasters and Your Community; A Primer for Parliamentarians*, GOI–UNDP Disaster Risk Management Programme.
3. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.

**Web References:**

. http://ndma.gov.in/ (Home page of National Disaster Management Authority)

2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. www.odihpn.org,*Disaster Preparedness Programme in India. A Cost Benefit Analysis*, Commissioned and Published by the Humanitarian Practice Network 'at ODI HPN.
4. www.empowerpoor.org, *Drought in India: Challenges and Initiatives; Poorest Areas in Civil Society (PACS) Programme*. [2001–2008]

**Question Paper Pattern:**

**Sessional Exam :**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

**End Exam:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

## PROJECT MANAGEMENT (PM)

| VI Semester :B.Tech. | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| OEC317 | OEC - II | 3 | 0 | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration:1.5 Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :**At the end of the course the student will be able to

**CO1:** Understand the methods of planning, scheduling and principles of construction management.

**CO2:** Formulate, solve CPM and PERT networks.

**CO3:** Understand the structure of organization and resource allocation.

**CO4:** Understand the procedure for documentation of tenders, contracts & time-cost analysis.

**CO5:** Understand basics of engineering economics and solving of cash flow problems.

**CO6:** Understand the concepts of quality control and safety management.

### UNIT – I

***Introduction to Construction Management:*** Significance – Objectives and functions of construction management – Types – Resources – Stages – Team of construction unit.

***Construction Planning and Scheduling:*** Objectives and importance of planning and Scheduling – Methods of planning and scheduling – Advantages and classification of schedules – Bar charts – Milestone charts.

### UNIT - II

***Network Techniques in Construction management:*** Elements of network – Network techniques – Breakdown structures – Representation and specifying of activities and events – Rules for Network.

***Critical Path Method (CPM):*** Introduction – Difference between CPM and PERT – Time estimates – Float – Critical path – Network analysis and computation problems.

### UNIT – III

***Program Evaluation and Review Technique (PERT):*** Introduction, time estimates, slack, critical path – Network analysis and computation problems.

***Cost–Time Analysis in Net Work Planning:*** Importance of time – Project cost analysis in network planning – Updating – Resources allocation.

### UNIT – IV

***Tenders and Contracts:*** Type of tenders – Principles of tendering – Notice inviting tender – Contracts definition – Essentials – Types – Documents – Conditions of contracts.

***Arbitration:*** Definition – Arbitrator – Arbitration agreement – Qualification of arbitrator – Advantages of arbitration.

***Organisation:*** Principles of organization – Types of organization – Measurement book.

### UNIT - V

***Engineering Economics:*** Basic Principles – Equivalence – Cash Flow diagram – Single Payment present worth factor – Uniform series present worth factor.

***Safety, Inspection and Quality Control:*** Importance of safety – Safety Measures – Personal Protection Equipment – Need for inspection at work – Principles ofinspection – Importance of

quality – Elements of quality – Organisation for quality control.

**Text Books:**

1. B.C. Punmia& K.K. Kandelwal, *Project Planning & Control with PERT & CPM*, Laxmi Publications (P) Ltd, New Delhi.
2. J.L. Sharma, *Construction Management and Accounts*, SatyaPrakasan (P), NewDelhi.
3.

**Reference Books:**

1. U.K. Shrivastava, *Construction planning and Management*, Galgotia (P), New Delhi.
2. S. Seetha Raman, *Construction Engineering and Management*, Umesh (P), New Delhi.
3. Chitkara, *Construction project management – Planning, Scheduling and Control*, Tata McGraw Hill.
4. Halpin, D.W, *Financial and Cost Concepts for Construction Management*, JohnWiley and Sons, New York.

**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weight age of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

| ADVANCED INFORMATION SYSTEMS (AIS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VI Semester : B.Tech** | | | | | **Scheme : 2020** | | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **OEC318** | **OEC-II** | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration 1½ Hrs** | | | | | **End Exam Duration: 3 Hrs** | | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Demonstrate the Object oriented concepts.

**CO2:** Interpret different types of Inheritance and Polymorphism.

**CO3:** Classify layer functionalities of OSI reference model and TCP Protocol suite.

**CO4:** Summarize the concepts of internetworking, security and IP addressing.

**CO5:** Demonstrate different types of protocols and web contents used in web design

## UNIT – I

**Introduction to Object Oriented Concepts**: Introduction, Programming Techniques, Introduction to Object Oriented Concepts, Concept of Structured Procedural Programming, Class, Object
**Characteristics of Objects:** Data Abstraction, Classification, Encapsulation and Message Passing. Access Specifiers in Class, UML Class Diagrams.

## UNIT – II

**Advanced Concepts in Object Oriented Technology:** Relationships, Inheritance- Protected Access Specifier, Multiple and Multilevel Inheritance, Generalization and Specialization, Abstract classes, Polymorphism, Implementation of OOC through C++.

## UNIT – III

**Introduction to computer Networks:** Introduction, Network Topology, OSI Reference Model, TCP Protocol Suite, Routing Devices, Types of Networks.

## UNIT – IV

**Internetworking:** Protocols for Internetworking, Internet Address and Domains, Packets, Packet Switched Networks, Virtual Private Networks, and Working of Internet.

## UNIT – V

**Introduction to Web Technology:** Introduction, Hyper Text Transfer Protocol (HTTP), File Transfer Protocol (FTP), Domain Name Server (DNS), Web Applications, Types of Web Content, Multi-Tier Web Applications, Performance of Web Applications.

**Text Books:**


1. Campus Connect Foundation Programme – Object Oriented Concepts – System
2. Campus Connect Foundation Programme – Computer Hardware and System Software - Vol. – 3, INFOSYS Concepts
3. Campus Connect Foundation Programme – Relational Database Management System, Client Server
4. E.Balaguruswamy, Object Oriented programming with C++, 2017
5. Data Communications & Networking, Forouzan, Tata McGrawHill, Fifth edition, 2017


**Web References:**

1. https://www.tutorialspoint.com/cplusplus/
2. https://www.geeksforgeeks.org/computer-network-tutorials/

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

| PRODUCT LIFE CYCLE MANAGEMENT (PLM) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VI Semester : B.Tech** | | | | | **Scheme : 2020** | | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| **OEC319** | **OEC - II** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| | | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration: 1½ Hrs** | | | | | **End Exam Duration: 3 Hrs** | | | |

**Course Outcomes:** At the end of the course the student will be able to

**CO1:** Understand Product life cycle management process.

**CO2:** Understand different steps in Product development process.

**CO3:** Get knowledge on Product data management

**CO4:** Understand the implementation of PLM and its impact on the organization

**CO5:** Understand core functions of PLM and supply chain and ERP systems

**UNIT – I**

Organization Business Models **(**MTS, MTO, CTO, ETO Etc), Basics of Enterprise Systems (PLM, ERP, MES), Background, Overview, Need, Benefits, and Concept of Product Life Cycle, Components / Elements of PLM, Emergence of PLM, Significance of PLM, Differences between PLM and PDM

**UNIT – II**

Integrated Product development process-Conceive-Specification, Concept design, Design-Detailed design, Validation and analysis (Simulation), Tool design, Realize-Plan manufacturing, Manufacture, Build/Assemble, Test(quality check).

**UNIT – III**

Workflow Processes, Design Collaboration, Processes Management, Document Management, Visualization, Bill of Materials (BOM) Management – Lab exercises.

**UNIT – IV**

Engineering Change Control, Configuration Management, Manufacturing Process Management, Variant Management, Classification PLM Architecture, Various PLM tools, Data Modeling, Security management.

**UNIT – V**

CAD Integrations, Information authoring tools (e.g., MCAD, ECAD, Technical publishing), Core functions (e.g., data vaults), Data Flow to Other systems such as Supply chain and ERP systems. (4 hours for lab exercises)

**Text Books**

1. Grieves, Michael, Product Lifecycle Management, McGraw-Hill publishers.
2. Antti Saaksvuori, Anselmi Immonen, Product Life Cycle Management – Springer publications

**Reference Books**

1.Kari Ulrich and Steven D. Eppinger, Product Design & Development, McGraw Hill International
2.Burden, Rodger PDM: Product Data Management, Resource Publications.

**Question Paper Pattern:**

**Sessional Exam:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

**End Exam:**
The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

## INDUSTRY 4.0 (I40)

| VI Semester : B.Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| OE320 | OEC-II | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1 ½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the Characteristics, Sensors, Actuators and Communication models for industry 4.0.

**CO2**: Understand Fourth revolution and Industry operations.

**CO3:** Understand the Cyber-Physical Systems, Sensors, platforms of Industrial IoT.

**CO4:** Understand the Cyber security, Industrial Internet Systems.

**CO5:** Understand Business Models and Architecture, Key enablers in Industrial IoT.

### UNIT – I

**Introduction to IoT, Sensing and Actuators, Communication**

Introduction, Transducer- Definition, Sensor – Static and Dynamic characteristics, Types, Actuator – Features, Types, Communication protocol, Standards, Features, Variants, IoT Networking - introduction, Proprietary non-IP based solution, IP based solutions.

### UNIT - II

**Industry 4.0: The Fourth Revolution**

Introduction, Sustainability Assessment of Manufacturing Industry, Lean Production System, Smart and Connected Business Perspective, Smart Factories

### UNIT – III

**Cyber-Physical Systems, Sensors, Platforms**

Cyber-Physical Systems and Next-Generation Sensors, Collaboration Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis.

### UNIT - IV

**Cyber security, Industrial Internet Systems:**

Cyber security – Introduction, challenges, Industrial Internet Systems, Industrial Sensing & Actuation, Industrial Processes and systems.

### UNIT - V

**Business Models and Architecture, Key Enablers:**

Industrial Business Models, Reference Architecture for Industrial Business Models of IIoT, Key Enablers of Industrial IoT in Sensing, Key Enablers of Industrial IoT in Connectivity, Key Enablers of Industrial IoT in Connectivity.

**Text Books**


1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”, VPT; 1 edition.
2. Industrial IoT Challenges, Design Principles, Applications, and Security, Ismail Butun, Springer Nature Switzerland AG, 2020.

3. Industrial Internet of Things Technologies and Research Directions, Anand Sharma, Sunil Kumar Jangir, Manish Kumar, Dilip Kumar Choubey, Tarun Shrivastava,S. Balamurugan, CRC, Taylor & Francis Group, LLC, 2020.

**Reference Books**

1. Industrial IoT Application Architectures and Use Cases, A. Suresh, Malarvizhi Nandagopal, Pethuru Raj, E. A. Neeba, Jenn-Wei Lin, CRC Press, Taylor & Francis Group, 2020.
2. "Introduction to Industry 4.0 and Industrial Internet of Things", Prof. Sudip Misra, IIT kharagpur

**Web References:**

1. https://www.electricaltechnology.org/2016/07/internet-of-things-iot-and-its-applications-in-electrical- power-industry.html
2. http://www.nptelvideos.in/2012/11/internet-technologies.html

**Question Paper Pattern:**

**Internal Assessment:** The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

## List of Open Electives - OEC-III & OEC-IV

| Open Elective Courses (OEC-III) | |
|---|---|
| **S. No** | **Course Title** |
| 1. | Multimodal Transportation Engineering |
| 2. | Air pollution and control |
| 3. | Industrial Robotics |
| 4. | Quality & Reliability Engineering |
| 5. | Smart Grid Technologies |
| 6. | Artificial Intelligence and Machine Learning |
| 7. | Distributed Embedded Systems |
| 8. | Natural Language processing |
| 9. | Design Thinking |
| 10. | Cloud, Micro services & Application |
| 11. | Block Chain Technologies |
| 12. | Agile Methodologies |
| 13. | Augmented Reality & Virtual Reality |

| Open Elective Courses (OEC-IV) | |
|---|---|
| **S. No** | **Course Title** |
| 1. | Composite Materials |
| 2. | Image Processing |
| 3. | Mobile Computing |
| 4. | Enterprise systems |
| 5. | Modern Web Applications |
| 6. | Cognitive Radio |
| 7. | Automation & Control |
| 8. | Human Resource Management |
| 9. | Design Patterns |
| 10. | Pre stressing Systems |
| 11. | Additive Manufacturing Technology |
| 12. | Drone Technology |
| 13. | Infrastructure for Smart City Development |

## MULTIMODAL TRANSPORTATION ENGINEERING (MTE)

| VII Semester : B. Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| OEC401 | OEC-III | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1 ½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to understand

**CO1:** the components of urban and rural roads and estimates the capacity and level of service

**CO2:** the components and functions of railway track

**CO3:** the control factors, gradients and geometric design of railway track

**CO4:** the various aircraft characteristics and design of runways

**CO5:** the various features in Harbours and Ports, their construction and coastal protection works

### UNIT – I

***Highway Engineering:*** Critical cross section of urban and rural roads- Road ecology- Classification of roads-Concept of Capacity and Level of Service-Factors affecting- Computation of Capacity and Level of Service as per Indo-HCM2017- Measure of effectiveness-Highway capacity and performance characteristics.

### UNIT - II

***Railway Track:*** Requirements of an ideal permanent way – Gauges in India – Selection of gauge- Functions and requirements of rails– Sleepers and Ballast- Functions and requirements, types of sleepers - Sleeper density – Ballast – Functions and requirements, types – Sub grade – Functions of sub grade or formation – Sub grade materials and its improvement.

### UNIT – III

***Track Alignment:*** Basic requirements – Factors controlling alignment – Gradients – Types of gradient – Grade compensation on curves.

***Geometric Design of the Track:*** Speed of the train – Speed on curves – Radius or degree of curvature – Super elevation or cant – Cant deficiency- negative super elevation - Types of transition curve – Length of transition curve –Widening of gauge on curves – Shift of the curve.

### UNIT – IV

***Airport Engineering:*** Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

### UNIT - V

***Harbour Engineering:*** Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works.

### Text Books


1. Indian Highway Capacity Manual- December2017, CSIR Publications, New Delhi.
2. C. Saxena and S.P. Arora [2015], *Railway Engineering*, Dhanpat Raj Publications
3. Khanna, S. K., Arora, M. G., and Jain, S. S. *Airport planning and Design*, Sixth Edition, Nem Chand and Bros, Roorkee, India, 2012.
4. C.Venkatramaiah., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015.

**Reference Books**

1. Satish Chandra and M. Agrawal, *Railway Engineering*, Second Edition, Oxford University Press, 2013.

2. Rangwala, S.C. *Railway Engineering*, Charotar Publishing House, Anand, India, 2008.

3. Horonjeff, R., McKelvey, F. X., Sproule, W. J., and Young, S. B. *Planning and Design of Airports*, Fifth Edition, McGraw-Hill, New York, USA, 2010.

**Web References:**

1. https/www.coursera.org

2. www.nptel.ac.in/courses

**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

| AIR POLLUTION AND CONTROL (APC) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VII Semester :B. Tech** | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **Total** |
| **OEC402** | **OEC-III** | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration: 1 ½ Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** To take up the basic concepts of air pollution.

**CO2:** To introduce students to basic concepts of pollution.

**CO3:** The contents involved the knowledge of causes of air pollution.

**CO4:** The contents involved the knowledge of health related to air pollution.

**CO5:** To develop skills relevant to control of air pollution.

## UNIT – I

***Introduction****:* History of Air pollution and episodes –Sources of air pollution and types – Introduction to meteorology and transport of air pollution: Global winds, Headley cells, wind rose terrestrial wind profile –Effects of terrain and topography on winds, lapse rate, maximum mixing depths, plume rise.

## UNIT - II

***Transport of Pollution in Atmosphere:*** Plume behavior under different atmospheric conditions – Mathematical models of dispersion of air pollutants –Plume behavior in valley and terrains – Plume behavior under different meteorological conditions –Concept of isoplates.

## UNIT – III

***Effects of Air Pollution:*** Effects of Air Pollution on human beings, plants and animals and Properties –Global Effects –Greenhouse effect –Ozone depletion, heat island, dust storms – Automobile pollution sources and control –Photochemical smog –Future engines and fuels.

## UNIT – IV

***Air Pollution control:*** Air Pollution control-at source – Equipment for control of air pollution – For particulate matter –Settling chambers–Fabric filters –Scrubbers –Cyclones Electrostatic precipitators, For Gaseous pollutants-control by absorption-adsorption scrubbers-secondary combustion after burners –Working principles advantages and disadvantages – Design criteria and examples.

## UNIT – V

***Air Quality Sampling and Monitoring:*** Stack sampling – Instrumentation and methods of analysis of SO2, CO etc, – Legislation for control of air pollution and automobile pollution.

**Text Books:**


1. C.S. Rao, *Environmental Pollution Control Engineering*, New Age International publishers.
2. H.S. Peavy, D.R. Row & G. Tchobanoglous, *Environmental Engineering*, McGraw Hill International Edition.
3. Martin Crawford, *Air Pollution Control Theory*, TMH Publication.


**Reference Books:**


1. H.C Parkins, *Air Pollution and Control,* McGraw Hill Publication.
2. Wark, K., Warner, C.F., and Davis, W.T., *Air Pollution: Its Origin and Control*, Addison-

Wesley Longman. 1998.

3. Gurjar, B.R., Molina, L., Ojha, C.S.P. (Eds.), *Air Pollution: Health and Environmental Impacts*, CRC Press.

4. Boubel, R.W., Fox, D.L., Turner, D.B., Stern, A.C., *Fundamentals of Air Pollution*, Academic Press.

**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

| INDUSTRIAL ROBOTICS (IRT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VII Semester: B. Tech** | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| **OEC403** | **OEC - III** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| | | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration : 1 ½ Hrs** | | | | | | **End Exam Duration : 3 Hrs** | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the basic components of industrial robots.

**CO2:** Understand the types of End Effectors and Sensors in robots.

**CO3:** Understand the Robot manipulator, forward and inverse kinematics.

**CO4:** Understand the programming methods for robots and design considerations of Robot work cell

**CO5:** Understand the manufacturing and processing applications of robot.

## UNIT – I

**Fundamentals of Robotics and Robot technology:** Automation and robotics, robot definition, robot anatomy, robot configurations, work volume, precession of movement, robot actuation and feed-back component, actuators, hydraulic actuators, electrical actuators (variable reluctance type and permanent magnet type stepper motor). Position sensors (potentiometer, resolvers, and encoders), velocity sensors (tachometer), power transmission devices.

## UNIT – II

**End Effectors and Sensors:** Robot end effectors, types of end effectors, mechanical grippers, other type of grippers- Vacuum cups, magnetic grippers, adhesive grippers, Hooks, Scoops and other miscellaneous devices. Sensors in robotics- tactile sensors, proximity and range sensors, Machine Vision, use of sensors in robotics.

## UNIT – III

**Robot Motion Analysis and Control:** Introduction to manipulator kinematics, position representation, forward transformation and reverse transformation of two degree freedom robot arm three degree of freedom arm in two dimensions, four degree freedom manipulators in thre dimension, homogeneous transformation and homogeneous transformation matrix.

## UNIT – IV

**Robot Programming:** Methods of robot programming- Lead through- WAIT, SIGNAL and delay commands; The textual robot programming languages, robot language structures, constants, variables and other data objects, motion commands, end effectors, sensors commands and monitor mode commands.

**Robot cell design and control:** Robot cell layout, work cell control, interlocks, error detection and recovery, graphical simulation of robot work cell.

## UNIT – V

**Robot Applications in Manufacturing:** Material transfer and machine loading and unloading general considerations in material handling.

**Processing Operations:** Spot welding, continuous arc welding, spray coating, and other processing operations.

**Text Books**

1. Mickel. P. Groover et. al, Industrial Robotics- Technology, Programming and Applications, McGraw Hill Publishers, New Delhi.
2. Deb S.R., Robotics Technology and Flexible Automation, TMH Publishers, New Delhi.
3. Richard D. Klafter, Robotic Engineering: An Integrated Approach, Pearson Publications.

**Reference Books**

1. K. S. Fu, Ralph C. Gonzalez and C.S.G. Lee, Robotics, control, sensing, vision, Mc Graw Hill.
2. Rama chandran, Nagarajan, Introduction to Industrial Robotics, Pearson.

**Question Paper Pattern:**

**Sessional Exam :**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

| QUALITY & RELIABILITY ENGINEERING (QRE) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VII Semester**: B. Tech | | | | | | **Scheme** : 2020 | | |
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **OEC 404** | **OEC-III** | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration : 1.5 Hrs** | | | | | | **End Exam Duration : 3 Hrs** | | |

**Course Outcomes :** At the end of the course students will be able to

| | |
|---|---|
| **CO1 :** | Understand the overview of the Total Quality Management system |
| **CO2:** | Understand concepts of customer satisfaction and employee involvement |
| **CO3:** | Apply the appropriate tools and techniques of continuous process improvement for controlling and improving quality |
| **CO4:** | Apply Quality Function Deployment and Bench Marking process for improving a product or process |
| **CO5:** | Understand concept of Reliability Engineering |

## UNIT – I

**IntroductiontoT.Q.M.:**IntroductiontoQuality;EvolutionofandbasicapproachtoTotalQuality Management;Leadershipconcepts;TheSevenhabitsofhighlyeffectivepeople;RoleofTQM Leaders; Implementation of TQM; Quality council, quality statements

## UNIT – II

**CustomerSatisfaction:**TypesofCustomers-InternalandExternal;Customerperceptionofquality; Feedback & brief discussion on Information Collecting Tools

**Employee Involvement:** Maslow's hierarchy of needs; Types of Teams, Stages of team development, Common barriers to team progress, Training; Benefits of Employee Involvement

## UNIT – III

**ContinuousProcessImprovement:**Introduction,Jurontrilogy,Improvementstrategies;P-D-S-A cycle & Problem solving method; Basic concepts of Kaizen and Six sigma quality control, Taguchi method, Quality circles

**Supplier Partnership:** Introduction, Partnering, Sourcing, Supplier Selection, Supplier Rating, Relationship Development

**Tools & Techniques of TQM :** Pareto diagram, Cause & Effect diagram

## UNIT – IV

**Benchmarking:** Introduction, Benchmarking process

**Quality Function Deployment:** Benefits of QFD, House of Quality

## UNIT – V

**Reliability Engineering:** Introduction, Failures & failure modes, Causes of failures

**Design for Reliability:** Designing for higher Reliability, Reliability & Cost

**Component Reliability:** MTTF, Time dependent hazard models – Exponential Distribution
**System Reliability:** Systems with components- in Series, and in Parallel; Non-Series-Parallel systems

**Redundancy Techniques:** Introduction, Component & Unit Redundancy, Weakest link technique

**Text Books:**


**1.** Dale H. Bester field, Total Quality Management, Pearson Education, New Delhi

**2.** E. Balagurusamy, Reliability Engineering, TMH Publishers, New Delhi

**3.** M. Mahajan, Statistical Quality Control, DhanapatRai and Sons Publishers, New Delhi


**Reference Books:**


**1.** Douglas C. Montgomery, Introduction to Quality Control, John Wiley and Sons Publishers, New York

**2.** N. Logothetis, Managing for Total Quality, From Deming to Taguchi, PHI Publishers, New Delhi

**3.** L.S. Srinath, Reliability Engineering, East West Press, New Delhi


**Question Paper Pattern:**

**Sessional Exam :**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

## SMART GRID TECHNOLOGIES (SGT)

| VII Semester : B.Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| OEC405 | OEC-III | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1 ½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the basic concepts, components and architecture of smart grid.

**CO2:** Understand the various measurement technologies in smart grid.

**CO3:** Understand about battery technology and energy storage in smart grid.

**CO4:** Understand the Interoperability and control of power grid.

**CO5:** Understand the cyber security issues in smart grid.

### UNIT – I

**Introduction:**
Today's Gird versus Smart Grid, Rationale for smart Grid, Computational Intelligence, Power System Enhancement, Communication and Standards, Environment and Economics, Shareholders Roles and Function, Architecture, Functions of Components.

### UNIT - II

**Sensors and Measurement:**
Sensors for Smart Grid, Monitoring and Measurement Technologies, PMU, Smart meters, Smart Appliances, Multi Agent Systems (MAS) Technology, Micro grid and Smart grid comparison, Wide Area Monitoring Protection and Control and SCADA.

### UNIT – III

**Energy Storage:**
Batteries, Flow Batteries, Fuel Cell and hydrogen electrolytes, Flywheel, Super conduction magnetic energy storage systems, super capacitors, Simulation and case studies

### UNIT - IV

**Interoperability:**
Introduction - State-of-the-Art-Interoperability - Benefits and Challenges of Interoperability- Model for Interoperability in the Smart Grid Environment - Smart Grid Network Interoperability - Interoperability and Control of the Power Grid, Standards - Approach to Smart Grid Interoperability Standards

### UNIT - V

**Smart Grid Cyber Security:**
Cyber Security State of the Art- Cyber Security Risks - Cyber Security Concerns Associated with AMI-Mitigation Approach to Cyber Security Risks - Cyber Security and Possible Operation for Improving - Methodology for Other Users

### Text Books


1. James Momoh, "Smart Grid: Fundamentals of design and analysis", John Wiley & sons Inc, IEEE press 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons Inc, 2012.
3. Lars.T.Berger, K.Iniewski, "Smart Grid: Applications, Communications & Security" Wiley India Pvt. Ltd, Reprint 2015.


### Reference Books


1. Fereidoon P. Sioshansi, "Smart Grid: Integrating Renewable, Distributed & Efficient Energy", Academic Press, 2012.

2. Clark W.Gellings, “The smart grid: Enabling energy efficiency and demand response”, Fairmont Press Inc,2009.
3. Qi Huang, Shi Jing “Innovative Testing and Measurement Solutions for Smart Grid”, John Wiley & Sons Inc, 2015.

**Web References:**

1. https://onlinecourses.nptel.ac.in/noc18_ee42/preview
2. https://www.smartgrid.gov/the_smart_grid/smart_grid.html
3. https://www.coursera.org/lecture/electric-power-systems/smart-grid-the-environment-aH8g0

**Question Paper Pattern:**

**Sessional Examination:** The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

## ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI & ML)

| VII - Semester: B. Tech | | | | | | Scheme:2020 | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **OEC 406** | **OEC-III** | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration: 1 ½ Hrs** | | | | | | **End Exam Duration:3 Hrs** | | |

**Course Outcomes:** At the end of the course students will be able to

**CO1:**.Recognize how foundations laid for Artificial Intelligence

**CO2:** Analyze the search strategies to find solutions to the problems by systematically generating new states

**CO3:** Understand the machine learning concepts and the main steps in a typical machine learning

**CO4:** Design a digit image classifier on MNIST dataset

**CO5:** Analyze various ML training models

### UNIT–I

**Introduction:** What Is AI? The Foundations of Artificial Intelligence

**Intelligent Agents*:*** Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, And the Structure of Agents.

### UNIT–II

**Uninformed Search Strategies**: BFS, DFS, Depth –limited search, IDA, Bidirectional search

Informed (Heuristic) Search Strategies- Greedy best-first search, A* search, Memory-bounded heuristic search, Learning to search better. Heuristic Functions.

### UNIT–III

**Machine Learning**

Introduction, Types of Machine Learning Systems, Challenges, Testing and Validating.

### UNIT–IV

Classification, Training a Binary Classifier, Performance measures, Multiclass classification, Error analysis, Multi label classification, Multi output classification

**End-to-End Machine Learning Project** :

Working with Real data, Launch, Monitor and Maintain your system

### UNIT–V

Training Models Linear Regression, Gradient Descent, Polynomial Regression, Learning Curves, Regularized Linear Models, Logistic Regression

**TextBooks:**

1.Stuart Russell and Peter Norvig, “Artificial Intelligence:A Modern Approach”,Third Edition,2010.Pearson Education.

2. Aurelian Geron,“Hands-On Machine Learning with Scikit-Learn and Tensor Flow:Concepts,Tools,and Techniques to build Intelligent Systems”,OReilly Publications,First Edition,

2017

**ReferenceBooks:**

1.Elaine Richie Kevin Knight[2008],[3rdEdition],Artificial Intelligence,TMH

2. Oliver Theobald,"Machine Learning for Absolute Beginners",Second Edition,2017

3. Miroslav Kubat, "An Introduction to Machine Learning" , Springer, 2017

**WebReferences:**

1.https://onlinecourses.nptel.ac.in/noc18_cs51

2.https://www.geeksforgeeks.org/F-intelligence-an-introduction/

3. *https://www.coursera.org/learn/python-machine-learning* offered by University of Michigan

4. https://github.com/ageron/handson-ml.

**Question Paper Pattern:**

**Sessional Exam**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Exam**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. and the student should answer any one question from each unit. Each Question carries 12 marks.

## DISTRIBUTED EMBEDDED SYSTEMS (DES)

| VII - Semester : B. Tech | | | | | | Scheme: 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| OEC 407 | OEC-III | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1 ½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes:** At the end of the course the student will be able to

**CO1:** Understand the real time environment and applications.

**CO2:** Understand System architecture and design of Distributed Embedded Systems

**CO3:** Understand inter task management and scheduling.

**CO4:** Analyze the network connection of distributed systems

**CO5:** Analyze the working of multiple embedded devices in a distributed network

### UNIT-I

Real Time Environment: Real-time computer system requirements, classification of real time systems, functional requirements, temporal requirements, global time, examples of real time systems.

### UNIT-II

Distributed System Design: Need of distributed systems, System Architecture, compatibility, scalability and dependability.

### UNIT-III

System Scheduling: Inter component communication, task management, and dual role of time; inter task interactions, Scheduling problem - static & dynamic scheduling – system design – validation – time–triggered architecture.

### UNIT-IV

Distributed Networks: Types of networks, comparisons, ISO-OSI model, TCP/IP connections. CAN concepts, Ethernet

### UNIT-V

Case Studies: Bluetooth controlled embedded operations, GSM based embedded operations, and event trigger based embedded applications.

**Text Books:**

1. Hermann Kopetz, Real–Time systems – Design Principles for distributed Embedded Applications, 2nd Edition, Springer 2011.

2. GlafP.Feiffer, Andrew Ayre and Christian Keyold, Embedded Networking with CAN and CAN open, Copperhill Media Corporation, 2008.

**Reference Books:**

1. Bernd Kleinjohann, Architecture and Design of Distributed Embedded Systems, Springer US,2013

1. Wayne Wolf, “Computers as Components”, Second edition, Morgan Kaufmann, 2008.

**Web References:**

1. https://www.coursera.org/specializations/real-time-embedded-systems
2. https://onlinecourses.nptel.ac.in/noc20_ee98/preview

**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions. and the student should answer any one question from each unit. Each Question carries 12 marks.

| NATURAL LANGUAGE PROCESSING (NLP) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VI Semester : B. Tech** | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **OEC 408** | **OEC-III** | **3** | **0** | **0** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration: 1½ Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes:** At the end of the course the student will be able to

**CO1:** Understand the importance of Text Wrangling, Cleansing and POS tagging.

**CO2:** Develop a NLP application using the NLTK library.

**CO3:** Implement Text classification algorithms using scikit-learn and NLTK.

**CO4:** Understand the basics of Tokenizing text using WordNet.

**CO5:** Understand the importance of Text feature extraction process.

## UNIT – I

**Introduction to Natural Language Processing**: Why learn NLP, Diving into NLTK, Text Wrangling and Cleansing, Sentence splitter, Tokenization, Stemming, Lemmatization, Stop word removal, Rare word removal, Spell correction, POS tagging, Named Entity Recognition (NER).

## UNIT – II

**NLP Applications**: Building your first NLP application, Other NLP applications – Machine translation, Information retrieval, Speech recognition, Text classification, Information extraction.

## UNIT – III

**Text Classification**: Machine Learning, Text classification, Sampling – Naïve Bayes, Decision trees, Stochastic gradient descent, Logistic regression, Support Vector Machines, The Random forest algorithm, Text clustering – K-Means.

## UNIT – IV

**Tokenizing Text and WordNet Basics**: Introduction, Tokenizing text into sentences, Tokenizing sentences into words, Tokenizing sentences using regular expressions, Training a sentence tokenizer, Filtering stop words in a tokenized sentence, Looking up Synsets for a word in WordNet, Looking up lemmas and synonyms in the WordNet, Calculating WordNet Synset similarity, Discovering word collocations.

## UNIT – V

**Feature Extraction**: Bag of words feature extraction, Training a Naïve Bayes classifier, Training a Decision tree classifier, Training a maximum entropy classifier, Training scikit-learn classifiers, Measuring precision and recall of a classifier, Training a classifier with NLTK-Trainer.

**Text Books:**


1. Natural Language Processing: Python and NLTK, Deepti Chopra, Jacob Perkins, and Nitin Hardeniya by Packt 2016.
2. Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems, Bodhisattwa Majumder, Anuj Gupta, Sowmya Vajjala, Harshit Surana published by O'Reily Media, Inc, 2020.

**Reference Books:**


1. Daniel Jurafsky & James H. Martin, Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, 2nd Edition, Pearson Education, 2009.
2. Tanvier Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford Higher Education, 2008.
3. Daniel M. Bikel & Imed Zitouni, Multilingual Natural Language Processing Applications: From Theory to Practice, Pearson Publication, 2012.
4. Christopher D. Manning, and Hinrich Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.


**Web References:**

1. https://www.coursera.org/specializations/natural-language-processing
2. https://www.udemy.com/course/speech-recognition-a-z-with-hands-onlearnkarts/
3. https://nptel.ac.in/courses/106105158

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

| DESIGN THINKING (DTH) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VII Semester :** B. Tech | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| **OEC 409** | **OEC-III** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| | | **3** | **0** | **0** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration 1½ Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |
| **Course Outcomes :** At the end of the course the student will be able to | | | | | | | | |
| **CO1:** Recognize the importance of Design Thinking | | | | | | | | |
| **CO2:** Identify the steps in Design Thinking process | | | | | | | | |
| **CO3:** Identify the difference between creativity and innovation | | | | | | | | |
| **CO4 :** Evaluate the value of creativity | | | | | | | | |
| **CO5:** Formulate specific problem statements of real time issues | | | | | | | | |
| | | | | | | | | |
| **UNIT – I** | | | | | | | | |
| **Introduction to Design Thinking**: Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry | | | | | | | | |
| **UNIT – II** | | | | | | | | |
| **Design Thinking Process:** Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development | | | | | | | | |
| **UNIT – III** | | | | | | | | |
| **Innovation:** Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. | | | | | | | | |
| **UNIT – IV** | | | | | | | | |
| **Product Design:** Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies. | | | | | | | | |
| **UNIT – V** | | | | | | | | |
| **Design Thinking in Business Processes:** Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes. | | | | | | | | |
| **Text Books:** | | | | | | | | |
| 1.Change by design, Tim Brown, Harper Bollins (2009) | | | | | | | | |
| 2.. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons | | | | | | | | |
| **Reference Books:** | | | | | | | | |
| 1. Design Thinking in the Classroom by David Lee, Ulysses press | | | | | | | | |

2. Rod Judkins, The Art of Creative Thinking, Rod Judkins, Hodder & Stoughton
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation – chesbrough. H

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

| CLOUD, MICRO SERVICES & APPLICATION (CMSA) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| VII Semester: B. Tech | | | | | | Scheme:2020 | | |
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | EndExam | TOTAL |
| OEC 410 | OEC-III | 3 | 0 | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | EndExamDuration:3 Hrs | | |

**Course Outcomes:** At the end of the course students will be able to

**CO1:** Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and its various delivery and deployment models.

**CO2:** Develop and design an application using various tools in cloud environment.

**CO3:** Acquire the basic and important design concepts an disuse of web application development techniques in cloud

**CO4:** Structure simple python program for developing an application in cloud.

**CO5:** Analyze the issue of cloud such as security, energy efficiency and interoperability, and provide an insight into future prospects of computing in the cloud monitoring.

## UNIT– I

**Cloud Fundamentals**-Cloud Service Components-Cloud Service, Deployment Models-Cloud components-Guiding principle with respect to utilization, Security, Pricing- Application of Cloud Computing. Case Study: Design and Implementation of Public and Private Cloud Environments – Open Stack and AWS.

## UNIT– II

**ApplicationArchitectures**-Monolithic&Distributed,MicroserviceFundamentalandDesignApproach-CloudNativeApplications-12FactorsApp-ApplicationIntegrationProcessandAPIficationProcess-APIFundamental-Microserviceand API Management- Spring Boot Fundamental and Design of Microservice - API Tools - Developer Portal-Applications of Micro service and API fication

## UNIT–III

**Devops fundamentals** - Devops Role and Responsibility-Tools and Applications- Containerization Process and Application-Evolution of APP Deployment- Docker Fundamentals - Docker Architecture-Docker Commands. Case study Orchestration, Kubernetes, Docker Container.

## UNIT– IV

**Cloud Security**-Cloud Security Shared Responsibility Architecture-Security By Design Principles-Identity And Access Management-Cloud Security Layers Illustration-Cloud Network, Host And Data Security Concepts-Security Operations and Major Cloud Service Provider Tools-Security Compliance and Regulations-Cloud Monitoring-Benefits of Cloud Monitoring-Overview of Cloud Monitoring Tools.

## UNIT– V

**Developing and Deploying an Application in the Cloud**- Building a python project based on Design-Development- Testing-Deployment of an application in the cloud using a development framework and deployment platform.

Case Study: Python Use case and Python Framework.

**TextBooks :**


1. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud ComputingConcepts, Technology &Architecture",PrenticeHall,2013.
2. GuoNingLiu, Qiang GuoTong, Harm Sluiman,AlexAmies,"Developing and Hosting Applications on the Cloud",IBMPress, 2012.
3. KaiHwang,GeofferyC.FoxandJackJ.Dongarra,"Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher,anImprintofElsevier,2012.
4. Rajkumar Buyya ,James Broberg Andrzej M.Goscinski , "Cloud Computing: Principles and Paradigms",Wiley,2011


**Reference Books**


1. Michael J. Kavis "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS,andIaaS)",1stEdition, Wiley,2014.
2. AzureVirtual Machineshttps://docs.microsoft.com/enus/azure/virtualmachines/
3. GoogleApp Enginehttps://cloud.google.com/appengine#allfeatures
4. GoogleKubernetesEnginehttps://cloud.google.com/kubernetesengine#allfeatures
5. DockerTutorial:https://dockercurriculum.com


**Question Paper Pattern**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## BLOCK CHAIN TECHNOLOGIES (BCT)

| VII Semester : B.Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC411 | OEC-III | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the basic concepts of Blockchain technology.

**CO2:** Interpret the security and risks involved in Blockchain applications.

**CO3:** Interpret the types of Blockchain applications and Blockchain solutions.

**CO4:** Understand the process of Ethereum Blockchain Implementation

**CO5:** Understand the process of Hyper ledger Blockchain Implementation

### UNIT – I

Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain. Evolution of Blockchain : Evolution of Computer Applications, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain. Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

### UNIT – II

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

### UNIT – III

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications

### UNIT – IV

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet

### UNIT – V

Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

**Text Books:**

3. Ambadas, Arshad Sarfarz Ariff, Sham “Blockchain for Enterprise Application Developers”, Wiley
2. Andreas M. Antonpoulos, “Mastering Bitcoin: Programming the Open Blockchain” , O’Reilly

**Reference Books:**

1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill
2. Mastering Bitcoin: Programming the Open Blockchain, 2nd ed., Antonopoulos, O'Reilly, 2017. ISBN: 978
3. Blockchain: Blueprint for a New Economy, Melanie Swan, O’Reilly

Web Resources

1. NPTEL online course : https://nptel.ac.in/courses/106/104/106104220/#

2.Udemy: https://www.udemy.com/course/build-your-blockchain-az/

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## AGILE METHODOLOGIES (AM)

| VII Semester : B. Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC 412 | OEC-III | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the importance of interacting with business stakeholders in determining the requirements for a software system

**CO2:** Analyze iterative software development processes: how to plan them, how to execute them.

**CO3:** Identify the impact of social aspects on software development success.

**CO4:** Understand Software process improvement as an ongoing task for development teams.

**CO5:** Analyze the Agile Metrics and Quality Assurance Activities

### UNIT – I

**AGILE METHODOLOGY:** Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

### UNIT – II

**AGILE PROCESSES:** Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

### UNIT – III

**AGILITY AND KNOWLEDGE MANAGEMENT:** Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

### UNIT – IV

**AGILITY AND REQUIREMENTS ENGINEERING:** Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

### UNIT – V

**AGILITY AND QUALITY ASSURANCE:** Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

**Text Books:**


1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

**Reference Books:**


1. Craig Larman, ―Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.
2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.


**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

| AUGMENTED REALITY & VIRTUAL REALITY (ARVR) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VII Semester : B. Tech** | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| **OEC 413** | **OEC-III** | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| | | **3** | **0** | **0** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration 1½ Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Explore the history of spatial computing and design interactions

**CO2:** Understand the foundational principles describing how hardware, computer vision algorithms function .

**CO3:** Learn Virtual reality animation and 3D Art optimization.

**CO4:** Demonstrate Virtual reality

**CO5:** Introduce to the design of visualization tools

## UNIT – I

**Designing and Art Across Digital Realities:** Introduction, Modalities, Types of common HCI modalities, New Modalities, The current state of modalities for spatial computing Devices, current controllers for immersive computing systems, Voice, Hands and Hardware inputs over the next generation.

**Designing for our senses, not our devices:** Envisioning a future, sensory technology, The Role of women in AI, Sensory Design, Five sensory Principles, Adobes' AR .

## UNIT – II

**Virtual Reality of Art:** A more natural way of making 3D art, VR for animation

**3D Art Optimization:** Introduction, Draw Calls, Using VR Tools for creating 3D Art, Acquiring 3D Models Versus Making them from scratch.

## UNIT – III

**Computer vision that makes augmented reality Possible works:** History of AR, How and why to select an AR Platform, Mapping, platforms, other Development considerations, The AR Cloud

**Virtual Reality and Augmented Reality – cross- platform theory:** Why cross platform, The role of game engines, understanding 3D Graphics, Portability lessons from video game design, simplifying the controller input.

## UNIT – IV

**Virtual Reality Toolkit:** What is VRTK, History, Steam VR Unity Toolkit, VRTK v4, future of VRTK, success of VRTK

**Three Virtual Reality and Augmented Reality Development Best Practices:** Handling Locomotion, Locomotion in VR, Locomotion in AR, Effective use of Audio, Audio in VR, Audio in AR, Common interaction paradigms, Inventory of VR, Augmented Reality Raycasts

## UNIT – V

**Data and Machine learning visualization Design and Development in spatial computing:** Introduction, understanding data visualization, principles for data and machine learning visualization design and development in spatial computing, why data and machine learning visualization works in spatial computing, 2D data

visualization vs 3D data visualization in spatial computing, interactivity in data visualizations and in spatial computing, animation, failures in data visualization, good data visualization design optimize 3D spaces, data representations, info graphics, and interactions, defining distinctions in data visualization and big data for machine, how to create data visualization: data visualization creation pipeline, webXR, data visualization challenges in XR, data visualization industry use case examples of data visualization, 3D reconstruction and direct manipulation of real world data, data visualization is for everyone, hands on tutorials, how to create data visualization, resources.

**Character AI and Behaviors:** Introduction, behaviors, current practice: Reactive AI, more intelligence in the system, Deliberative AI, machine learning.

## Text Books:


1. Erin Pangilinan, Steve lukas, and Vasanth Mohan, "Creating Augmented & Virtual Realities", 1st edition, O'REILLY, 2019.


## Reference Books:


1. Steve Aukstakalnis, "Practical Augmented Reality", Pearson Education, 2017


## Question Paper Pattern:

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## COMPOSITE MATERIALS (CM)

**VII Semester: B. Tech** | **Scheme : 2020**

| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC 414 | OEC – IV | 3 | 0 | 0 | 3 | 40 | 60 | 100 |

**Sessional Exam Duration : 1 ½ Hrs** | **End Exam Duration : 3 Hrs**

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Identify the properties of fiber and matrix materials used in commercial composites, and its manufacturing techniques.

**CO2:** Understand manufacturing methods and their elastic properties of lamina.

**CO3:** Analyze the Hooke's law for different type of materials.

**CO4:** Understand the elastic behavior of the unidirectional composite

**CO5:** Analyze a laminated plate in bending, including finding laminate properties from lamina.

### UNIT – I

**Basic Concepts and Characteristics:** Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites.
**Reinforcements:** Fibers- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide fibers. Particulate composites, Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites

### UNIT – II

**Manufacturing methods:** Autoclave, tape production, moulding methods, filament winding, hand layup, pultrusion, RTM .
**Micromechanics:** Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties

### UNIT – III

**Coordinate transformations:** Hooke's law for different types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation.

### UNIT – IV

**Elastic behaviour of Unidirectional Composites:** Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

### UNIT – V

**Analysis of laminated composite plates:** Introduction, thin plate theory, specially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory.

### Text Books

1. R.M.Jones, Mechanics of Composite Materials Mc Graw Hill Company, New York.
2. Isaac and M.Daniel, Engineering Mechanics of Composite Materials, Oxford University Press.
3. Madhujit Mukhopadadhyay, Mechanics of composite materials and structures, Universities Press

### Reference Books

1. L. R. Calcote, Analysis of Laminated Composite Structures ,Van Nostrand Rainfold
2. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley Interscience, New York

**Question Paper Pattern:**

**Sessional Exam :**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

**End Exam:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

## IMAGE PROCESSING (IP)

| VII Semester : B. Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| OEC 415 | OEC-IV | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1 ½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the concepts of image processing system and various operations that can perform on digital images.

**CO2**: Understand the image enhancement in spatial and frequency domain.

**CO3:** Understand various image restoration techniques.

**CO4:** Understand various image compression and segmentation techniques.

**CO5:** Understand the various mathematical transforms , color image concepts and processing.

### UNIT – I

**Basic Concepts** Definition, Applications of Digital Image Processing, Fundamental Steps, Components of Image Processing System, Human Visual System, Simple Image Formation Model, Image Sampling And Quantization, Spatial and Gray Level Resolution, Image Interpolation, Some Basic Relationships Between Pixels, Linear And Non Linear Operations.

### UNIT - II

**Image Enhancement**

**Spatial Domain:** Basic Gray Level Transformations, Histogram Processing, Enhancement Using Logical And Arithmetic Operations, Image Subtraction, Image Averaging, Basic of Spatial Filtering, Smoothing And Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

**Frequency Domain:** Introduction to Fourier Transforms, Basics of Filtering in Frequency Domain, Fundamental Steps in Filtering in Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering.

### UNIT – III

**Image Restoration** Model of Image Degradation/Restoration Model, Noise Models, Restoration In Presence of Noise Only-Spatial Filtering, Adaptive Filters, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position Invariant Derivations, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration.

### UNIT - IV

**Image Compression** File format (bmp, tiff, pcx, gif, jpeg.), Compression fundamentals, Image Compression Models, Error Free Compression: VLC, Arithmetic Coding, LZW coding, Bit plane Coding, Lossless Predictive Coding, Lossy Compression: Lossy Predictive Coding, Block Transform coding

**Image Segmentation** Fundamentals, Detection of Discontinuities: Point, Line, Edge detection, Edge Linking and Boundary Detection: Local Processing, Global Processing via Hough Transform.

### UNIT - V

**Image Transforms** Introduction One and Two Dimensional Discrete Fourier Transform (DFT), Properties of DFT, Properties of Discrete cosine and sine transforms, Properties of Slant, KL transforms.

**Color Image Processing** Color fundamentals, Color models: RGB, CMY and CMYK, HSI, Converting colors, RGB to HIS, HIS to RGB manipulating HIS component images, Pseudo color Image Processing, Full Color Image Processing.

### Text Books

1. Rafael Gonzalez & Richard Woods, ―Digital Image Processing‖, 3rd Edition. Pearson publications, 2012

2. Anil K. Jain, —Fundamental of Digital Image Processing‖, PHI publication, 2013.
3. S. Jayaraman, S. Esakkirajan & T. Veera Kumar, —Digital Image Processing‖, Mc. Graw Hill, 2011.

**Reference Books**

1. Pratt, —Digital Image Processing‖, 2nd Edition, Wiley Publication, 1991.
2. S. Sridhar, —Digital Image Processing‖, Oxford University Press, 2011.

**Web References:**

1. https://nptel.ac.in/courses/117105079/
2. https://nptel.ac.in/courses/117104069/
3. https://nptel.ac.in/courses/106105032/

**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

## MOBILE COMPUTING (MC)

**VII Semester : B. Tech** | **Scheme : 2020**

| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC 416 | OEC-IV | 3 | - | - | 3 | 40 | 60 | 100 |

**Sessional Exam Duration** 1½ Hrs | **End Exam Duration:** 3 Hrs

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** To learn about the mobile infrastructure, radio resource management, overview of generation 1G to 5G

**CO2:** To illustrate the location management involved in GSM, Mobile IP.

**CO3:** To illustrate the transmission, transaction technology involved in mobile.

**CO4:** To explore the wireless network in mobile.

**CO5:** To discover the cognitive radio networks in mobile

### UNIT – I

**Introduction** Overview of wireless and mobile infrastructure, Preliminary concepts on cellular architecture, Design objectives and performance issues, Radio resource management and interface, Propagation and path loss models, Channel interference and frequency reuse, Cell splitting, Channel assignment strategies, Overview of generations:- 1G to 5G

### UNIT – II

**Location And Handoff Management** Introduction to location management (HLR and VLR), Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity based), Mobility models characterizing the movement of groups of nodes (Reference point based group mobility model, Community based group mobility model), Static (Always vs. Never update, Reporting Cells, Location Areas) and Dynamic location management schemes (Time, Movement, Distance, Profile Based), Terminal Paging (Simultaneous paging, Sequential paging), Location management and Mobile IP, Overview of handoff process, Factors affecting handoffs and performance evaluation metrics, Handoff strategies, Different types of handoffs (soft, hard, horizontal, vertical).

### UNIT – III

**Wireless Transmission Fundamentals** Introduction to narrow and wideband systems, Spread spectrum, Frequency hopping, Introduction to MIMO, MIMO Channel Capacity and diversity gain, Introduction to OFDM, MIMO-OFDM system, Multiple access control (FDMA, TDMA, CDMA, SDMA), Wireless local area network, Wireless personal area network (Bluetooth and zigbee).

### UNIT – IV

**Wireless Network** Mobile Ad-hoc networks - Characteristics and applications; Coverage and connectivity problems, Routing in MANETs, Wireless sensor networks - Concepts, basic architecture, design objectives and applications; Sensing and communication range, Coverage and connectivity, Sensor placement, Data relaying and aggregation, Energy consumption, Clustering of sensors, Energy efficient Routing (LEACH).

### UNIT – V

**Cognitive Radio Networks** Fixed and dynamic spectrum access, Direct and indirect spectrum sensing, Spectrum sharing, Interoperability and coexistence issues, Applications of cognitive radio networks, Introduction to D2D communications-High level requirements for 5G architecture, Introduction to the radio resource management, power control and mode selection problems,

Millimeter wave communication in 5G.

**Text Books:**

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson, 2004.
2. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005

**Reference Books:**

1. Theodore Rappaport, “Wireless Communications: Principles and Practice”, Pearson Education, 2014.
2. Ezio Biglieri, MIMO, “Wireless Communications”, Cambridge University Press, 2009.
3. Ivan Stojmenovic, “Handbook of Wireless Networking and Mobile Computin”, Wiley, 2002.
4. James Cowling, “Dynamic Location Management in Heterogeneous Cellular Networks”, 2004.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## ENTERPRISE SYSTEMS (ES)

| VII Semester : B. Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC 417 | OEC-IV | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand basic elements of Enterprise Systems

**CO2:** Develop skills in understanding architecture

**CO3:** Understand the application patterns

**CO4:** Understand the integration and patterns

**CO5:** Analyze the deployment

### UNIT – I

**Introduction to Modern Enterprise Systems**: Introduction to enterprise systems. Elements of enterprise systems – Business Information system, Decision support systems, Knowledge management systems, Financial and human resource systems. Kinds of Enterprise systems- B2C and B2B models.
**Components of Enterprise systems:** Channels (Mobile, web, desktop, partner integration), Data management, workflow, Controlling and Auditing, Accounting etc.

### UNIT – II

**Key characteristics Enterprise systems:** Distributivity, Managed redundancy, Exception processing, Collaboration, Data transformation.
**Enterprise System architectures**: Batch processing, Monolithic, client server, ecommerce, service oriented, micro service, and cloud architectures.

### UNIT – III

**Introduction to Enterprise Application architectures**: Layer Architecture, Event driven Architecture, Service oriented Architecture, Micro service architecture, Plug-in architecture.
**Application architecture Patterns:** Layering, Organizing domain logic, Mapping to database, Web Presentation, Concurrency.

### UNIT – IV

**Enterprise Application Integration:** Introduction to Enterprise Integration, different integration styles. Elements of messaging-based Integration.
**Enterprise Integration patterns:** Modern service integration techniques. Introduction to WSDL, SOAP. Introduction RESTFul webservices integration. Differences between SOAP and REST.

### UNIT – V

**Deployment of Enterprise applications:** Key requirements in deployment - Stability, capacity, Security, availability, Network, Availability, and Transparency (Basic Introduction only).
**Introduction to Enterprise Architecture**: Importance of Enterprise Architecture. Enterprise architecture models. Zachman Framework, TOGAF Framework.

**Text Books:**

1. Ralph Stair, George Reynold, “Principle of Information Systems”, 10 ed.
2. Martin Fowler et al, “Pattern of Enterprise Application Architecture”, Addison-Wesley, 2012
3. Gregor Hohpe, Bobby Woolf, Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions,

**Reference Books:**

1. Mark Richards, Software Architecture patterns, 2015, O’Reilly.
2. Sam Newman, “Building Microservices”, 2015,O’Reilly.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## MODERN WEB APPLICATIONS (MWA)

| VI Semester : B. Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC 418 | OEC-IV | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes:** At the end of the course the student will be able to

**CO1:** Understand the various steps to design static websites.

**CO2:** Develop a Web Page using the HTML5.

**CO3:** Apply CSS effectively to create interactive websites.

**CO4:** Implement client-side scripting using JavaScript to design dynamic websites.

**CO5:** Develop end to end application - web frontend and backend development.

### UNIT – I

**Introduction to Internet & World Wide Web:** Concept of website, its need and purpose, Types of websites: Static and dynamic website, Web Browsers, − Web Servers, Uniform Resource Locator, Tools and Web Programming Languages. Web Standards, Tiered Architecture: Client Server Model, Three Tier Model, Service Oriented Architectures, REST services, Introduction to HTML, XML, JSON

### UNIT – II

**Hyper Text Mark Up Language**: - Languages used for website development, HTML5: basic tags, formatting tags, Adding images, Lists, Embedding multimedia in Web pages, Inserting tables, Internal and External Linking, Frames, Forms

### UNIT – III

**Cascading Style Sheets (CSS3)**: Basics of Cascading Style sheets, Advantages of CSS, External Style sheet, Internal style sheet, Inline style sheet, CSS Syntax, color, background, Font, images

### UNIT – IV

**Java Script**: Features of JavaScript, extension of JavaScript, Syntax of JavaScript: data types, operators, variables, tag, Document Object Model (DOM) with JavaScript, Selection Statement using if and Switch, Iterative statement: for, for/in, while, do while, break and continue

### UNIT – V

**Front End Framework**: Introduction to jQuery - Syntax, Selectors, Events, Traversing, AJAX ; Introduction to Bootstrap – Basics, Grids, Themes ; Angular JS – Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, Validation

**Back End Technologies:** Introduction to RESTful services, Resources, Messages (Request, Response), Addressing, Methods – (GET, POST, PUT, DELETE)

**Text Books:**


1. Deitel and Deitel and Nieto, ―Internet and World Wide Web - How to Program‖, Prentice Hall, 5th Edition, 2011.
2. HTML5 Black Book,2nd Edition, Dreamtech Press,2016.

3. HTML & CSS: Design and Build Websites, Jon Duckett, John Wiley & Sons
4. RESTful Web Services: Leonard Richardson, Sam Ruby,May 2007

**Reference Books:**

1. Web Technologies, Uttam K. Roy, Oxford Higher Education., 1st edition, 10th impression, 2015.
2. Robert Pattinson, Beginners Guide for HTML and CSS Web Design and Web Development,2018
3. Jeffrey C and Jackson, —Web Technologies A Computer Science PerspectivePearsonEducation, 2011.
4. Gopalan N.P. and Akilandeswari J., —Web Technology, Prentice Hall of India, 2011.

**Web References:**

1. https://www.tutorialspoint.com/Html/index.htm
2. https://www.w3.org/Style/CSS/
3. Bootstrap - CSS Framework: https://getbootstrap.com
4. https://docs.angularjs.org/api/ng/function/angular.element

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## COGNITIVE RADIO (CR)

**VII - Semester: B. Tech** | **Scheme:2020**

| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC 419 | OEC-IV | 3 | - | - | 3 | 40 | 60 | 100 |

**SessionalExamDuration:1 ½ Hrs.** | **End Exam Duration: 3 Hrs.**

**Course Out comes:** At the end of the course the student will be able to

**CO1:** Understand the architecture of SDR and management of unlicensed spectrum.

**C02:** Analyze the Aware and Adaptive cognitive radios.

**CO3:** Analyze the spectrum awareness and interference avoidance

**CO4:** Understand technical challenges in CR and various spectrum sensing methods.

**CO5:** Analyze the OFDM based Cognitive radio and MIMO-OFDM channel estimation

### UNIT-I

**Software defined Radio:** Basic SDR – Software and Hardware Architecture of an SDR – Spectrum Management – Managing unlicensed spectrum–Noise Aggregation-Component development–Wave form development– Cognitive wave form development

### UNIT-II

**Cognitive Radio Technology:** Introduction–Radioflexibilityandcapability–Aware–Adaptive–Comparison of Radio capabilities and Properties–Available Technologies–IEEE 802 Cognitive Radio related activities.

### UNIT-III

**Spectrum Awareness:**
Introduction,TheInterferenceavoidanceproblem,CognitiveRadioRole,Spectralfootprintminimization, Creating Spectrum Awareness-Spectrum usage reporting, Spectrum sensing, Potential Interference analysis, Distributed sensing and operation, Channel awareness and multiple signals in space

### UNIT–IV

**Cognitive Radio technical challenges and spectrum sensing:**
Design Challenges associated with CR -Hardware requirements-Hidden primary user problem-
Detecting spread spectrum primary users-Sensing duration and frequency-Security.

### UNIT–V

**Spectrum sensing**
Spectrum sensing overview – Classification - Matched filter – waveform based sensing – cyclo-stationary based sensing –Energy detector based sensing –Radio Identifier– Cooperative sensing-other sensing methods.

**Text Books:**


1.BruceA.Fetti,–*Cognitive Radiotechnology"*, 1st Edition,Elsevier.
2.H.Arslan–*CognitiveRadio,SDRandAdaptiveWirelessSystems*|,Springer,2007.


**References:**


1.K.C.Chen, R.Prasad , —Cognitive Radio Networks‖ , Wiley, 2009.
2.J. H. Reed, —Software Radio‖, Pearson, 2004.
3. Paul Burns, —Software defined radio for 3G‖, Artech House, 2003.


**WebReferences:**

1.https://nptel.ac.in/courses/108107107/3
**2**.https://www.youtube.com/watch?v=hzxgDyXbpt4
**3**.https://www.youtube.com/watch?v=z-E5jIoUFbA

**Question Paper Pattern:**

**Sessional Exam:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ORType)ineachsection.Thestudentshallansweronequestionfromeachsection.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions.andthestudentshouldanswer anyonequestionfromeachunit.EachQuestioncarries12marks.

## AUTOMATION & CONTROL (AMC)

| VII Semester : B. Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC 420 | OEC- IV | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1 ½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the elements of automation principles

**CO2:** Understand the construction and working of pneumatic systems

**CO3:** Understand the working of hydraulic systems

**CO4:** Understand various control techniques in automation

**CO5:** Understand the automated testing and inspection methods in industry

### UNIT - I

**Automation in Manufacturing Industries:** Introduction- Automation in production system, Principles and strategies of automation, Basic elements of an automated system, Advanced automation functions, Levels of automations, Automated flow lines and transfer mechanisms, Analysis of transfer lines without storage, Automated flow lines with storage buffers.

### UNIT - II

**Pneumatic Systems:** Introduction to pneumatic systems: advantages and limitations, applications, structure and signal flow of pneumatic systems; pneumatic power pack: air generation and distribution, air reservoir, constructional details and working of filter, lubricator, pressure regulator, actuators, direction control valves, check valves, flow control valves, pneumatic counter.
Symbols of pneumatic valves, traverse time diagram, design of manually operated circuits: direct and indirect control of actuators, control of single and multiple actuators.

### UNIT - III

**Introduction to Hydraulic systems:** Advantages and limitations, physical principles of oil hydraulics, hydraulic power pack, hydraulic fluids, filters, types of hydraulic pumps, pump performance calculations, hose size calculations, hydraulic actuators and accessories, accumulator, hydraulic valves, pressure control valves, flow control valves, open-center and closed-center hydraulic systems.

### UNIT - IV

**Control Technologies in Automation:** Industrial Control Systems, Process Industries Verses Discrete-Manufacturing Industries, Continuous Verses Discrete Control, Computer Process Control and its Forms. Computer Based Industrial Control: Introduction & Automatic Process Control, Building Blocks of Automation System: LAN, Analog & Digital I/O Modules, SCADA System & RTU.

### UNIT - V

**Automated Inspection and Testing:** Inspection and testing, Statistical Quality Control, Automated Inspection Principles and Methods, Sensor Technologies for Automated Inspection, Coordinate Measuring machines, Other Contact Inspection Methods, Machine Vision, Other optical Inspection Methods.

**Text Books :**


1. Mikell-P.-Groover “Automation-Production-Systems-and-Computer-Integrated-Manufacturing”-Ed-4-2015, Pearson publishers
2. Majumdar S.R., “Pneumatic Systems Principles and Maintenance”, Tata McGraw Hill, New Delhi.
3. Peter Croser and Frank Ebel, "Pneumatics Basic Level TP 101" Festo Didactic GMBH & Co,

Germany.
4. Hasebrink J.P. and Kobler R., “Fundamentals of Pneumatic Control Engineering”, Festo Didactic GMBH & Co, Germany.
5. Krishna Kant “Computer Based Industrial Control” -PHI
6. Groover M. P., "Industrial Robotics, Technology, Programming and Application", McGraw Hill Book and Co., 2012.

**Reference Books :**

1. Merkle D.,Schrader B. and Thomes M., "Hydraulics Basic Level TP 501" Festo Didactic GMBH & Co, Germany.
2. Peter Rohner, “Industrial Hydraulic Control” John Wiley and Sons, Brisbane
3. Tiess Chiu Chang & Richard A. Wysk “An Introduction to Automated Process Planning Systems”
4. Amber G.H & P.S. Amber “Anatomy of Automation” PrenticeHall
5. Srinivas Medida, "Pocket Guide on Industrial Automation", First Edition, IDC Technologies, 2008

**Web References:**

1. https://www.electrical4u.com/industrial-automation/
2. https://conceptsystemsinc.com/what-is-industrial-automation-types-of-industrial-automation
3. https://www.thomasnet.com/articles/automation-electronics/general-automation-systems

**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

| HUMAN RESOURCE MANAGEMENT (HRM) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VII Semester : B. Tech** | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **OEC 421** | **OEC-IV** | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration 1½ Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :** At the end of the course the student will be able to

CO1: Understand human resource management concept and challenges

CO2: Understand human resource system design

CO3: Understand Functional Areas of HRM

CO4: Understand human resource planning

CO5: Understand human resource management in Service Sector

## UNIT – I

**HUMAN RESOURCE MANAGEMENT**: Concept And Challenges: Human Resources Management – Meaning, Definitions, Characteristics, Objectives, Importance, Functions and Process, Challenges, Recent Trends -Human Resources Manager – Duties and Responsibilities. The Components Of HR Systems: HR Philosophy; HR policies, practices and processes

## UNIT – II

**HUMAN RESOURCE SYSTEM DESIGN:** HR Profession- Human Resource(HR) Professional Qualities and Skills ;HR Department-Meaning, Definitions, Characteristics, Objectives, Importance, Functions and Process of Human Resources Development-Differences between personnel Management and Human Resources Development; Line Management Responsibility in HRM; Performance Evaluation and Management: Selected Evaluation Techniques; Human Resource Accounting And Audit: Definition Of Human Resource Accounting (HRA), Need, Significance, Objectives For Hr, Measurements In HRA, Meaning of Human Resource Audit ,Need Of Human Resource Audit Conducting Human Resource Audit, Human Resource Audit Process; Information Management In HRA.

## UNIT – III

**Functional Areas of HRM:** Recruitment and Staffing**:** Strategic recruitment decisions, Types of recruitment-Internal recruitment , External recruitment, Selection process, Staffing global assignments;
Compensation and Reward System: Compensation - Meaning, Definitions, Objectives and Importance-Wages and Salary Perquisites, Fringe Benefits, Bonus and Incentives – Meanings only, incentives in sun rise sector and sun set sector.
Employee Relations - Define employee relations, four methods for managing employee relations;
HR compliance: Meaning and Importance;
Human Resource Information Systems: Importance of HR Information Systems Features of HR Information Systems, Designing And Implementing an HRIS;
Payroll Management: What is Payroll Management , Importance of Payroll Management, Payroll Management Process, Payroll Processing Stages, Methods of Payroll Management.

## UNIT – IV

**Human Resource Planning:** Strategic and Human Resource Planning, The HR Planning Process; Training And Development: Introduction: Training-Objectives, Training Process of training, Training needs assessment, Training evaluation, Development-Development process, Development needs analysis, Succession planning.

## UNIT – V

**Strategic Management of Human Resources:** SHRM, relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity in the Workplace.
**Human Resource Management in Service Sector:** Managing Human Element in Service Sector: Human Element in Service Sector – Introduction, Role and Significance; The Services Triangle ; Front Line Employees /Boundary Spanners – Meaning, Issues Faced by Front Line Employees: Person/Role Conflicts, Organization/Client Conflict, Inter client Conflict; Emotional Labour – Meaning, Strategies for Managing Emotional Labor**;** Flexible Working Practices – Implications for HR.

## Text Books:


1. Prof. Gary Dessler , Human Resources Management, Pearson, 16th Edition, 2020.
2. Prof.JohnM.Ivancevich, "Human Resource Management", Tata McGraw Hill Publication, 12th Edition, 2003.
3. Prof.Aswathappa, "Human Resource Management and Personnel Management", 3 rd Edition, Tata McGraw Hill, 2002.


## Reference Books:


1. Dr.C.B.Gupta, "Human Resource Management ", Sultan Chand & Sons, New Delhi, 1st Edition, 2018.
2. Prof.S.S.Khanka, "Human Resource Management", Chand & Company, New Delhi, 2019
3. Dr.S.Seetharaman et al., "Human Resource Management", SciTech Publications Pvt Ltd. Chennai,2012.


## Question Paper Pattern:

**Sessional Examination:**
The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.
**End Examination:**
The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## DESIGN PATTERNS (DP)

| VII Semester: B. Tech | | | | | Scheme: 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC 422 | OEC-IV | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | End Exam Duration: 3 Hrs | | | |

**Course Outcomes:** At the end of the course the student will be able to

**CO1:** Understand the usage of design patterns for solving object-oriented design problems

**CO2:** Describe the creational patterns abstract factory, factory method, builder, prototype, and singleton.

**CO3:** Understand structural patterns: adapter, bridge, composite, decorator, facade, fly weight, proxy.

**CO4:** Explain behavioral patterns chain of responsibility, command, interpreter, iterator, mediator, memento, observer, state, strategy, template method, and visitor.

**CO5:** Explain the patterns used in solving design problems of Lexi Document Editor

### UNIT – I

**Design Pattern Introduction:** What Is a Design Pattern, Describing Design Patterns, the Catalog of Design Patterns, Organizing the Catalog, How to Select a Design Pattern, How to Use a Design Pattern, How Design Patterns Solve Design Problems?

### UNIT – II

**Creational Patterns:** Abstract Factory Pattern, Builder Pattern, Factory Method Pattern, Prototype Pattern, Singleton Pattern.

### UNIT – III

**Structural Patterns:** Adapter Pattern, Bridge Pattern, Composite Pattern, Decorator Pattern, Facade Pattern, Flyweight Pattern, Proxy Pattern.

### UNIT – IV

**Behavioral patterns:** Chain of responsibility Pattern, Command Pattern, Interpreter Pattern, Iterator Pattern, Mediator Pattern, Memento Pattern, Observer Pattern, State Pattern, Strategy Pattern, Template method Pattern, Visitor Pattern.

### UNIT – V

**A Case Study:** Designing a Document Editor, Design Problems, and Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation.

### Text Books:


1. Erich Gamma [2008], Design Patterns elements of reusable object oriented software, Pearson Education.
2. Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal, PatternOriented Software Architecture: A System of Pattern, John Wiley & Sons; 1996.


### Reference Books:


1. Mark Grand, Pattern's in JAVA Vol-I, Wiley DreamTech
2. Mark Grand, Pattern's in JAVA Vol-II, Wiley DreamTech
3. Mark Grand [2006], JAVA Enterprise Design Patterns Vol-III, Wiley DreamTech
4. Eric Freeman-Oreilly-spd, Head First Design Patterns.
5. Alan Shalloway,Design Patterns Explained, Pearson Education.

**Web References:**

1. https://sourcemaking.com/design_patterns
2. https://www.oodesign.com/

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## PRESTRESSING SYSTEMS (PS)

| VII Semester :B. Tech | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | Total |
| OEC 423 | OEC-IV | 3 | - | - | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the principles and systems of pre-stressing.

**CO2:** Understand the various methods of pretensioning

**CO3:** Understand the various methods of post tensioning

**CO4:** Determine the losses in pre-tensioned and post-tensioned members.

**CO5:** Analyse the prestressed members with straight, concentric and eccentric tendons.

### UNIT – I

***Introduction:*** Historical development – General principles of prestressing – Pretensioning and post tensioning – Advantages and limitations of prestressing – Need for high strength steel and high grade concrete for prestressed elements – Prestressing types.

### UNIT - II

***Methods and Systems of Pretensioning:*** Pre tensioning methods – Tensioning devices -Long line system (Hoyer system) -Individual Mould System - Strut system (ShorerChalos System) – Comparison of the various systems - Precast elements – Poles, Masts, Pylons and railway sleepers their advantages and disadvantages, applications and manufacturing techniques

### UNIT – III

***Methods and Systems of Posttensioning:*** Tensioning device for post tensioning –Methods of post tensioning - MagnelBlatonsystem, Freyssinet system, Gifford Udall system, Lee McCall System, Prescon System, Baur – Leonhardt System – Comparison of Pretensioning and Posttensioning systems

### UNIT – IV

***Losses of Prestress:*** Losses of prestress in pre tensioned and post tensioned members due to instantaneous losses – elastic deformation, friction and anchorage slip; time-dependent losses – shrinkage, creep and relaxation of stress.

### UNIT - V

***Analysis of Sections for Flexure:*** Elastic analysis of concrete beams prestressed with straight,concentric, eccentric, bent and parabolic tendons – Kern lines – Cable profile.

**Text Books:**


1. N. Krishna Raju, *Prestressed Concrete,* Sixth Edition, Tata McGraw–Hill publishing Company Limited.
2. Praveen Nagarajan, *Prestressed Concrete,* Pearson Education Inc., New Delhi.
3. G.S. Pandit, S.P. Gupta, Prestressed Concrete, CBS Publishers and Distributors Pvt. Ltd., Vijayawada.


**Reference Books:**


1. E. G. Nawy, *Prestressed Concrete: A fundamental approach*, Prentice Hall.


**Reference Codes:**


1. IS 1343-2012, *Code of Practice for Prestressed Concrete*, BIS, New Delhi.
2. IS 456-2000, *Code of Practice for plain and reinforced concrete*, BIS, New Delhi.


**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

## ADDITIVE MANUFACTURING TECHNOLOGY (ADMT)

**VII Semester: B. Tech** | **Scheme : 2020**

| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| OEC 424 | OEC – IV | 3 | - | - | 3 | 40 | 60 | 100 |

**Sessional Exam Duration : 1 ½ Hrs** | **End Exam Duration : 3 Hrs**

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand prototyping, and the phases of Rapid prototyping.

**CO2:** Understand the rapid prototyping process chain.

**CO3:** Understand the functioning of Liquid based rapid prototyping systems.

**CO4:** Understand the functioning of Powder based rapid prototyping systems.

**CO5:** Understand the Direct methods of Tooling and Indirect methods of Tooling.

### UNIT – I

**Introduction:** Historical Development, Definition of prototype, types of prototypes, Role of prototypes, Three phases of development leading to Rapid prototyping, Fundamentals of rapid prototyping, Applications and advantages of rapid prototyping.

### UNIT – II

**Rapid prototyping process chain:** 3D modelling, data conversion and transmission, checking and preparing, Building and post processing. Liquid based rapid prototyping systems- Stereo Lithography Apparatus (SLA), applications, advantages and disadvantages of Stereo lithography. STL file format, Types of Errors.

**Fusion Deposition Modelling:** Principle, process, applications, advantages and disadvantages of FDM, Multi Jet Modelling Systems.

### UNIT – III

**Solid based rapid prototyping systems:** Laminated Object Manufacturing (LOM), three phases o LOM, Applications of LOM, advantages and disadvantages of LOM.

**Solid Ground Curing(SGC):** Steps in solid ground curing, Applications of solid ground curing, advantages and disadvantages of Solid ground curing, build time calculation.

### UNIT – IV

**Powder-based Rapid prototyping systems:** Selective Laser Sintering (SLS), Materials for SLS, Principle, Process, Applications, advantages and disadvantages of SLS.

**Three Dimensional Printing (3DP):** Principle, Process, Applications, advantages and disadvantages of 3DP

**Laser Engineered Net Shaping (LENS)** : Principle, Process steps, Applications, Advantages and disadvantages of LENS

### UNIT – V

**Direct methods of rapid tooling :** AIM tooling, SLS rapid steel, Direct Laser Metal Sintering (DMLS), Laminate tooling

**Indirect methods of rapid Tooling**: RTV silicon rubber moulds, Vacuum casting, Reaction injection Moulding(RIM),Wax Injection moulding, Spray metal tooling, 3D kelt tool

### Text Books

1. Chua C.K., Leong.K.F, and Lim C, C.S., Rapid Prototyping Principles and Applications, World Scientific Publishing Co. Pte. Ltd

2. D.T.Pham and S.S.Dimov, Rapid manufacturing The technologies and applications of rapid Prototyping and rapid tooling. Springer Publications

**Reference Books**

1. Terry Wholers, Wholers report, Wholers Associates
2. I. Gibson D. W. Rosen and B. Stucker., Additive manufacturing technologies, Springer Publication

**Question Paper Pattern:**

**Sessional Exam :**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

**End Exam:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

| DRONE TECHNOLOGY (DT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VII Semester: B. Tech** | | | | | | **Scheme: 2020** | | |
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **TOTAL** |
| **OEC 425** | **OEC - IV** | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration: 1½ Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes:** At the end of the course students will be able to

| | |
|---|---|
| **CO1:** | Understand the historical development of unmanned aerial vehicles |
| **CO2:** | Understand different drone parts and their contribution for successful flight operation |
| **CO3:** | Identify the battery to be used for UAV application. |
| **CO4:** | Understand working of motor that can be used in UAV. |
| **CO5:** | Classify different microcontrollers and flight controllers |

## UNIT – I

**Introduction to drones and their applications**: - Definition of drones, history of drones, Structural classification of drones: - fixed wing structure, lighter than air systems, rotary wings aircraft and applications of drones.

## UNIT – II

**Components of drones**:-classifications of drone structures and their suitability, applications and uses of drone frame materials, classifications and applicability of propeller motors, drone materials, design parameters for propellers, composition and structuring of Electronic speed controller, flight control board, characteristics of FCB and their structure.

## UNIT – III

**Battery and its management**: Introduction of Battery, Description of Li-Po Battery, Charging / Discharging of Battery. Back up, Ratings, Shelf Life, Maintenance and safety of Battery. Selection criteria of Battery for Drone application.

## UNIT – IV

**Sensors :** Wi fi devices, RADAR and range finder, GPS receiver, Gyro sensor, Speed and Distance sensor, Image sensor, TOF sensor, Chemical sensor. Cameras in drones and selection criteria of camera for different range. Barometers, Accelerometer, Magnetometer, remote control for drone.

**Motors :** Difference between AC and DC motors and stepper motor, Brushed and Brushless motors, brief idea of motor capabilities for a drone build. Selection criterion of motor for drone application. Working and application of BLDC motor.

## UNIT – V

**Connections and Interfaces of Devices in Drone**:Brief introduction of RS232, RS422, RS485, UART ports. Different types of connectors and their specifications. Microcontroller interfacing techniques.

**Introduction to Drone Programming** Introduction to programming language used in drone : C and Python. Installation of cards.Auto Pilot software i.e. Ardupilot, Openpilot

**Text Books:**

**1.** Terry Kilby and Belinda Kilby, "Make:Getting Started with Drones ",Maker Media, Inc, 2016

**2.** VasilisTzivaras, "Building a Quadcopter with Arduino", Packt Publishing, 2016

**3.** Donald Norris, "Build Your Own Quadcopter -Power Up Your Designs with the Parallax Elev-8" , McGraw-Hill Education, 2014

**Reference Books:**

**1.** Baichtal, "Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs", Que Publishing,2016.

**2.** Austin, Unmanned Aircraft Systems: UAVS Design, Development and Deployment. Wiley, 2010.

**3.** Sebbane, Smart Autonomous Aircraft: Flight Control and Planning for UAV. CRC Press, 2015

**4.** Zavrsnik, Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance. Springer, 2015.

**Web References :**

1. https://www.dronezon.com/learn-about-drones-quadcopters/

2.http://ardupilot.org/copter/docs/advanced-multicopter-design.html

**Question Paper Pattern:**

**Sessional Exam :**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

**End Exam:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

| INFRASTRUCTURE FOR SMART CITY DEVELOPMENT (ISCD) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **VII Semester :B. Tech** | | | | | | **Scheme : 2020** | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
| | | **L** | **T** | **P** | **C** | **Continuous Internal Assessment** | **End Exam** | **Total** |
| **OEC 426** | **OEC-IV** | **3** | **-** | **-** | **3** | **40** | **60** | **100** |
| **Sessional Exam Duration:1.5Hrs** | | | | | | **End Exam Duration: 3 Hrs** | | |

**Course Outcomes :**At the end of the course the student will be able to

**CO1:** Understand the fundamental concepts of smart and sustainable cities.

**CO2:** Understand the GIS applications in Smart City Planning.

**CO3:** Understand the component of smart cities and dwell into their technological advancement.

**CO4:** Understand the involvement of stake holders in the design and implementation of responsive smart cities.

**CO5:** Explain the importance of different linkages and their defined roles including government, urban planners, universities, city developers and communities.

## UNIT – I

***Smart City Planning – An Overview*:** Understanding – Dimensions – Global experience, Global standards and performance bench marks, Practice codes. India 100 smart cities policy and mission, Smart city planning and development, Financing smart cities development, Governance of smart cities.

## UNIT - II

***Green Building Concepts & Sustainable Development:*** Green projects in smart cities, sustainability – Green building – Rating system – Energy efficient building – Energy saving systems.

***GIS Applications in Smart City Planning:*** Coordinate system and geo-coding, vector data structure and algorithms, raster data structure and algorithms, data bases for GIS – Concepts, error modeling and data uncertainty, decision making through GIS, constructing spatial data infrastructure and spatial information system. National Urban Information system. Why remote sensing, aerial & satellite remote sensing – Principles of aerial remote sensing – Aerial photo-interpretation – Photogrammetry – Stereovision – Measurement of heights/depths by relief displacement and parallax displacement. Principles of satellite remote sensing, spatial, spectral and temporal resolutions.

## UNIT – III

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

## UNIT – IV

***Water Supply and Drainage:***Water – sources of water, treatment and storage, transportation and distribution, quality, networks, distribution losses, water harvesting, recycling and reuse, norms and standards of provision, institutional arrangements, planning provisions and management issues. Sanitation – points of generation, collection, treatment, disposal, norms and standards, grey water disposal, DEWATS, institutional arrangements, planning provisions and management issues. Municipal and other wastes –generation, typology, quantity, collection, storage, transportation, treatment, disposal, recycling and reuse, wealth from waste, norms and standards, institutional arrangements, planning provisions and management issues. Power – Sources of power procurement, distribution networks, demand assessment, norms and standards, planning provisions and management issues.

## UNIT - V

***Project Management for Smart Cities:***Philosophy and concepts of Project management phases – Stages of project & their approval status – Planning – Scheduling – PERT model - Project cost analysis – Resource allocation & Levelling – Project monitoring and control – Risk management – Case studies.

***E–Governance and IOT:*** The concept of management – Concept of e-management &e-business - e-Government Principles – Form e-Government to e-governance - e-governance and developing countries – Designing and Implementing e-Government Strategy; E-governance: Issues in implementation. IOT- fundamentals, protocols, design and development, data analytics and supporting services, case studies.

**Text Books:**

1. Gupta Tripati, *Smart cities transforming India*, Pentagon Press.
2. Marta Peris-Ortize, Dag r Bennett, Diana Perez, Bustamante Yabav, *Sustainable Smart Cities*, Springer
3. Mani. N, *Smart Cities and Urban Development in India*, New Century Publications.

**Web References:**

1. https://smartnet.niua.org
2. https://smartcitiescouncil.com
3. https:// mygov.in/group/smart- cities.

**Question Paper Pattern:**

**Sessional Exam:** The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

**End Exam:** The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

| CSE (DS) | Professional Elective Course (PE-I) |
|---|---|
| S.No | Course Title |
| 1. | Computing for Data Science |
| 2. | Applied Linear Algebra |
| 3. | Advanced Database Management System |

| CSE (DS) | Professional Elective Course (PE-II) |
|---|---|
| S.No | Course Title |
| 1. | Machine Learning for Image Processing |
| 2. | Pattern Recognition |
| 3. | Data Science using Open Source Tools |

| CSE (DS) | Professional Elective Course (PE-III) |
|---|---|
| S.No | Course Title |
| 1. | Video Analytics |
| 2. | Artificial Intelligence & Humanity |
| 3. | Computer Vision |

| CSE (DS) | Professional Elective Course (PE-IV) |
|---|---|
| S.No | Course Title |
| 1. | Artificial Intelligence for Cyber Security |
| 2. | Quantum Computing |
| 3. | Neural Networks |
| 4. | Deep Learning |

| CSE (DS) | Professional Elective Course (PE-V) |
|---|---|
| S.No | Course Title |
| 1. | Cloud Computing |
| 2. | Cyber Threat Intelligence |
| 3. | Intelligent Security Systems |
| 4. | Digital Forensics |
| 5. | Cryptography & Network Security |

# COMPUTING FOR DATA SCIENCE (CDS)

| V Semester : CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CD305 | PEC-I | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

CO1: Demonstrate Data Processing And Analysis

CO2: Understand Statistics And Probability

CO3: Illustrate The Statistical Models And Methods, Machine Learning.

CO4: Demonstrate The Bayesian Statistics

CO5: Understand The Signal Processing, Data Input And Output

## UNIT – I

***Introduction to Python, Data processing and Analysis:***
Importing modules, Introduction to pandas: series data frames ,time series, The seaborn graphics library

## UNIT – II

***Statistics:***
Importing Modules, Review of statistics and probability, random numbers, Random variables and solutions, Hypothesis testing, Nonparametric methods

## UNIT – III

***Statistical Modeling:***
Importing modules, Introduction to statistical modeling, defining statistical methods with Patsy, Linear regression, Discrete Regression

***Machine Learning:***
Importing modules, Regression, Classification, Clustering

## UNIT – IV

***Bayesian Statistics:***
Importing modules, Introduction to Bayesian statistics, Model definition: sampling posterior distribution, Linear regression

## UNIT – V

***Signal Processing:***
Importing Modules, Spectral Analysis, Signal Filters
***Data Input and Output*:**
Importing modules, separated values, JSON, Serialization

**Text Books:**

1. "Numerical Python Scientific Computing and Data Science Applications with Numpy, Scipy and Matplotlib", Robert Johansson, second edition,Apress,2019

**Reference Books:**

2. "Statistics For Data Science Leverage The Power Of Statistics For Data Analysis, Classification, Regression, Machine Learning And Neural Networks", James D.Miller,Packt,2017.
3. "Data Science From Scratch", Joel Grus, O'reilly,2015

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## APPLIED LINEAR ALGEBRA (ALA)

| V Semester : CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CD306 | PEC-I | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration : 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the abstract concepts of matrices and system of linear equations using decomposition methods.

**CO2:** Understand the basic notion of vector spaces and subspaces.

**CO3:** Apply the concept of vector spaces.

**CO4:** Understand the concepts of linear transformations.

**CO5:** Understand the concepts of inner product spaces.

### UNIT – I

**Gaussian elimination and Gauss Jordan methods:** Elementary matrices- permutation matrix - inverse matrices - System of linear equations - LU factorizations.

### UNIT – II

**Vector Spaces:** The Euclidean space and vector space subspace –linear combination-span-linearly dependent-independent- bases - dimensions-finite dimensional vector space.

### UNIT – III

**Subspace Properties:** Row and column spaces -Rank and nullity – Bases for subspace – invertibility- Application in interpolation.

### UNIT – IV

**Linear Transformations and applications:** Linear transformations – Basic properties-invertible linear transformation - matrices of linear transformations - vector space of linear transformations – change of bases – similarity.

### UNIT – V

**Inner Product Spaces:** Dot products and inner products – the lengths and angles of vectors – matrix representations of inner products- Gram-Schmidt orthogonalization.

**Text Books:**


1. Linear Algebra, Jin Ho Kwak and Sungpyo Hong, Second edition Springer(2004).
2. Introductory Linear Algebra- An applied first course, Bernard Kolman and David, R. Hill, 9th Edition Pearson Education, 2011


**Reference Books:**


1. Elementary Linear Algebra, Stephen Andrilli and David Hecker, 5th Edition, Academic Press(2016)
2. Applied Abstract Algebra, Rudolf Lidl, GuterPilz, 2nd Edition, Springer 2004
3. Contemporary linear algebra, Howard Anton, Robert C Busby, Wiley 2003
4. Introduction to Linear Algebra, Gilbert Strang, 5th Edition, Cengage Learning (2015).

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# ADVANCED DATABASEMANAGEMENT SYSTEMS (ADBMS)

| V Semester: CSE (DS) | | | | | | Scheme: 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CD307 | PEC-I | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | End Exam Duration:3 Hrs | | |

**Course Outcomes:** At the end of the course students will be able to

**CO1:** Summarize the basic concepts of object-based databases.

**CO2:** Explain different database system architectures and concepts of parallelism in databases.

**CO3:** Illustrate the concepts of distributed databases.

**CO4:** Explain the automated information retrieval systems.

**CO5:** Outline the concepts of transactions in databases.

## UNIT– I

***Object Based Databases***

Complex data types, Structured types and Inheritance in SQL, Table inheritance, Array and Multiset types in SQL, Object identity and reference types in SQL, Implementing O-R features. Persistent programming languages, Object-Oriented v/s Object relational.

## UNIT– II

***Database System Architecture***

Centralized and Client–server architectures, Server system architectures, Parallel systems.

***Parallel Databases***

Introduction, I/O parallelism, Interquery parallelism, Intraquery parallelism, Intraoperation parallelism, Interoperation parallelism, Design of parallel systems.

## UNIT– III

***Distributed Databases***

Homogeneous and Heterogeneous databases, Distributed data storage, Distributed Transactions, Commit protocols, Concurrency control in distributed databases, Availability, Distributed query processing, Heterogeneous distributed database.

## UNIT– IV

***Information–retrieval systems***

Overview, Relevance ranking using terms and Hyperlinks, Synonyms, Homonyms and Ontologies, Indexing of documents, Measuring retrieval, effectiveness Web search engines, Information retrieval and Structured data.

## UNIT– V

***Advanced Transaction processing***

Transaction processing, Monitors, Transactional workflows, Main memory databases, Real time transaction systems, Long duration transactions, Transaction management in Multi databases.

**TextBooks :**

1.HenryF.Korth&AbrahamSilberschatz,6th edition[2017],*DatabaseSystemConcepts*

**Reference Books :**

1. Ramez Elmasri, Navathe[2009],*Fundamentals of Database systems.*
2. R.Ramakrishnan,J.Gehrke,DatabaseManagementSystems,McGrawHill,2009

**WebReferences:**

1. http://www.exploredatabase.com/2014/03/advanced-dbms-topics.html
2. https://www.tutorialspoint.com/distributed_dbms/
3. https://dsinghpune.wordpress.com/advanced-database-management-system/

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# MACHINE LEARNING FOR IMAGE PROCESSING (MLIP)

| VI Semester : Common for CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CM309 | PEC-II | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the fundamental concepts of a digital image processing system.

**CO2:** Describe image segmentation and representation techniques

**CO3:** recognize the objects in an image Based on Decision-Theortic Methods and Structural Methods

**CO4:** estimate probability density functions to the patterns of the training set.

**CO5:** Design an optimal linear classifier by adopting an appropriate optimality criterion.

## UNIT – I

**Image Processing Basics:** Image Sampling and Quantization, Image Acquisition, Some Basic Relationship between Pixels. An Introduction to the mathematical tools used in Digital image Processing.
Intensity Transformations: Pixel based intensity Transformations, Histogram Processing methods.

## UNIT – II

**Morphology**: Dilation, erosion, opening, closing, hit and miss transform, thinning, Boundary Extraction, Hole Filing, Convex Hull, Thickening, Skeleton, Pruning extension to grayscale morphology, Euler technique .

**Image Segmentation**: Point, Line and Edge Detection, Thresholding, Region Based Segmentation, Segmentation using Morphological .

## UNIT – III

**Representation and Description**: Representation, Boundary Descriptors, Regional Descriptors

**Object Recognition**: Pattern and Pattern Classes, Recognition Based on Decision-Theortic Methods, Structural Methods

## UNIT – IV

**Classifiers Based on Bayes decision Theory**: Bayes decision theory, Discriminant functions and Decision Surfaces, Estimation of Unkown Probability Density Functions.

## UNIT – V

**Linear Classifiers: Linear:** Discriminant Functions and Decision Hyperplanes, The Perceptron algorithm, Least Square Methods, Mean Square Estimation Revisited, Logistic Discrimination, Support Vector Machines

**Text Books:**


1. Rafael Gonzalez & Richard Woods, Digital Image Processing, 3rd Edition. Pearson publications, 2012
2. Sergios Theodoridis, K. Koutroumbas, Pattern Recognition, Academic Press,4th edition,2018

**Reference Books:**

1.Kevin P. Murphy, Machine Learning A Probabilistic Perspective, The MIT Press,2022

2.Richard O. Duda, Peter E. Hart, David G. Stork, Pattern Classification, John Wiley & Son,2001

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# PATTERN RECOGNITION (PR)

<table>
<tr><td colspan="5">VI Semester : Common for CSE, CST, CSE(DS) & CSBS</td><td colspan="4">Scheme : 2020</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">CS318</td><td rowspan="2">PEC-II</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>TOTAL</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 1½ Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Summarize on supervised and unsupervised classification methods for various pattern recognition problems.</td></tr>
<tr><td colspan="9">CO2: Compare various clustering techniques of unsupervised learning.</td></tr>
<tr><td colspan="9">CO3: Understand various structural pattern recognition models.</td></tr>
<tr><td colspan="9">CO4: Outline feature extraction and subset selection methods for various applications</td></tr>
<tr><td colspan="9">CO5: Analyze the neural networks for pattern recognition problems and Fuzzy Pattern Classifiers.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Pattern Classifier<br>Overview of pattern recognition – Discriminant functions – Supervised and Unsupervised learning – Parametric estimation – Maximum likelihood estimation – Bayesian parameter estimation – Perceptron algorithm – LMSE algorithm – Problems with Bayes approach – Pattern classification by distance functions – Minimum distance pattern classifier.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Unsupervised Classification<br>Clustering for unsupervised learning and classification – Clustering concept – C-means algorithm – Hierarchical clustering procedures – Graph theoretic approach to pattern clustering – Validity of clustering solutions.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Structural Pattern Recognition<br>Elements of formal grammars – String generation as pattern description – Recognition of syntactic description – Parsing – Stochastic grammars and applications – Graph based structural representation</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Feature Extraction and Selection<br>Entropy minimization – Karhunen – Loeve transformation – Feature selection through functional approximation – Binary feature selection.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Recent Advances<br>Neural network structures for Pattern Recognition – Neural network based Pattern associators – Unsupervised learning in neural Pattern Recognition – Self-organizing networks – Fuzzy logic – Fuzzy pattern classifiers – Pattern classification using Genetic Algorithms.</td></tr>
</table>

**Text Books:**

1. Robert J.Schalkoff, “Pattern Recognition Statistical, Structural and Neural Approaches”, Wiley, India, 2009.
2. M. Narasimha Murthy and V. Susheela Devi, “Pattern Recognition”, Springer 2011
3. Sergios Theodoridis, Konstantinos Koutroumbas, “Pattern Recognition & Matlab Introduction”, Fourth edition, Acadamic press, 2010

**Reference Books:**

1. Andrew R. Webb, Keith D. Copsey, “Statistical Pattern Recognition”, Third Edition, Wiley, 2011.
2. Duda R.O., Har P.E.,and David G Stork, “Pattern Classification”, Second edition, John Wiley & Sons, NewYork, 2012.
3. S.N. Deepa , S.N. Sivanandam, “Principles of Soft Computing”, Second Edition, Wiley, 2012.
4. Tou and Gonzales, “Pattern Recognition Principles”, Wesley Publication Company, London, 1974.

**Web References:**

1. https://www.mathworks.com/discovery/pattern-recognition.html
2. https://www.igi-global.com/book/pattern-recognition-classification-time-series/147125
3. https://www.mathworks.com/discovery/pattern-recognition.html

**Question Paper Pattern:**

**Sessional Exam:**

The Question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The Question paper shall consists of 3 sections with Two Questions (EITHER/OR type) in each section. The student shall answer one question from each section.

**End Exam:**

The Question paper for end examination is for 60 marks. The Question paper shall consists of 5 units with Two Questions (EITHER/OR type) in each unit. Each of these questions may contain sub questions and the student shall answer one question from each unit. Each question carries 12 marks.

# DATA SCIENCE USING OPEN SOURCE TOOLS (DSOST)

| V1 Semester : CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CD308 | PEC-II | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

CO1:Understand the basics of Data science, Toolboxes used for Data Scientist

CO2:Understand Descriptive Statistics, Statistical Inference

CO3: Understand the basics of Machine Learning ,Supervise Learning, Regression Analysis

CO4: Understand the basics of Unsupervised Learning, Network Analysis

CO5: Understand the Recommender System, Statistical Natural Language Processing for sentiment

## UNIT – I

***Introduction to Data Science:*** What is Data Science?
***Toolboxes for Data Scientist :***Introduction, Fundamentals of python libraries for Data Scientist, Installation, IDE, Get started with python for Data scientists

## UNIT – II

***Descriptive Statistics :***Introduction ,Data Preparation ,Exploratory Data Analysis, Estimation, Conclusion
***Statistical Interference:*** Frequentist Approach, Measuring variability in Estimates.

## UNIT – III

***Machine Learning:*** Introduction, Supervised Learning, Learning Curves, Training, Validation and Testing, Learning Models, ***Case Study:*** Toy business case
***Regression Analysis:*** Linear Regression, Logistic regression

## UNIT – IV

***Unsupervised Learning:*** Clustering: similarities and distances, what constitutes a good clustering, Defining metrics to measure clustering quality, Taxonomies of clustering techniques
***Network Analysis:*** Basic Definition of Graphs, Social Network Analysis, centrality, Ego-Networks, Community Detection

## UNIT – V

***Recommender System:*** How do recommender systems work: Content-based filtering, Collaborative Filtering, Hybrid recommenders, Modelling User preferences, Evaluating Recommenders,
***Case study:*** Movie Lens dataset, User Based Collaborative Filtering.
***Statistical Natural Language Processing for sentiment:*** Data cleaning, Text Representation

**Text Books:**

1.“Introduction to Data Science, A python Approach to concepts, Techniques and Applications” Laura Igual & Santi Segui,2016

2.“Data Science from Scratch” Joel Grus

**Reference Books:**

1. “Mastering python for data science” Samir Madhavan, Packt publishing,2015
2. “Data Science with python” Rohan Chopra, Aaron England and Mohamed Noordeen Alaudeen Packt publishing, 2019
3. “Data Science Project with Python”Stephen Klosterman,Packt publishing 2019
4. “Data Science using Python and R” Wiley,this edition first published 2019

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# VIDEO ANALYTICS (VA)

| VII Semester : Common for CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CM401 | PEC-III | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Identify and analyze suitable methods of Image low level and high level processing.

**CO2:** Model and apply various camera models to obtain 3D vision.

**CO3:** Apply various object recognition methods for computer vision real time applications.

**CO4:** Understand Object and texture recognition methods.

**CO5:** Identify and analyze various intelligent video analytics use cases.

## UNIT – I

**Introduction to Computer Vision:** Motivation, Relationships to other fields, Image preprocessing, Image Enhancement, Image segmentation, Feature Extraction- Shape representation and description- Contour-based shape representation and description, region based shape representation and description, statistical and syntactic texture description methods.

## UNIT – II

**Motion Analysis:** Differential Motion Analysis methods, Change detection, Segmentation using motion, Image flow, segmentation using moving camera, Optical flow, Analysis based on correspondence of interest points, detection of specific motion patterns, video tracking, motion models to aid tracking.

## UNIT – III

**Object Recognition:** Knowledge representation, Statistical Pattern Recognition, Neural Nets, Syntactic pattern recognition, Recognition as graph matching, Optimization techniques in recognition, fuzzy systems, texture recognition methods.

## UNIT – IV

**Intelligent Video Analytics:** Real-time video analytics and video mining, temporal and spatial event recognition, Vision-based activity recognition, Behavior Analysis, Content-Based Analysis of Digital Video.

## UNIT – V

**Video Analytics:** State of the art applications with reference to computer vision applications, Deep learning in video analytics, Human motion recognition and its applications, Video Analytics for Business Intelligence, Virtual reality/Augmented reality applications, and Healthcare applications.

**Text Books:**

1.Sonka, Hlavac, Boyle, Digital Image Processing and Computer Vision, CENGAGE Learning, Indian Edition.

2.Ramesh Jain, Kasturi, Schunck, Machine Vision, McGraw-Hill.

**Reference Books:**

1.Milan Sonka, Vaclav Hlavac, Roger Boyle, Image Processing, Analysis, and Machine Vision, 2nd Edition, Thomson Learning.

2.David Forsyth, Jean Ponce, Computer Vision, Pearson Education.

3.Jan ErilSolem, Programming Computer Vision with python, O'REILLY.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# ARIFICIAL INTELLIGENCE AND HUMANITY (AIH)

| VII Semester: Common for CSE(AIML) & CSE(DS) | | | | | | Scheme:2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CM404 | PEC-III | L | T | P | C | Continuous Internal Assessment | EndExam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | | EndExamDuration:3 Hrs | | |

**Course Outcomes:** At the end of the course students will be able to

**CO1:** Understand the International laws in Artificial Intelligence.

**CO2:** Understand the relationship of Artificial Intelligence with the mankind.

**CO3:** Understand the Doctrine and concept for Artificial Intelligence.

**CO4:** Understand the Privacy of Humans and limitations of Artificial Intelligence.

**CO5:** Understand the Cosmopolitanism and Artificial Intelligence.

## UNIT– I

**Introduction to Artificial Intelligence and International Law:** Artificial intelligence, A Dilemma for Law Legal Linguistics: A Pathway to Modern Legal Conceptualization of AI Beyond Legal principles: the Philosophical approach

## UNIT– II

**The Basic Relationship**: The Pragmatism Philosophy of Contemporary International Law, The Bright and Dark Sides in A Spectrum, The Pragmatic Relativity for Mankind

## UNIT–III

**Legal Visibility:** Doctrine and Concept For AI, Introduction to the Philosophy and Concept AI-Utility Structures, Conclusive Dynamism

## UNIT– IV

**Beyond the Human Rights Discourse:** A New Vision Revisiting the idea of privacy of humans. Human Rights:A 2-Dimensional Limitation: The Privacy Doctrine Innovation and its Discourse

## UNIT– V

**Student Devices Cosmopolitanism and AI:** A Transnational Development Fear/Myth of AGI and Limitedness of ML Vis-à-vis Digital Colonialism Algorithms Legalized and Cultivated

**TextBooks :**

1.“Artificial Intelligence-Ethics and International Law: An Introduction”, Abhivardhan, BPB Publications, First Edition 2019.

**Reference Books :**

1. Artificial Intelligence and Legal analytics: New Tools for Law Practice in the Digital Age, Ashley K, Cambridge University Press 2017.

## Question Paper Pattern:

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# COMPUTER VISION (CV)

| VII Semester : Common for CSE(AIML) , CSE(DS) & CSBS | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CM403 | PEC-III | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration:1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Present the image formation process.

**CO2:** Use the image processing operators for image preprocessing and conversion.

**CO3:** Apply the data interpolation techniques for model fitting and optimization.

**CO4:** Understand the Deep Neural Networks and CNNs for computer vision recognition and lower level vision tasks.

**CO5:** Understand object detection and semantic segmentation methods.

## UNIT – I

**Image formation**

Introduction to computer vision, Geometric primitives and transformations: 2D transformations, 3D transformations, 3D rotations, 3D to 2D projections, Lens distortions, Photometric image formation: Lighting, Reflectance and shading, Optics, The digital camera: Sampling and aliasing, Color, Compression.

## UNIT – II

**Image processing**

Point operators: Pixel transforms, Color transforms, Compositing and matting, Histogram equalization, Linear filtering: Separable filtering, Band-pass and steerable filters, More neighborhood operators: Non-linear filtering, Bilateral filtering, Binary image processing.

## UNIT – III

**Model fitting and optimization**

Scattered data interpolation: Radial basis functions, Overfitting and underfitting, Robust data fitting, Variational methods and regularization: Discrete energy minimization, Total variation, Bilateral solver, Application: Interactive colorization, Markov random fields: Conditional random fields.

## UNIT – IV

**Deep Learning**

Deep neural networks: Weights and layers, Activation functions, Regularization and normalization, Loss functions, Backpropagation, Training and optimization.

Convolutional neural networks: Pooling and unspooling, Network architectures, Model zoos, Visualizing weights and activations.

## UNIT – V

**Recognition**

Instance recognition, Image classification: Feature-based methods Deep networks, Face recognition. Object detection: Face detection, Pedestrian detection, General object detection.

Semantic segmentation: Instance segmentation, Panoptic segmentation, Pose estimation.

Video understanding, Vision and language.

**Text Books:**

1.Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2nd Edition, 2022.

**Reference Books:**

1. WESLEY E. SNYDER, HAIRONG QI, Fundamentals of Computer Vision, Cambridge University Press, 2017.

2. Aditi Majumder, M. Gopi, Introduction to VISUAL COMPUTING Core Concepts in Computer Vision, Graphics, and Image Processing, CRC Press, Taylor & Francis Group, 2018.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# ARTIFICIAL INTELLIGENCE FOR CYBER SECURITY (AICS)

| VII Semester : Common for CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CM405 | PEC-IV | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the concepts of AI, ML & Cybersecurity

**CO2:** Identify various privacy risks on AI systems and vulnerabilities in the AI algorithms

**CO3:** Develop a framework to manage the risks

**CO4:** Identify various cyber attacks on AI systems and create a secured AI framework

**CO5:** Identify the threats and test the security on AI systems

## UNIT – I

Introduction: What is AI? Understand the Impact of AI, Machine Learning-The engine that drives AI: What is Machine learning? Different types of Machine learning, Basic introduction about Cyber security

## UNIT – II

AI Governance and Risk management: Privacy risks, Job disruptions, AI assisted cybercrime, Cyber attacks on AI systems, Bias and Prejudice in AI algorithms

AI laws and regulations: The global AI regulatory landscape, The EU -AI act

## UNIT – III

Creating AI governance framework: AI governance framework, key components of AI governance framework, AI and machine learning policy, AI governance committee, AI risk management framework, AI trust policies

## UNIT – IV

Cyber security risks of AI systems: Cyber attacks on AI systems, AI cyber security vs Traditional cyber security, Lifecycle of an AI system.

Creating AI security framework: How to create AI security framework, key components of AI security framework

## UNIT – V

Threat modeling AI systems, Security testing of AI systems, Fraud prevention with cloud AI solutions.

**Text Books:**

1. Artificial Intelligence Governance and Cyber security, Taimur Ijial
2. Artificial Intelligence for cybersecurity, Alessandro Parisi

**Reference Books:**

1. AI and Machine learning for cybersecurity management, Mark Osborne
2. AI in Cybersecurity , Leslie F sikos

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# QUANTUM COMPUTING (QC)

| VII Semester : Common for CSE, CST, CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CS406 | PEC-IV | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the Quantum Computation

**CO2:** Understand the Framework of Quantum Mechanics

**CO3:** Understand Deutsch Algorithm

**CO4:** Understand Amplitude Amplification

**CO5:** Implement Error Correction Codes

## UNIT – I

**INTRODUCTION AND BACKGROUND:** Computers and the Strong Church–Turing Thesis, The Circuit Model of Computation, A Linear Algebra Formulation of the Circuit Model Reversible Computation, A Preview of Quantum Physics, Quantum Physics and Computation.

## UNIT – II

**QUBITS AND THE FRAMEWORK OF QUANTUM MECHANICS:** The State of a Quantum System, Time-Evolution of a Closed System, Composite Systems, Measurement.

## UNIT – III

**INTRODUCTORY QUANTUM ALGORITHMS:** Probabilistic Versus Quantum Algorithms, Phase Kick-Back, The Deutsch Algorithm, The Deutsch–Jozsa Algorithm.

## UNIT – IV

**ALGORITHMS BASED ON AMPLITUDE AMPLIFICATION :** Grover's Quantum Search Algorithm, Amplitude Amplification, Quantum Amplitude Estimation and Quantum Counting, Searching Without Knowing the Success Probability.

## UNIT – V

**QUANTUM ERROR CORRECTION:** Classical Error Correction, The Classical Three-Bit Code, Fault Tolerance, Quantum Error Correction, Error Models for Quantum Computing, Encoding.

**Text Books:**

1.An Introduction to Quantum Computing by Phillip Kaye, Raymond Laflamme, Michele Mosca.

**Reference Books:**

1. Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/
2. An Introduction to Quantum Computing. P. Kaye.
3. Quantum Computer Science. N. David Mermin.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# NEURAL NETWORKS (NN)

| VII Semester: Common for CSE(AIML) & CSE(DS) | | | | | Scheme: 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CM406 | PEC-IV | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration: 1½ Hrs | | | | | End Exam Duration:3 Hrs | | | |

**Course Outcomes:** At the end of the course students will be able to

**CO1:** Demonstrate ANN structure and activation Functions. Identify structure and learning of perceptions

**CO2:** Understand Feed forward, multi-layer feed forward networks and Back propagation algorithms.

**CO3:** Summarize the fundamentals of Artificial Neural Networks.

**CO4:** Understand the historical trends in deep learning and use Tensor flow for performing Linear Regression, Gradient Descent, optimizers, graph visualization and training curves.

**CO5:** Understand the training of Deep Neural Nets.

## UNIT– I

***Introduction to Neural Networks***

Introduction and ANN Structure, Biological neurons and artificial neurons. important terminologies, Model of an ANN. Activation functions used in ANNs. Typical classes of network architectures.

## UNIT– II

***Training models:***

Mathematical Foundations and Learning mechanisms. Re-visiting vector and matrix algebra, State-space concepts, Concepts of optimization, Error-correction learning. Memory based learning, Hebbian learning. Competitive learning.

## UNIT– III

***ANN Types:***

Single layer perceptrons, Structure and learning of perceptrons, Pattern classifier, introduction and Bayes' classifiers, Perceptron as a pattern classifier, Perceptron convergence. Limitations of a perceptrons.

Feed forward ANN, Structures of Multi-layer feed forward networks. Back propagation algorithm, Back propagation - training and convergence, Functional approximation with back propagation. Practical and design issues of back propagation learning.

## UNIT– IV

***Introduction to Deep Learning*** : Introduction, Historical trends in Deep Learning

***Up and Running with TensorFlow***

Installation, Creating Your First Graph and Running It in a Session, Managing Graphs, Lifecycle of a Node Value, Linear Regression with TensorFlow. Implementing Gradient Descent, Feeding Data to the Training Algorithm, Saving and Restoring Models, Visualizing the Graph and Training Curves Using TensorBoard, Name Scopes, Modularity, Sharing Variables.

## UNIT– V

***Training Deep Neural Nets***

Vanishing/Exploding Gradients Problems, Reusing Pretrained Layers, Faster Optimizers, Avoiding Overfitting Through Regularization

**Text Books :**

1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004
3. "Hands-On Machine Learning with Scikit-Learn and TensorFlow" March 2017: First Edition

**Reference Books :**

1. Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997
2. "Neural Networks and Deep Learning", Michael Nielsen.
3. "Neural Networks and Deep Learning " Aggarwal, Charu C.Springer International Publishing.

**Web References:**

1. https://www.coursera.org/learn/introduction-tensorflow?

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# DEEP LEARNING (DLE)

| VII Semester : Common for CSE , CST , CSBS, CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CS407 | PEC-IV | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand concept of deep learning and Artificial Neural Network.

**CO2:** Summarize the Deep Neural Nets.

**CO3:** Understand the Convolutional Neural Networks Operations.

**CO4:** Understand the different types of Convolutional Neural Networks Architectures.

**CO5:** Understand the Recurrent Neural Networks and deep RNN training.

## UNIT – I

**Deep Learning:** Introduction, Difference between Machine Learning and Deep Learning, Applications of Deep Learning

**Artificial Neural Network:** Introduction, Artificial Neural Networks from Biological to Artificial Neurons, Difference between ANN and BNN, Single Layer Perceptron, Training Multi-layer perceptron, Fine-Tuning Neural Network Hyper parameters.

**Case Study:** Heart Disease Prediction using ANN

## UNIT – II

**Deep Neural Network:** Training a DNN, Vanishing/Exploding Gradients Problems, Faster Optimizers, Avoiding Overfitting through Regularization

## UNIT – III

**Convolutional Neural Network-1:** The Convolutional operation, Motivation, Pooling, structured Outputs, Applications of CNN

## UNIT – IV

**Convolutional Neural Network-2**: CNN Architectures: LeNet5, AlexNet, GoogLeNet, ResNet, advantages of CNN

**Case Study:** Handwritten Digit Recognition

## UNIT – V

**Recurrent Neural Network**: Recurrent Neurons, Types of Recurrent Neural Network, Basic RNNs in TensorFlow, Training RNNs, Deep RNNs, LSTM,

**Case Study:** Time series prediction with LSTM recurrent neural networks,

**Text Books:**


1. "Hands-On Machine Learning with Scikit-Learn and TensorFlow" March 2017: First Edition
2. "Deep Learning" Ian Good fellow Yoshua Bengio Aaron Courville, MIT Press book

**Reference Books:**


1. "Neural Networks and Deep Learning", Michael Nielsen.
2. "Neural Networks and Deep Learning " Aggarwal, Charu C.Springer International Publishing.


**Web References:**

1. https://www.geeksforgeeks.org
2. https://www.coursera.org/specializations/deep-learning

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# CLOUD COMPUTING (CC)

| VII Semester: Common for CSE ,CST, CSE(AIML) & CSE(DS) | | | | | | Scheme:2020 | | |
|---|---|---|---|---|---|---|---|---|
| CourseCode | Category | Hours/Week | | | Credits | Maximum Marks | | |
| CS410 | PEC-V | L | T | P | C | Continuous Internal Assessment | EndExam | TOTAL |
| | | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional ExamDuration:1½ Hrs | | | | | | EndExamDuration:3 Hrs | | |

**CourseOutcomes:** At the end ofthecoursestudents willbe able to

**CO1:**Understandthe features, layers and types ofclouds.

**CO2:**Understand the Virtual Machine Provisioning and Migration Servicesincloud

**CO3:**Understand the Aneka Cloud Architecture and Hybrid Cloud Architecture.

**CO4:**Understand the cloud features implemented in Google, Microsoft, Amazon andSalesForce.com

**CO5:**Understand the Cloud Applications, Best Practices and Future of Cloud.

## UNIT– I

**Introduction to Cloud Computing:** Roots of Cloud Computing, Layers and Types of Clouds, Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks.

## UNIT– II

**Virtual Machine Provisioning and Migration Services:** Introduction and Inspiration, Virtual Machines (VM), VM Provisioning and Manageability, VM Migration Services, Provisioning in the Cloud Context-Amazon Elastic Compute Cloud, Infrastructure Enabling Technology, Eucalyptus, VM Dynamic Management Using OpenNebula, and Future Research Directions.

## UNIT– III

**Aneka-Integration of Private and Public Clouds:** Introduction, Aneka Cloud Architecture, Aneka Resource Provisioning Service, Hybrid Cloud Implementation-Design and Implementation Guidelines , Aneka Hybrid Cloud Architecture, Use Case—The Amazon EC2 Resource Pool, Implementation Steps for Aneka Resource Provisioning Service

## UNIT– IV

**Cloud computing with Titans:** Google: Google App Engine, Google Web Tool Kit,Microsoft: Azure services platform, windows live, Exchange online, Share Point services, Microsoft Dynamic Customer Relationship Management (CRM),Amazon: Amazon EC2, Amazon Simple DB,Amazon S3, Amazon Cloud Front ,Amazon Simple Queue Service, Salesforce.com: Force.com, Salesforce.com CRM, AppExchange.

## UNIT– V

**Cloud Applications:** Grep The Webon Amazon cloud - Architecture, Workflow, ECG (Electro-CardioGram) analysis in Health Care, Multiplayer online Games**.**

**Best Practices**- Finding the Right Vendor, Phased-in vs. Flash-cut Approaches, Be Creative in Your Approach, How Cloud Computing Might Evolve - Researcher Predictions, Responding to Change.

**TextBooks :**

1. "Cloud Computing: Principles and Paradigms" byRajkumarBuyya, James Broberg, and Andrzej Goscinski, Wiley Press, New York, USA, Edition 2011.
2. "Cloud Computing: A Practical Approach" by Anthony T.Velte, Toby J Velte, , Robert Elsenpeter. McGraw-Hill, Inc. New York, NY, USA, Edition 2010

**Reference Books :**

1. RajkumarBuyya, Chee Shin Yeo, SrikumarVenugopal, James Broberg, and IvonaBrandic, "CloudComputing and Emerging IT Platforms: Vision, Hype, and Reality for Delivering Computing as the5th Utility", Future Generation Computer Systems, Volume 25, Number 6, ISSN: 0167- 739X,Elsevier Science, Amsterdam, The Netherlands, June2009.

2. Suraj Pandey, William Voorsluys, Sheng Niu, Ahsan Khandoker, and RajkumarBuyya, "AnAutonomic Cloud Environment for Hosting ECG Data Analysis Services", Technical Report,CLOUDS-TR-2010-4, Cloud Computing and Distributed Systems Laboratory, The University ofMelbourne, Australia, August 3,2010.

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# CYBER THREAT INTELLIGENCE (CTI)

| VII Semester : Common for CSE(AIML) & CSE(DS) | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CM407 | PEC-V | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the basic concepts to build the core of Cyber Threat Intelligence.

**CO2:** Learn the tools used in Cyber Threat Intelligence.

**CO3:** Explore various applications of Cyber Threat Intelligence.

**CO4:** Analyze a few prominent Threat Intelligence Frameworks.

**CO5:** Understand the processes, people, and technology that make up a dedicated threat intelligence capability.

## UNIT – I

**Introduction to Cyber Threat Intelligence** : What is Threat Intelligence, Importance of Threat Intelligence, Benefits From Threat Intelligence, Data and Information Are Not Intelligence. Types of Cyber Threat Intelligence :Operational Threat Intelligence, Strategic Threat Intelligence, The Role of Threat Data Feeds, The Role of Private Channels and the Dark Web.

## UNIT – II

**Phases of the Cyber Threat Intelligence Lifecycle** : Direction – Collection – Processing – Analysis-Dissemination.
**Tools and People** :Overview of Security Information and Event Management (SIEM) and security analytical tools, Threat Intelligence teams, Responsibilities of Security Operations Center (SOC) team, Improving the "Time to No" using Threat Intelligence.

## UNIT – III

**Threat Intelligence for Incident Response** :Continuing Challenges - A skills gap, Too many alerts, too little time, Time to response is rising .The Reactivity Problem, Minimizing Reactivity in Incident

Response - Identification of probable threats, Prioritization. Strengthening Incident Response With Threat Intelligence, Threat Intelligence in Action - Use case: Prepare processes in advance, Use case: Scope and contain incidents, Use case: Remediate data exposure and stolen assets.

**Threat Intelligence for Digital Risk Protection** : Being Online Is Being at Risk, Types of Digital Risk, Uncovering Evidence of Breaches on the Web, Uncovering Evidence of Brand Impersonation and Abuse, Critical Qualities for Threat Intelligence Solutions.

## UNIT – IV

**Analytical Frameworks for Threat Intelligence** : The Lockheed Martin Cyber Kill Chain - Limitations of the Cyber Kill Chain, The Diamond Model – Flexibility, Challenges with the Diamond Model, The MITRE ATT&CK Framework - Categories of attacker behavior.

## UNIT – V

**Threat Intelligence Journey** : Don't Start With Threat Feeds,Clarify Threat Intelligence Needs and Goals, Automating as much as possible, Integrating threat intelligence with processes and infrastructure.

**Developing the Core Threat Intelligence Team** : Identify teams that can benefit most from threat intelligence, Core Competencies, Collecting and Enriching Threat Data - The human edge, Additional sources, Combining sources, The role of intelligent machines. Engaging With Threat Intelligence Communities.

**Text Books:**

1.Dr. Christopher Ahlberg, " The Threat Intelligence Hand Book", Second Edition, Cyber Edge Press, 2019.

**Reference Books:**

1.Jon Friedman Mark Bouchard, John P. Waters "Definitive Guide to Cyber Threat Intelligence",Cyber Edge Press, 2015.

2.https://www.softwaretestinghelp.com/siem-tools/

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## INTELLIGENT SECURITY SYSTEMS (ISS)

| VII Semester : Common for CSE(AIML) & CSE(DS) | | | | | Scheme : 2020 | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CM408 | PEC-V | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | End Exam Duration: 3 Hrs | | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand Computer Security with Artificial Intelligence, Machine Learning and Data Science

**CO2:** Design concepts of Firewall

**CO3:** DemonstrateIntrusion detection Systems

**CO4:** AnalyzeMalware and Vulnerabilities Detection and Protection

**CO5:** Understand nature of attacks, defense Strategies

### UNIT – I

**Computer Security with Artificial Intelligence, Machine Learning and Data Science:** Computer Security basic concepts, Sources of Security Threats, Attacks against IoT and Wireless Sensor Networks, Introduction to Artificial Intelligence, Machine Learning and Data Science, Fuzzy logic and Systems, Artificial Neural Networks, Genetic Algorithms, Hybrid Intelligent Systems.

### UNIT – II

**Firewall Design and Implementation:** Firewall definition, History and Functions, Firewall operational Models, Basic architecture, Process of design, implementation and maintenance, Firewall policy formalization with rules, Evaluation and Current developments.

### UNIT – III

**Intrusion detection Systems (IDS):** Definition, Goals and primary functions, Historical perspective,

Typical IDS architecture Topologies, Components and Operational Ranges, IDS types: Classification approaches, IDS Performance Evaluation, AI and ML techniques in IDS design, Intrusion detection tools.

## UNIT – IV

**Malware and Vulnerabilities Detection and Protection:** Malware definition, History and trends in development, Classification, Spam, Software vulnerabilities, Principles of Malware Detection and anti-malware protection, Detection algorithms, Anti-malware tools.

## UNIT – V

**Hackers Vs Normal Users:** Hacker's activities and protection against, Data Science investigation of ordinary users practice, User's authentication, Anonymity, Attacks against anonymity and protection.

**Adversarial Machine Learning:** Definition, Adversarial attack taxonomy, Defense Strategies.

**Text Books:**

1.Leon Reznic, *Intelligent Security Systems: How Artificial Intelligence, Machine Learning and Data Science work for and against Computer Security*,Wiley-IEEE Press, 1st Edition, 2021

2.CrinaGrosan, Ajith Abraham, Intelligent Systems: A Modern Approach, Springer, 2011

**Reference Books:**

1.Eric Cole, Dr. Ronald Kurtz and James W. Conley, Network Security Bible, Wiley Publishers,2009

2.William R. Cheswick, Steven M. Bellovin, Aviel D. Rubin, Firewall and Internet Security, Pearson Education, 2nd Edition,2007

3.Rebecca Gurley Bace, Intrusion Detection, Technology Series,2000

4.Zsolt Nagy, Artificial Intelligence and Machine Learning Fundamentals, 2018

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

# DIGITAL FORENSICS (DF)

<table>
<tr><td colspan="5">VII Semester : Common for CSE ,CST , CSE(AIML) & CSE(DS)</td><td colspan="4">Scheme : 2020</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">CS412</td><td rowspan="2">PEC-V</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>TOTAL</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration1½ Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand the fundamental concepts of digital forensic, digital evidence and the incident response process.</td></tr>
<tr><td colspan="9">CO2:Apply various data acquisition techniques and tools on the evidences.</td></tr>
<tr><td colspan="9">CO3:Learn the methods applicable for different forensic investigations.</td></tr>
<tr><td colspan="9">CO4:Usage of various forensic tools to analyse different forensics data.</td></tr>
<tr><td colspan="9">CO5:Gains knowledge on cloud forensic procedures and challenges.</td></tr>
<tr><td colspan="9">CO6: Understand the concept of file system and their use in forensic analysis.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Digital forensics: Introduction, History, Rules of Computer/ Digital forensic, Digital forensic as a discipline, Definition of digital forensic, digital forensic investigations, Goal of digital forensic investigation.<br><br>Digital evidences: Introduction, what is digital evidence, rules of digital evidence, characteristics of digital evidence, types of evidence, challenges in evidence handling, volatile evidence, evidence handling procedures.<br><br>Incidence Response: Introduction, Goals of incident response, people involved in incident response, incident respond Methodology, Activities in initial response, Phases after detection of an incident.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
</table>

**Data Collection:** Introduction, the facts in a criminal case, people involved in data collection techniques, Live data collection, Live data collection examples-Windows, Unix.

**Forensic Duplication:** Introduction, Rules of forensic duplication(Thumb Rule), Necessity of forensic duplication, Forensic duplicates as admissible evidence, Important terms in forensic duplicate, Forensic duplication Tool requirements, Creating a Forensic duplicate of a Hard Drive, Creating a Qualified Forensic duplicate of a hard Drive.

## UNIT – III

**Network Forensics:** Introduction to IDS (Intrusion Detection System), Types of IDS, Advantages and disadvantages, Understanding Network intrusions and Attacks, recognizing pre-intrusion/ Attack activities, Port Scans, Address Spoofing, Attacking with Trojans, Viruses and Worms, Understanding Password cracking, Understanding Technical Exploits, Collecting Network based evidence, Investigating routers, Network Protocols.

**E-Mail Forensics:** Importance of E-Mail as evidence, Working of E-Mail, Steps in E- mail communication, E-mail service protocols, E-Mail forensic analysis steps, E- Mail Forensic Tools.

## UNIT – IV

**Mobile Forensics:** Mobile hacking- SMS and Call Forging, mobile phone forensics, Forensic procedures CIA Traid, Software and hardware mobile phone tricks, Android forensics, Mobile forensic Tools.

**Computer Forensic Tools:** Introduction, evaluating computer forensic tool needs,types of computer forensic tools, tasks performed by computer forensic tools, Tool comparisons, software tools, hardware tools, Various computer/ Digital forensic tools.

## UNIT – V

**Cloud Forensics:** Introduction, Three dimensions of cloud forensics, usage of cloud forensic, challenges to cloud forensic. Impact of cloud computing on digital forensic, Cloud forensic Tools.

**File systems:** Various types of file systems, Introduction to storage layers, Hard disk drive, Forensic Analysis of file systems.

**Text Books:**

1.Dr.Neelakshijain and Dr.Dhanajay R. Kalbande, Digital Forensic: The Fascinating World of Digital Evidences, Wiley Publications, 2017.

**Reference Books:**

1.Kevin Mandia, Chris Prosise, Incident Response and computer forensics, Tata McGraw Hill, 2006.
2.Nelson, Phillips Enfinger, Steuart, Computer Forensics and Investigations, CENGAGE Learning.

3.John R. Vacca, Computer Forensics, Computer Crime Investigation, Firewall Media, New Delhi.
4.https://www.oreilly.com/library/view/digital-forensics-with/9781597495868/

**Question Paper Pattern:**

**Sessional Examination:**

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions ( EITHER/ OR Type ) in each section. The student shall answer one question from each section.

**End Examination:**

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

## CRYPTOGRAPHY & NETWORK SECURITY (CNS)

| VII Semester : Common for CSE(AIML), CSE(DS) & CSBS | | | | | | Scheme : 2020 | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Category | Hours/Week | | | Credits | Maximum Marks | | |
| | | L | T | P | C | Continuous Internal Assessment | End Exam | TOTAL |
| CM409 | PEC-V | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Sessional Exam Duration 1½ Hrs | | | | | | End Exam Duration: 3 Hrs | | |

**Course Outcomes :** At the end of the course the student will be able to

**CO1:** Understand the concepts and principles of Network Security.

**CO2:** Analyze various classical encryption techniques and block cipher structure.

**CO3:** Analyze advanced encryption standard.

**CO4:** Understand block cipher modes of operation.

**CO5:** Explain various asymmetric ciphers

**CO6:** Understand cryptographic hash functions and digital signatures

### UNIT – I

***Introduction to Security concepts:*** Computer Security concepts, OSI Security Architecture, Security attacks, Security services, Security mechanisms, Fundamental security design principles, A model for Network Security.

***Number Theory:*** Euclidean Algorithm, Modular Arithmetic, Fermat's and Euler's Theorem, Testing for primality

### UNIT – II

***Symmetric Ciphers:*** Classical Encryption Techniques: Symmetric Cipher model, Substitution techniques, Transposition techniques, Steganography.

***Block Ciphers and DES:*** Traditional block cipher structure, Data Encryption Standard, DES Example, Strength of DES, Block cipher design principles.

### UNIT – III

***Advanced Encryption Standard:*** AES Structure, AES transformation functions, AES Key Expansion, AES Example, AES Implementation.

***Block Cipher Operation Modes:*** Multiple Encryption and Triple DES, Electronic codebook, Cipher Block Chaining Mode, Cipher feedback mode, output feedback mode.

### UNIT – IV

***Asymmetric Ciphers and Public key cryptosystems:*** Public-Key Cryptography and RSA: Principles of Public-key cryptosystems, RSA Algorithm. Daffier Hellman Key Exchange, Elgamal Cryptographic systems.

### UNIT – V

***Cryptographic Hash Functions:*** Applications of cryptographic hash functions, Hash functions based on cipher block chaining, SHA.

***Message Authentication codes:*** Requirements, Message authentication functions, security of MACs.

***Digital Signatures:*** Digital Signature requirements, Elgamal Digital Signature, Schnorr Digital Signature scheme.

**Text Books:**

| |
|---|
| 1 William Stallings, [7th Edition], Cryptography and Network Security, Pearson, 2017 |
| 2. Behrouz A. Forouzan, D Mukhopadhayay, [2nd Edition], Cryptography and Network Security, MC Graw Hill, 2010 |
| **Reference Books:** |
| 1.Eric Cole, Dr. Ronald Kurtz and James W. Conley, Network Security Bible, Wiley Publishers, 2009 |
| 2.Bruce C. Berndt, Number Theory in the Spirit of Ramanujan, University Press, American Mathematical Society, 2006 |
| 3.V.K. Jain, Cryptography and Network Security, Khanna Publishing House, 2017 |
| 4.Atul Kahate, Cryptography and Network Security, TMH, 4th Edition, 2019 |
| **Question Paper Pattern:** |
| **Sessional Examination:**<br>The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.<br>**End Examination:**<br>The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks. |