# DAV UNIVERSITY JALANDHAR

# Course Scheme & Syllabus

# For

# B.Tech. in Computer Science and Artificial Intelligence

## 1st TO 8thSEMESTER Examinations
## 2022–2023 Session

## Syllabi Applicable For Admissions in 2022

**Mandatory Induction program (Appendix A)**
**[Induction program for students to be offered right at the start of the first year.]**

## 3 Weeks Induction Program (Mandatory)

- **Physical activity**
- **Creative Arts**
- **Universal Human Values**
- **Literary**
- **Proficiency Modules**
- **Lectures by Eminent People**
- **Visits to local Areas**
- **Familiarization to Dept. /Branch & Innovations**

## Scheme of Courses
## B.Tech. in Computer Science and Artificial Intelligence
## Semester-1

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | MTH151A | Engineering Mathematics-I | 4 | 0 | 0 | 4 | Core |
| 2 | CHE151A | Chemistry | 4 | 0 | 0 | 4 | Core |
| 3 | CSE101B | Computer Fundamentals and Programming | 4 | 0 | 0 | 4 | Core |
| 4 | EVS100A | Environmental Studies | 4 | 0 | 0 | 0 | AECC |
| 5 | MEC101A | Engineering Drawing | 2 | 0 | 4 | 4 | Core |
| 6 | ENG151B | Basic Communication Skills | 3 | 1 | 0 | 3 | AECC |
| 7 | CHE152 | Chemistry Lab | 0 | 0 | 2 | 1 | Core |
| 8 | CSE103A | Computer Fundamentals and Programming Lab | 0 | 0 | 2 | 1 | Core |
| 9 | ENG152A | Basic Communication Skills Lab | 0 | 0 | 2 | 1 | AECC |

**L: Lectures T: Tutorial P: Practical Cr: Credits**

## Scheme of Courses
## B. Tech. in Computer Science and Artificial Intelligence
## Semester-2

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | MTH152A | Engineering Mathematics-II | 4 | 0 | 0 | 4 | Core |
| 2 | PHY151B | Engineering Physics | 4 | 0 | 0 | 4 | Core |
| 3 | MEC103 | Mechanical Engineering Fundamentals | 4 | 0 | 0 | 4 | Core |
| 4 | ELE105 | Basic Electrical Engineering | 4 | 0 | 0 | 4 | Core |
| 5 | SGS107B | Human Values and General Studies | 4 | 0 | 0 | 0 | AECC |
| 6 | MEC104 | Manufacturing Practice | 0 | 0 | 4 | 2 | Core |
| 7 | PHY152A | Engineering Physics Laboratory | 0 | 0 | 2 | 1 | Core |
| 8 | ELE106 | Basic Electrical Engineering Laboratory | 0 | 0 | 2 | 1 | Core |

**L: Lectures T: Tutorial P: Practical Cr: Credits**

*Note: At the end of the examination of 2nd Semester the students will undergo compulsory Swachh Bharat Summer Internship for a period of 100Hrs duration. The credits for this will be included in the 3rd semester*

## Scheme of Courses
## B. Tech. in Computer Science and Artificial Intelligence
## Semester-3

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI201 | Object Oriented Programming | 4 | 0 | 0 | 4 | Core |
| 2 | CAI203 | Computer Organization & Architecture | 3 | 0 | 0 | 3 | Core |
| 3 | CAI205 | Data Structures | 3 | 1 | 0 | 3 | Core |
| 4 | CAI207 | Digital Electronics | 4 | 0 | 0 | 4 | Core |
| 5 | CAI209 | Discrete Mathematics | 4 | 0 | 0 | 4 | Core |
| 6 | CAI211 | Object Oriented Programming Laboratory | 0 | 0 | 4 | 2 | Core |
| 7 | CAI213 | Data Structures Laboratory | 0 | 0 | 4 | 2 | Core |
| 8 | CAI215 | Digital Electronics Lab | 0 | 0 | 2 | 1 | Core |
| 9 | CAI217 | Swachh Bharat Summer Internship | 0 | 0 | 0 | 2 | Training |
| 10 | CEC101 | Community Engagement Course | 1 | 0 | 0 | 1 | Core |
| 11 | CEC102 | Community Engagement Field Activities | 0 | 0 | 1 | 1 | Core |

**L: Lectures T: Tutorial P: Practical Cr: Credits**

## Scheme of Courses
## B. Tech. in Computer Science and Artificial Intelligence

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI202 | Introduction to Artificial Intelligence and Data Science | 3 | 1 | 0 | 3 | Core |
| 2 | CAI204 | Data Communication | 3 | 1 | 0 | 3 | Core |
| 3 | CAI206 | Operating System Concepts | 3 | 0 | 0 | 3 | Core |
| 4 | CAI208 | Python Programming | 4 | 0 | 0 | 4 | Core |
| 5 | MTH252A | Engineering Mathematics-III | 4 | 0 | 0 | 4 | Core |
| 6 | CAI210 | Seminar | 0 | 0 | 2 | 1 | Core |
| 7 | CAI212 | Operating System Concepts Laboratory | 0 | 0 | 4 | 2 | Core |
| 8 | CAI214 | Python Programming Lab | 0 | 0 | 2 | 1 | Core |
| 9 | CAI216 | Data Communication Laboratory | 0 | 0 | 2 | 1 | Core |

## Semester-4

**L: Lectures T: Tutorial P: Practical Cr: Credits**

***Note:*** *At the end of the examination of 4$^{th}$ Semester the students will undergo compulsory industrial training for a period of 4 weeks duration in reputed industries. Every student will submit the Training Report within two weeks from the start of teaching for 5$^{th}$Semester. The marks for this will be included in the 5$^{th}$ Semester.*

## Scheme of Courses
## B. Tech. in Computer Science and Artificial Intelligence
## Semester-5

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI301 | Machine Learning | 3 | 0 | 0 | 3 | Core |
| 2 | CAI303 | Database Management System | 3 | 1 | 0 | 3 | Core |
| 3 | CAI305 | Software Engineering | 3 | 0 | 0 | 3 | Core |
| 4 | CAI307 | Algorithm Design & Analysis | 3 | 0 | 0 | 3 | Core |
| 5 | CAI309 | Computer Graphics | 3 | 1 | 0 | 3 | Core |
| 6 | CAI311 | Machine Learning Laboratory | 0 | 0 | 2 | 1 | Core |
| 7 | CAI313 | Database Management System Laboratory | 0 | 0 | 4 | 2 | Core |
| 8 | CAI315 | Algorithm Design & Analysis Laboratory | 0 | 0 | 2 | 1 | Core |
| 9 | CAI317 | Graphics with Python Laboratory | 0 | 0 | 2 | 1 | Core |
| 10 | CAI300 | Industrial Training | 0 | 0 | 0 | 2 | Training, D & P |

**L: Lectures T: Tutorial P: Practical Cr: Credits**

## Scheme of Courses
## B. Tech. in Computer Science and Artificial Intelligence
## Semester-6

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI302 | Theory of Computation | 4 | 0 | 0 | 4 | Core |
| 2 | CAI304 | Data Mining | 3 | 1 | 0 | 3 | Core |
| 3 | CAI306 | Deep Learning | 4 | 0 | 0 | 4 | Core |
| 4 | CAI308 | Principles of Soft Computing | 3 | 0 | 0 | 3 | Core |
| 5 | CAI310 | Relational Database Management System | 3 | 0 | 0 | 3 | Core |
| 6 | CAIXXX | Department Specific Elective-I | 3 | 1 | 0 | 3 | DSE-I |
| 7 | CAI312 | Relational Database Management System Lab | 0 | 0 | 2 | 1 | Core |
| 8 | CAIXXX | Department Specific Elective-I Lab | 0 | 0 | 2 | 1 | DSE-I |
| 9 | CAI314 | Data Mining Lab | 0 | 0 | 4 | 2 | Core |

**L: Lectures T: Tutorial P: Practical Cr: Credits**

***Note:***

- *Department specific elective-I should be from the basket of "Department Specific Elective-I".*
- *At the end of the examination of 6$^{th}$ Semester the students will undergo compulsory industrial training for a period of 6 weeks duration in reputed industries. Every student will submit the training report within two weeks from the start of teaching of 7$^{th}$ Semester. The marks for this will be included in the 7$^{th}$ semester.*

## Scheme of Courses
## B. Tech. in Computer Science and Artificial Intelligence
## Semester-7

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI401 | Natural Language Processing | 4 | 0 | 0 | 4 | Core |
| 2 | CAI403 | Compiler Design | 4 | 1 | 0 | 4 | Core |
| 3 | CAI405 | Information Security | 3 | 1 | 0 | 3 | Core |
| 4 | CAIXXX | Discipline Specific Elective-II | 3 | 0 | 0 | 3 | DSE-II |
| 5 | | Generic Elective-I | 4 | 0 | 0 | 4 | GE-I |
| 6 | CAI407 | Information Security Lab | 0 | 0 | 2 | 1 | Core |
| 7 | CAI409 | Natural Language Processing with Deep Learning Lab | 0 | 0 | 4 | 2 | Core |
| 8 | CAI400 | Training | 0 | 0 | 0 | 2 | Training, D & P |
| 9 | CAI450 | Project | 0 | 0 | 8 | 4 | T,D&P |

**L: Lectures T: Tutorial P: Practical Cr: Credits**

***Note:***

- *Department specific elective-II should be from the basket of "Department Specific Elective-II".*
- *Generic elective-I should be from the "Generic Elective Basket"*

## Scheme of Courses
## B. Tech. in Computer Science and Artificial Intelligence
## Semester-8

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI402 | R Programming | 3 | 0 | 0 | 3 | Core |
| 2 | CAIXXX | Discipline Specific Elective-III | 4 | 0 | 0 | 4 | DSE-III |
| 3 | CAIXXX | Discipline Specific Elective-IV | 4 | 0 | 0 | 4 | DSE-IV |
| 4 | CAIXXX | Discipline Specific Elective-V | 4 | 0 | 0 | 4 | DSE-V |
| 5 | | Generic Elective-II | 4 | 0 | 0 | 4 | GE-II |
| 6 | CAI420 | Seminar | 0 | 0 | 4 | 2 | Training, D & P |
| 7 | ENG352 | Professional Communication | 3 | 0 | 0 | 3 | AECC |

**L: Lectures T: Tutorial P: Practical Cr: Credits**

***Note:***

- *Department specific elective-III & IV should be from the basket of "Department Specific Elective-III & IV" respectively.*
- *Generic elective-II should be from the "Generic Elective Basket"*

**Discipline Specific Elective-I**

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI342 | Introduction to JAVA Programming | 3 | 1 | 0 | 3 | DSE-I |
| 2 | CAI344 | C# Programming | 3 | 1 | 0 | 3 | DSE-I |
| 3 | CAI346 | Network Programming | 3 | 1 | 0 | 3 | DSE-I |
| 4 | CAI348 | C Shell Programming | 3 | 1 | 0 | 3 | DSE-I |
| 5 | MOOC Courses | | 4 | 0 | 0 | 4 | |

**Discipline Specific Elective-I Lab**

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI362 | Introduction to JAVA Programming Lab | 0 | 0 | 2 | 1 | DSE-I |
| 2 | CAI364 | C# Programming Lab | 0 | 0 | 2 | 1 | DSE-I |
| 3 | CAI366 | Network Programming Lab | 0 | 0 | 2 | 1 | DSE-I |
| 4 | CAI368 | C Shell Programming Lab | 0 | 0 | 2 | 1 | DSE-I |

**Discipline Specific Elective-II**

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI451 | AI in Healthcare Informatics | 3 | 0 | 0 | 3 | DSE-II |
| 2 | CAI455 | AI in Humanities | 3 | 0 | 0 | 3 | DSE-II |
| 3 | CAI457 | Data Analysis | 3 | 0 | 0 | 3 | DSE-II |
| 4 | MOOC Courses | | 3 | 0 | 0 | 3 | |

**Discipline Specific Elective-III**

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI442 | Parallel computing | 4 | 0 | 0 | 4 | DSE-III |
| 2 | CAI444 | Mobile Computing & Communication | 4 | 0 | 0 | 4 | DSE-III |
| 3 | CAI446 | Cloud Computing | 4 | 0 | 0 | 4 | DSE-III |
| 4 | CAI448 | Green Computing | 4 | 0 | 0 | 4 | DSE-III |
| 5 | MOOC Courses | | 4 | 0 | 0 | 4 | |

**Discipline Specific Elective-IV**

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI452 | Operational Research | 4 | 0 | 0 | 4 | DSE-IV |
| 2 | CAI454 | Fuzzy Logic & Neural Network | 4 | 0 | 0 | 4 | DSE-IV |
| 3 | CAI456 | Database Administration | 4 | 0 | 0 | 4 | DSE-IV |
| 4 | CAI458 | Network security | 4 | 0 | 0 | 4 | DSE-IV |
| 5 | CAI460 | Wireless network communication | 4 | 0 | 0 | 4 | DSE-IV |
| 6 | MOOC Courses | | 4 | 0 | 0 | 4 | |

**Discipline Specific Elective-V**

| S.NO. | Paper Code | Course Title | L | T | P | Cr | Nature of Course |
|---|---|---|---|---|---|---|---|
| 1 | CAI462 | Image Processing and Pattern Recognition | 4 | 0 | 0 | 4 | DSE-V |
| 2 | CAI464 | Mobile application development | 4 | 0 | 0 | 4 | DSE-V |
| 3 | CAI466 | Cyber laws & IPR | 4 | 0 | 0 | 4 | DSE-V |
| 4 | CAI468 | Web Technology | 4 | 0 | 0 | 4 | DSE-V |
| 5 | CAI470 | Big Data Analytics | 4 | 0 | 0 | 4 | DSE-V |
| 6 | MOOC Courses` | | 4 | 0 | 0 | 4 | |

## Generic Elective Basket

## Generic Elective-I

| S.NO. | Paper Code | Course Title | L | T | P | Cr |
|---|---|---|---|---|---|---|
| 1 | CAI801 | Software Engineering & Project Management | 4 | 0 | 0 | 4 |

| S.NO. | Paper Code | Course Title | L | T | P | Cr |
|---|---|---|---|---|---|---|
| 1 | CAI802 | Computer Networks | 4 | 0 | 0 | 4 |
| 2 | MOOC Courses | | 4 | 0 | 0 | 4 |

## B Tech Course Structure

| CBCS | Nature of Courses | Core | Elective Courses | | | Ability Enhancement Courses | | Total Credits |
|---|---|---|---|---|---|---|---|---|
| Year | Course Structure | Core | Dissertation/ Project | Generic Elective/ MOOC Courses | Discipline Specific Elective/ MOOC Courses | Ability Enhancement Compulsory Courses | Skill Enhancement Courses | |
| 2022 | CSE+AI | 140 | 4 | 8 | 19 | 7 | 8 | 186 |

| Core | Basic Sciences (BS) including Mathematics, Physics, Chemistry, Biology | Engineering Sciences (ES) including Materials, WS, ED, Basics of EE/ME/CSE | Interdisciplinary Core | Discipline Core | Total Credits |
|---|---|---|---|---|---|
| 140 | 22 | 15 | 2 | 101 | 140 |

# Detailed Syllabus

**Course Title: Engineering Mathematics-I**
**Paper Code: MTH151A**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**CourseObjective:** The aim of this course is to familiarize the students with the theory of matrices which are used in solving equations in mechanics and the other streams. This course also provides a comprehensive understanding of the origin and development of ideas to exhibit the techniques origin and development of ideas to exhibit the techniques of solving ordinary differential equations.

**UNIT-A**

Rank of matrices, Inverse of Matrices, Gauss Jordan Method, reduction to normal form, Consistency and solution of linear algebraic system of equations, Gauss Elimination Method, Eigen values and Eigen vectors, Diagonalisation of Matrix, Cayley Hamilton theorem. Orthogonal, Hermition and unitary matrices.

**(11Hours)**

**UNIT-B**

Concept of limit and continuity of a function of two variables, Partial derivatives, Homogenous Function , Euler's Theorem, Total Derivative, Differentiation of an implicit function, chain rule, Change of variables,Jacobian, Taylor's and McLaurin'sseries. Maxima and minima of a function of two and three variables: Lagrange's method of multipliers.

**(13Hours)**

**UNIT-C**

Formation of ordinary differential equations, solution of first order differential equations by separation of variables, Homogeneous equations, Reduce to Homogenous, exact differential equations, equations reducible to exact form by integrating factors, equations of the first order and higher degree, Clairaut's equation.

**(13Hours)**

**UNIT-D**

Solution of differential equations with constant coefficients: method of differential operators. Non – homogeneous equations of second order with constant coefficients: Solution by method of variation of parameters, Simultaneously Linear differential equation.

**(11Hours)**

**REFERENCES:**


1. Grewal, B.S. *Higher Engineering Mathematics*. New Delhi: Khanna Publication, 2009.
2. Kreyszig, Erwin. *Advanced Engineering Mathematics*. New Delhi: Wiley Eastern Ltd., 2003.
3. Jain, R K, and K Iyengar S R. *Advanced Engineering Mathematics*, New Delhi: Narosa Publishing House, 2003.
4. Thomas, George B. and Finney Ross L. *Calculus and Analytic Geometry*. New Delhi Addison Wesley, 1995.

**Course Title: Chemistry**
**Course Code: CHE151A**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objectives**:
The objective of the Engineering Chemistry is to acquaint the student with the basic phenomenon/concepts of chemistry for the development of the right attitudes by the engineering students to cope up with the continuous flow of new technology. The student will able to understand the new developments and breakthroughs efficiently in engineering and technology.

**Expected Prospective:**
This course will equip students with the necessary chemical knowledge concerning the fundamentals as well as new technology in the field of chemistry.

**UNIT- A**

**Spectroscopy and its Applications**

**General Introduction:** Introduction, electromagnetic spectrum, absorption and emission spectrum, atomic and molecular spectroscopy, types of molecular spectra, experimental techniques, selection rules, width and intensities of spectral lines.

**UV/Visible Spectroscopy:** types of electronic Transitions,Chromophores, Auxochromes, Effect of conjugation on Chromophores, Factors affecting λmax and intensity of spectral lines, effect of solvent onλmax, isobestic point, applications.

**IR Spectroscopy:** Infrared region, fundamental modes of vibrations and types, theory of infrared spectra, vibrational frequency and energy levels, anharmonic oscillator, modes of vibrations of polyatomic molecules, characteristic signals of IR spectrum, finger print region, factors affecting vibrational frequency; applications.

**NMR Spectroscopy:** Principle and instrumentation, relaxation processes, proton magnetic resonance spectroscopy, number of signals, Chemical shift, Spin-Spin Splitting, coupling constant, applications.

**(11Hours)**

**UNIT- B**

**Water and its treatment**

Introduction, hardness of water, degree of hardness, units of hardness, boiler feed water: specification, scales and sludge formation; priming& foaming, boiler corrosion, caustic embrittlement, treatment of boiler feed water, internal treatment of water; softening of water by lime-soda, zeolite and ion exchange methods, desalination of water; Water for domestic use: purification of water for domestic use.

**Corrosion and its Prevention**

Introduction; different types of corrosion - wet and dry corrosion; mechanism of wet corrosion; comparison of dry and wet corrosion, Types of electrochemical corrosion: galvanic corrosion, concentration cell corrosion or differential aeration corrosion, waterline corrosion, pitting corrosion, crevice corrosion, stress corrosion, intergranular corrosion; other forms of corrosion: atmospheric corrosion, soil corrosion, microbiological corrosion, erosion corrosion, Filliform corrosion, stray current corrosion, passivity, galvanic series, factors influencing corrosion, various methods of corrosion control.

**(13Hours)**

**UNIT-C**

**Chemistry in Nanoscience and Technology:** Introduction,Materials self-assembly, molecular vs. material self-assembly, hierarchical assembly, self-assembling materials, two dimensional assemblies, Mesoscale self-assembly, coercing colloids, Nano-crystals, supramolecular

structures, Nano scale materials, future perspectives applications, nano-composities and its applications.

**(13Hours)**

**UNIT-D**

**Polymers and polymerization**

Introduction, monomer and repeating unit, degree of polymerization, functionality, classification of polymers: based on origin, monomers, structure, method of synthesis, tacticity or configuration, action of heat, chemical composition, ultimate form; types of polymerization, specific features of polymers, regularity and irregularity, tacticity of polymers, average molecular weights and size, determination of molecular weight by number average methods, effect of molecular weight on the properties of polymers, introduction to polymer reinforced composites.

**(11Hours)**

**REFERENCES:**


1. William Kemp, *Organic Spectroscopy*, Palgrave Foundations, 1991.
2. D. A. Skoog, F. J. Holler and A. N. Timothy, *Principle of Instrumental Analysis*, 5th Edition., Saunders College Publishing, Philadelphia, 1998.
3. C. P. Poole, Jr., F. J. Owens, *Introduction to Nanotechnology*, WileyInterscience, 2003.
4. L.E. Foster, Nanotechnology, *Science Innovation & Opportunity*, Pearson Education, 2007.
5. P. Ghosh, *Polymer Science and technology* (2nd Edition), Tata McGraw Hill, 2008.
6. Wiley *Engineering Chemistry*, Second Edition, 2013.

**Course Title: Computer Fundamentals and Programming**
**Course Code: CSE101B**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** To get basic knowledge of computers (hardware and software), its components and Operating systems. To acquire programming skills in C, basic knowledge of Internet

**UNIT-A**

**Introduction to Computers**

Computer System, Block diagram of a Computer System and its working. Classification and generation of computers. I/O devices and types of memories. Number system.

**Computer Hardware, Software and Firmware**

Types of Software, Operating Systems, their types and functions. Comparison between MS-Office and open office with its latest features. Booting and its types.

**Computer Network**

Types of network and networking devices.

**(15Hours)**

**UNIT-B**

**Idea of Algorithm:**

Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples.

**Introduction to Programming**

Generation of programming languages. Basic Constructs of C Keywords, Identifiers, Variables, Data Types and their storage, Various Operators and Expressions, External Variables and Scope of Variables, Structure of C Program and stages of compilation of C program. Control Structures Decision making statements.

**(15Hours)**

**UNIT-C**

**Arrays and Functions**

Functions Advantages of functions, function prototype, declaring and defining functions, return statement, call by value and call by reference, recursion, and storage classes. Arrays and Strings. Various string manipulation functions.

**(8Hours)**

**UNIT-D**

**Structures and Pointers**

Introduction to Pointers and its types. Structure and union. Use of enum data type. Macros and conditional compiler directives.

**(8Hours)**

**REFERENCES:**

1. V.K. Jain: "Fundamentals of Information Technology and Computer Programming", PHI. Latest Edition.
2. Anita Goel: "Computers Fundamentals", Pearson Publications
3. Brian Kernighan and Dennis M. Ritchie: "The C Programming language", Prentice Hall, 2nd Edition 2007.
4. K.N.King: "C Programming: A Modern Approach", W.W. Norton Company 2nd edition (2008).
5.Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing
6. Gottfired : "Programming in ANSI C, Schaum Series", TMH publications, 2nd Edition (1996).
7. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

**Course Title: Environmental Studies**
**Paper Code: EVS100A**

| L | T | P | Credits | Marks |
|---|---|---|---|---|
| 4 | 0 | 0 | 0 | Satisfactory/Unsatisfactory |

**Course Objective:** This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

## Unit-I

### Introduction to Environmental Studies

1. Definition, components and types of Environment.
2. Meaning of Environmental Studies and its Multidisciplinary nature;
3. Scope and importance; Concept of sustainability and sustainable development.

**(6Hours)**

### Natural Resources: Renewable and Non---Renewable Resources

1. Land resources and land use change; Land degradation, soil erosion and desertification.
2. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
3. Water: Use and over---exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter---state).
4. Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

**(8Hours)**

## Unit-II

### Ecosystems

1. What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems :
   a. Forest ecosystem
   b. Grassland ecosystem
   c. Desert ecosystem
   d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**(2Hours)**

**Biodiversity and Conservation**

Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots

a. India as a mega---biodiversity nation; Endangered and endemic species of India
b. Threats to biodiversity: Habitat loss, poaching of wildlife, man---wildlife conflicts, biological invasions; Conservation of biodiversity: In---situ and Ex---situ conservation of biodiversity.
c. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

**(8Hours)**

**Unit-III**

**Environmental Pollution** Environmental Pollution: types, causes, effects and controls; Air, water, soil and noise pollution

1. Nuclear hazards and human health risks
2. Solid waste management: Control measures of urban and industrial waste.
3. Pollution case studies.

**(8Hours)**

**Environmental Policies & Practices**

1. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture

- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

**(8Hours)**

**Unit IV**

**Human Communities and the Environment**

1. Human population growth: Impacts on environment, human health and welfare.
2. Resettlement and rehabilitation of project affected persons; case studies.
3. Disaster management: floods, earthquake, cyclones and landslides.
4. Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.

5. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
6. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

**(8Hours)**

**Field work**

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site---Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems---pond, river, Delhi Ridge, etc.

**(8Hours)**

**Suggested Readings:**


1. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.*Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.*Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science,* 339: 36---37.
7. McCully, P. 1996. *Rivers no more: the environmental effects of dams* (pp. 29---64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971.*Fundamentals of Ecology*. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.

**11.** Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.

**12.** Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012.*Environment*. 8th edition. John Wiley & Sons.

**13.** Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. *Tripathi 1992*.

**14.** Sengupta, R. 2003. *Ecology and economics*: An approach to sustainable development. OUP.

**15.** Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.

**16.** Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology*: *Voices from the Tropics*. John Wiley & Sons.

**17.** Thapar, V. 1998*. Land of the Tiger*: *A Natural History of the Indian Subcontinent*.

**18.** Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.

**19.** Wilson, E. O. 2006.*The Creation: An appeal to save life on earth*. New York: Norton.

**Course Title: Engineering Drawing**
**Course Code: MEC101A**

| L | T | P | Credits |
|---|---|---|---|
| 2 | 0 | 4 | 4 |

**Course Objectives:** Students will be able to use the techniques to interpret the drawings and to use it in the field work of engineering. They will learn various lines, planes, solids and their sectioning and to develop their lateral surfaces. Concepts of orthographic and isometric projections

**UNIT-A**

**Drawing Techniques**

Introduction to drawing instruments, various types of lines and their convention, principles of dimensioning, Engineering symbols, Gothic lettering in single stroke as per SP-46 code (Vertical and inclined)

**Scales**

Concept of scaling, construction of plane and diagonal scales

**(11Hours)**

**UNIT-B**

**Projection of Points**

Concept of plane of projections (Principle planes), First and third angle projections; projection of points in all four quadrants, shortest distance problems

**Projection of Lines and Planes**

Projection of line parallel to both planes, perpendicular to one plane, inclined to one and both the reference planes and their traces. Plane perpendicular to one plane inclined to one and both the reference planes and their traces. Concept of profile plane and auxiliary planes, to find the true length, $\alpha$, $\beta$, $\theta$ and $\Phi$.

**(12Hours)**

**UNIT-C**

**Projection of Solids**

Right and oblique solids; solids of revolution and polyhedrons, projection of solid with axis perpendicular to one plane and parallel to one or both reference planes. Projection of solid with axis inclined to one or both reference planes.

**Sectioning of Solids**

Theory of sectioning, types of section planes, their practice on projection of solids, Sectioning by auxiliary planes,to find true section of truncated solids.

**(12Hours)**

**UNIT-D**

**Development of Surfaces**

Method of Development, Development of surfaces: Parallel line and Radial line method. Development of oblique solids, Development of curved surfaces.

**Orthographic and Isometric Views**

Draw orthographic views from isometric view or vice-a-versa, Missing line and missing view

**(10Hours)**

**REFERENCES:**


1. Jolhe, A.J., "*Engineering Drawing*", Tata McGraw-Hill, New Delhi.
2. Gill, P.S., *"Engineering Drawing",* S.K. Kataria and Sons, Ludhiana
3. French T.E. and Vierck, C.J., *"Graphic Science"*, McGraw-Hill, New York
4. Zozzora F., *"Engineering Drawing",* McGraw Hill, New York

**Course Title: Basic Communication Skills**
**Course Code: ENG151B**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objectives**:

- To enhance students' vocabulary and comprehension skills through the prescribed texts.
- To hone students' reading and writing skills.
- To teach the rules of English grammar descriptively.
- To make students aware about the socio-cultural aspect of English.

**Learning Outcomes:** Students will

- Have developed a wide vocabulary and be able to summarize ideas.
- Be able to read and analyze texts and display competence in written communication.
- Show a considerable understanding of English Grammar.
- Demonstrate sensitivity to cultural differences while communicating

**Unit – A**

**Applied Grammar ( in Socio-Cultural Context)**

- Tenses
- Passives
- Reported/Reporting Speech

**Unit – B**

1. **Reading (Communicative Approach to be Followed)**

    - Nissim Ezekiel : The Patriot (Poem)

(Sub-topic: Basic Introduction to Indianisms and Difference between Indian English & Standard English)

2. **Writing**

    - Paragraph Writing : Topic Sentence, Inductive logic, and Deductive logic
    - Essays: Narrative, Descriptive, Expository, and Persuasive
    - Notice: Format, Characteristics, and 5 W's,

- Email: Structure, Characteristics of Effective Emails, and Advantages

**Unit – C**

1. **Applied Grammar ( in Socio-Cultural Context)**

    - Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, and Interjection
    - Modals: Can, Could, May, Might, Will, Would, Shall, Should, and Must

**Unit – D**

1. **Reading (Communicative Approach to be Followed)**

    Alleen Pace Nilsen: Sexism in English (Prose)

    (Sub-topic: Relationship between Society & Language and Sexist Language)

2. **Writing**

    Letter Writing: Formal and Informal

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**Teaching Methodology**:

a. **Grammar:** Grammar must be taught descriptively in socio-cultural context. The contextual teaching of grammar helps a learner understand the application of grammar rules in real life situations. The learner who learns grammar in isolation is unable to use the language fluently, whereas the learner who learns grammar in context uses the language confidently and fluently in real life situations.

b. **Literary Texts:** Communicative approach should be followed to teach the texts. Classroom activities guided by the communicative approach are characterised by trying to produce meaningful and real communication, at all levels. As a result there may be more emphasis on skills than systems, lessons are more learner-centred, and there may be use of authentic materials.

    Teachers can introduce the topic or theme of the text, pre-teach essential vocabulary items and use prediction tasks to arouse the interest and curiosity of students.

c. **Writing**: Some of the strategies that should be adopted are as follows:

- Regularly assign brief writing exercises in your classes.
- Provide guidance throughout the writing process, i.e. Pre-Writing, Drafting, Revising, Editing, and Publishing.
- Give students opportunities to talk about their writing.
- Encourage students to revise their work.

**Testing**: The examinations will be conducted as per the norm of the university.

**REFERENCES:**

**a. Books**


1. Eschholz, Paul and Rosa, Alfred (ed.), *Subject and Strategy*. NY: St. Martin's Press, 1978. Print.
2. Ezekiel, Nissim. *Collected Poems 1952-1988*. New Delhi: Oxford University Press, 1999. Print.
3. Hosler, Mary Margaret. *English Made Easy*. Delhi: McGraw, 2013. Print.
4. Koneru, Aruna. *Professional Communication*. Delhi: McGraw, 2008. Print.
5. Mahanand, Anand. *English for Academic and Professional Skills*. Delhi: McGraw, 2013. Print.
6. Rani, D Sudha, TVS Reddy, D Ravi, and AS Jyotsna. *A Workbook on English Grammar and Composition*. Delhi: McGraw, 2016. Print.
7. Rizvi, M. Ashraf. *Effective Technical Communication*. Delhi: McGraw, 2018. Print.
8. Sharma, R.C. and Krishna Mohan. *Business Correspondence and Report Writing*. Delhi: McGraw, 2013. Print.
9. Tyagi, Kavita and Padma Misra. *Basic Technical Communication*. Delhi: PHI Learning, 2013. Print.


**b. Websites**


1. www.youtube.com (to watch standard videos)
2. http://learnenglish.britishcouncil.org/en
3. https://owl.english.purdue.edu/

**Course Title: Chemistry Lab**
**Course Code: CHE152**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives**:
This course is intended to learn the basic concepts of Engineering Chemistry Laboratory. The present syllabus has been framed as per the recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

**Expected Prospective:**
The students will be able to understand the basic objective of experiments in Engineering chemistry, properly carry out the experiments, and appropriately record and analyse the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals.

**List of Experiments**

1. Verify Lambert Beer's law using spectrophotometer and $CoCl_2$ or $K_2Cr_2O_7$ solution.
2. Determine the strength of HCl solution by titrating against NaOH solution conducto metrically.
3. Determination of the strength of HCl solution by titrating against NaOH using pH meter.
4. Determination of total hardness of water (tap) using standard EDTA solution and Eriochrome black T indicator.
5. Determination of alkalinity of water.
6. Determination of surface tension of given liquid by using Stalagmometer.
7. Determination of residual chlorine in a water sample.
8. Determination of Flash & Fire point of given a given lubricating oil by Pensky-Marten's apparatus.
9. Determination of the viscosity of given lubricating oil by using Redwood Viscometer.
10. Preparation of a polymer phenol/urea formaldehyde resin.
11. Determination of moisture, volatile matter and ash content in a given sample of coal by proximate analysis.
12. Determination of dissolved oxygen present in given sample of water.

**REFERENCES:**


1. Levitt, B.P. Findlay's Practical Physical Chemistry, 9th edition, Longman Group Ltd., 1973.
2. Yadav, J.B. Advanced Practical Physical Chemistry.
3. Vogel, A. I. A textbook of Quantitative Inorganic Analysis, Longman Gp. Ltd, 4$^{th}$ edition (2000).

**Course Title: Computer Fundamentals and Programming Lab**
**Course Code: CSE103A**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Instruction for Students:** The students will be attending a laboratory session of 2 hours weekly and they have to perform the practical related to the following list.

**List of Experiments:**

1. Introduction to various hardware components of computer.
2. Installation of any operating system.
3. Creation of any social account **(**Microsoft, Google etc.**).**
4. Introduction to MS-Office.
5. Introduction to basic structure of C program, utility of header and library files.
6. Implementation of program related to the basic constructs in C.
7. Programs using functions by passing values using call by value and call by reference method.
8. Program to illustrate the use of arrays in C.
9. Programs related to string handling in C.
10. Program to illustrate the use of pointers.

**Course Title: Basic Communication Skills Lab**
**Course Code: ENG152A**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives**:

- To improve the preparation and presentation competencies necessary for oral communication in a variety of contexts, as both a speaker and a listener.
- To improve pronunciation.
- To promote interactive skills through Group Discussions and role plays.

**Learning Outcomes:** Students will be able to:

- Develop proper listening skills
- Articulate and enunciate words and sentences clearly and efficiently
- Show confidence and clarity in public speaking projects

| **Unit – A Speaking and Listening** |
|---|
| • IPA for Language Learning - Basic Phonetics |
| • Movie-Clippings |
| • Role Plays |
| • Group Discussions |
| • Mock Interviews |

**Project File:** Each student will prepare a project file on any of the topics given by class teacher. Student should be able to justify the contents of his/her scrap file. The file must be handwritten, not typed. Students must acknowledge all the sources of information in his/her scrap file.

**Testing:** The end term lab. examination will be conducted as per the norm of the university.

The distribution of marks in the end-term lab. examination is as follows:

| **Component** | **Weightage** |
|---|---|
| **Project File**<br>Marks will be given for originality, creativity and presentation. Student will receive credit for his/her command of the language also. | **30 %** |
| **Lab. Activity**<br>It may include dialogue writing (Dialogue to Prose and Prose to Dialogue), writing about a picture/some object, writing a report, | **30%** |

| | |
|---|---|
| writing on a topic of general interest, listening exercise, English phonetic exercise, etc. It will be decided by examiner on the spot. | |
| **Viva Voce**<br><br>Questions will be based on the project file. Examiner may ask other non-technical questions related to student's life and interests. | **40%** |
| **Total** | **100%** |

**For the final result, marks will be calculated as per the criterion laid down by the university:**

| **Component** | **Weightage** |
|---|---|
| Marks Obtained in the lab examination | **80%** |
| Continuous Assessment (Based on Student's Regularity & Class Performance) | **20%** |
| **Total** | **100%** |

**Reference Books**

**c. Books**


10. Crystal, David. *The Gift of the Gab – How Eloquence Works*. Connecticut: Yale University, 2016. Print.
11. Gangal, J. K. *A Practical Course in Spoken English*. India: Phi Private Limited, 2012. Print.
12. Hosler, Mary Margaret. *English Made Easy*. Delhi: McGraw, 2013. Print.
13. Koneru, Aruna. *Professional Communication*. Delhi: McGraw, 2008. Print.
14. Mahanand, Anand. *English for Academic and Professional Skills*. Delhi: McGraw, 2013. Print.
15. Rani, D Sudha, TVS Reddy, D Ravi, and AS Jyotsna. *A Workbook on English Grammar and Composition*. Delhi: McGraw, 2016. Print.
16. Rizvi, M. Ashraf. *Effective Technical Communication*. Delhi: McGraw, 2018. Print.

17. Sharma, R.C. and Krishna Mohan. *Business Correspondence and Report Writing*. Delhi: McGraw, 2013. Print.

18. Suzana, Roopa. *A Practical Course in English Pronunciation*. Delhi: McGraw Hill Education, 2017. Print.

19. Tyagi, Kavita and Padma Misra. *Basic Technical Communication*. Delhi: PHI Learning, 2013. Print.

**d. Websites**

4. www.youtube.com (to watch standard videos)
5. http://learnenglish.britishcouncil.org/en
6. https://owl.english.purdue.edu/

**Course Title: Engineering Mathematics-II**
**Course Code: MTH152A**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** The objective of the course is to equip the students with the knowledge of concepts of vectors and geometry and their applications. A flavor of pure mathematics is also given to the readers.

**UNIT-A**

Functions of Complex Variables: Complex Numbers and elementary functions of complex variable De-Moivre's theorem and its applications. Real and imaginary parts of exponential, logarithmic, circular, inverse circular, hyperbolic, inverse hyperbolic functions of complex variables. Summation of trigonometric series. (C+iS method).

**(11Hours)**

**UNIT-B**

**Integral Calculus:** Rectification of standard curves; Areas bounded by standard curves; Volumes and surfaces of revolution of curves;

**Multiple Integrals**: Double and triple integrals and their evaluation, change of order of integration, change of variable, Application of double and triple integration to find areas and volumes. Centre of gravity and Moment of inertia

**(13Hours)**

**UNIT-C**

Vector Calculus: Scalar and vector fields, differentiation of vectors, velocity and acceleration.

**Vector differential operators**: Del, Gradient, Divergence and Curl, their physical interpretations. Line, surface and volume integrals.

**Application of Vector Calculus**: Flux, Solenoidal, and Irrotational vectors. Gauss Divergence theorem.Green's theorem in the plane, Stoke's theorem (without proofs) and their applications

**(13Hours)**

**UNIT-D**

Infinite Series: Convergence and divergence of series, Tests of convergence (without proofs): Comparison test, Integral test, Ratio test, Raabe's test, Logarithmic test, Cauchy's root test, and Gauss test. Convergence and absolute convergence of alternating series, Uniform Convergence and Power Series

**(11Hours)**

**REFERENCES:**


1. Grewal, B.S., *Higher Engineering Mathematics*. New Delhi: Khanna Publication, 2009
2. Kreyszig, Erwin, *Advanced Engineering Mathematics*. New Delhi: Wiley Eastern Ltd., 2003.
3. Jain, R K, and K Iyengar S R., *Advanced Engineering Mathematics*, New Delhi: Narosa Publishing House, 2003.
4. Thomas, George B. and Finney Ross L., *Calculus and Analytic Geometry*. New Delhi Addison Wesley, 1995

**COURSE NAME: Engineering Physics**
**COURSE CODE: PHY151B**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** The aim of this course on physics is to make the student of engineering understand the basic concepts of physics which will form the basis of certain concept in their respective fields.

**UNIT-A**

**PHYSICAL OPTICS**:
**Interference:** Division of wave front, Fresnel's biprism, division of amplitude, Newton's rings and applications.
**Diffraction:** Difference between Fraunhofer and Fresnel diffraction, Fraunhofer diffraction through a slit, plane transmission diffraction grating, its dispersive and resolving power.
**Polarization**: Polarized and unpolarised light, double refraction, Nicol prism, quarter and half wave plates.

**(12Hours)**

**UNIT-B**

**LASER**: Spontaneous and stimulated emission, Laser action, Characteristics of laser beam, concept of coherence, He-Ne laser, Semiconductor laser, Ruby laser and applications, Holography.
**FIBRE OPTICS**: Propagation of light in fibres, numerical aperture, single mode and multimode fibres, applications

**(13Hours)**

**UNIT-C**

**DIELECTRICS:** Molecular Theory, polarization, displacement, susceptibility, dielectric coefficient, permittivity, relations between electric vectors, Gauss's law in the presence of a dielectric, energy stored in an electric field, Behaviour of dielectric in alternating field and Clausius-Mossotti equation.

**(13Hours)**

**UNIT-D**

**QUANTUM MECHANICS**: Difficulties with Classical physics, Introduction to quantum mechanics simple concepts, Black Body radiation, Planck's Law of radiation and its limitations, Group velocity and phase velocity, Schrodinger's wave equations and their applications.
**NANOPHYSICS:** Introduction to Nano science and Nanotechnology, Electron confinement, Nanomaterial, Nanoparticles, Quantum structure, CNT, Synthesis of Nanomaterial and Application of Nanomaterial.
**SUPER CONDUCTIVITY**: Introduction (experimental survey), Meissner effect, Type I and type II superconductors, London equation, Elements of BCS theory, Applications of superconductors.

**(13Hours)**

**REFERENCES:**


1. Sear, F.W. Electricity and Magnetism. London: Addison-Wesley, 1962.
2. Resnick and Halliday. Physics.New York: Wiley, 2002.
3. Lal,B. and Subramanyam, N.A Text Book of Optics. New Delhi: S. Chand and Company Limited, 1982.
4. Jenkins, and White. Fundamental of Physical Optics. New York: Tata McGraw-Hill, 1937.
5. Griffiths,D. Introduction to Electrodynamics, New Delhi: Prentice Hall, 1998.
6. Beiser, A. Perspective of Modern Physics. New Delhi: McGraw Hill Ltd., 2002.
7. Verma, N.K Physics for Engineers. New Delhi: Prentice Hall., 2014.

**Course Title**: **Mechanical Engineering Fundamentals**
**Course Code: MEC103**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** To impart the basic knowledge of thermodynamic principles, design principles, power transmission devices, power producing and power absorbing devices.

**UNIT-A**

**Fundamental Concepts of Thermodynamics**

Introduction, Thermodynamic System and its types, Boundary and its types, Surroundings, Thermodynamic properties, State, Path, process and cycles, Thermodynamic Equilibrium, Working Substance, Microscopic and Macroscopic Analysis, Units and Dimensions, Quasi Static Process, Reversible and Irreversible processes, Point Function and Path Function, Mechanical and Thermodynamic work, P-dv Work (Displacement Work), Work is a Path Function, Equations for work done in various processes

**Laws of Thermodynamics**

Zeroth law of Thermodynamics, Temperature, Thermometry (Measurement of temperature), Temperature Scales, Energy, Potential and Kinetic Energies at Micro and Macro Level, Internal Energy, Law of conservation of energy, Joule's Experiment, First law of thermodynamics (Open and Closed System), Energy – A property of system, Enthalpy, Entropy, Heat, Heat vs Temperature, specific heat, Heat Capacity, Specific heat at constant volume, Specific heat at constant pressure, Adiabatic Index, Limitations of first law of thermodynamics

**(12Hours)**

**UNIT-B**

**Pressure**

Pressure Concept and Definition, Pressure conversion Table, Atmospheric pressure, Standard Atmospheric Pressure, Gauge Pressure, Vacuum Pressure, Absolute pressure, Properties of fluid, Pressure head of a Liquid, Pascal's Law, Pressure measurement: Mechanical Gauges and Manometers, Mechanical Gauges: (Bourdon tube pressure gauge, Diaphragm pressure gauge, Dead weight), Manometers: (Principle/Advantage/Limitation/ Classification), Piezometer, Single U tube manometer (Numerical for Vacuum and Gauge pressure), [Simple problems on above topics]

**Heat Transfer**

Introduction, Heat Transfer vs Thermodynamics, Applications, Thermal Conductivity, Thermal Resistance, Modes of heat transfer, Spectrum of electromagnetic radiation, Surface emission properties, Absorptivity, Reflectivity and Transmissivity, Fourier law, Newton's law of cooling, Stefan Boltzmann's Law, Heat Exchangers (Applications, Selection, Classification), Thermal Insulation (Properties of insulation, Types of Insulations, Thermal Insulating Materials)

**Power Absorbing Devices**

Power Absorbing Devices, Difference between Hydraulic pump, Air compressor, Fan, Blower, Pump (Function, Selection, Applications), Classification of Pump, Positive displacement and Dynamic Pumps, Reciprocating Pumps and its types, Rotary Pumps and its types, Centrifugal Pump, Axial Pump

**(12Hours)**

**UNIT-C**

**Power Producing Devices Boiler**

States of matter, Changing State of Matter, Sublimation, Effect of temperature during change of Phase, Steam boiler, Application, Classification of boilers, Types of boilers (Brief Description),

Essentials of a good boiler, Advantages of superheating the steam, Comparison between Water tube and Fire tube boilers, Function of boiler Mountings and Accessories

**Turbines**

Turbine, Classification based on working fluid, Classification of hydraulic turbines, Selection of hydraulic turbines, Impulse Turbines (Pelton Wheel/ Turgo/ Cross Flow), Reaction Turbines (Francis/ Kaplan/ Propeller)

**Internal Combustion Engines**

Heat Engine, Types of Heat Engine, Advantages, Disadvantages and Applications, Classification of IC Engine, Engine Components (Location, Function and Material), and Basic Terminology used in IC engine, Four stroke Cycle Engines (SI and CI), Two stroke Cycle Engines (SI and CI)

**(12Hours)**

**UNIT-D**

**Principles of Design**

Need of design, Product Life Cycle, Material properties and selection, Factors affecting material selection, Stress and Strain and its types, Hooke's law, Modulus of Elasticity, Longitudinal and Lateral Strain, Poisson's ratio, Stress- Strain Curve for ductile material and brittle material, Factor of Safety, Centre of Gravity, Centroid, Centroid of areas of plain, Figures (Without Derivation), Centroid of areas of composite sections (Without Derivation), Moment of Inertia, Radius of gyration, Theorem of perpendicular axis, Theorem of parallel axis, MI of L, I and T sections, [Simple problems on above topics]

**Power Transmission Devices and Machine Elements**

Individual and group drive system (advantages and Disadvantages), Belt drive (Types: V and Flat Belts and their Applications, Advantages and Disadvantages), Ropes drive (Types: Fiber and Wire Ropes and their Applications, Advantages and Disadvantages), Chain drive (Applications, advantages and Disadvantages, Sprockets), Gear drive (Types of Gears), Power transmission shafts, Types of shafts, Application of shafts, Axle, Keys (Function, Classification), Coupling (Function, Classification: Rigid and Flexible), Flanged coupling, Oldham's coupling, Universal coupling, Bearings and their types, Flywheel construction and types

**(12Hours)**

**REFERENCES:**


1. Rajan T.S. *Basic Mechanical Engineering*, New Delhi: New Age Publishers.
2. Singh Sadhu *Principles of Mechanical Engineering*, New Delhi: S Chand Publishers.
3. Shankar V.P., *Basic Mechanical Engineering*, New Delhi: Laxmi Publishers.
4. Phthak G. K., *Basic Mechanical Engineering*, New Delhi: Rajsons Publications.
5. Kumar Parveen, *Basic Mechanical Engineering*, New Delhi: Pearson Education

**Course Title: Basic Electrical Engineering**
**Course Code: ELE105**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** This course provides basic knowledge of DC and AC Circuit Analysis and Network Theorems, Magnetic Circuits and various electrical devices & installation e.g. MCB, ELCB, MCCB, DC Machines, AC Machines etc.
**Learning Outcomes:** Apply the knowledge of Electrical Engineering principles to solve DC and AC circuits. Formulate and analyse electrical circuits. Understand basic principles of electromagnetism to implement in electrical machines and transformers. Identify and select various electrical machines according to the applications. Apply the ethical principles for troubleshooting & installation of safety devices as per norms of engineering practice

**UNIT-A**

**D.C Circuit Analysis:**
Voltage source, current source, dependent and independent sources, analysis of D.C circuit by KCL and KVL , Nodal and Mesh analysis, Superposition theorem, Maximum Power Transfer Theorem, Thevenin and Norton Theorems.

**(12 Hours)**

**Unit-B**

**A.C Circuit Analysis:**
Review of single phase A.C. circuit under sinusoidal steady state, RMS Value, Average Value, Form factor, Peak factor solution of RL, RC, R.L.C. Series circuit, the j operator, complex representation of impedance, solution of series circuit, series resonance, 3 phase A.C. Circuit, star and delta connections, line and phase quantities solution of 3 phase circuits, balance supply voltage and balanced supply voltage and balance load, Phasor diagram, measurement of power and power factor.

**(14 Hours)**

**UNIT-C**

**Magnetic Circuit & Transformers:**
B-H Curve, saturation leakage and fringing. Hysteresis and eddy currents.Single phase transformer, basic concepts constructional, voltage, current Transformation, Ideal transformer and its Phasor diagram, voltage regulation, OC/SC test, losses and efficiency, Autotransformer.

**(14Hours)**

**UNIT-D**

**Rotating Electrical Machines:**
Basic concepts, working principle and general construction of DC machines (motor/generators), torque and EMF expression. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor.

**Electrical Installations**
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Various faults in Battries, Elementary calculations for energy consumption, power factor improvement and battery backup.

**(12 Hours)**

**REFERENCES:**


1. M.S. Sukhija, T.K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford University Press, 2012.
2. Ashfaq Husain, HarsoonAshfaq, " Fundamentals of Electrical Engineering, $4^{th}$ Edition, DhanpatRai and Co., 2013
3. V.N. Mittle, "Basic Electrical Engineering", $2^{nd}$ Edition, Tata McGraw Hill Publication.
4. B.L. Theraja, A.K. Theraja, " A Text Book of Electrical Technology, Volume-1, S. Chand Publication
5. Debashisha Jena, "Basic Electrical Engineering", $1^{st}$ edition, Wiley India Publication, 2012.
6. B.L. Theraja, R.S. Sedha, " Principles of Electric Devices and Circuits", S. Chand Publication, $1^{st}$ edition, 2006

**Course Title: Human Values and General Studies**
**Course Code: SGS107B**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 0 |

**Course Objective:**

**a)** To sensitize students about the role and importance of human values and ethics in personal, social and professional life.
**b)** To enable students to understand and appreciate ethical concerns relevant to modern lives.
**c)** To prepare a foundation for appearing in various competitive examinations
**d)** To sensitize the students about the current issues and events of national and international importance
**e)** To provide opportunity to the students to study inter disciplinary subjects like Geography, Science, Economy, Polity, History, International Relations etc.

**UNIT-A**

**Human Values**

**1.** **Concept of Human Values:** Meaning, Types and Importance of Values.
**2.** **Value Education :** Basic guidelines for value education
**3.** **Value crisis and its redressal**

**Being Good and Responsible**

**1.** Self-Exploration and Self Evaluation
**2.** Acquiring Core Values for Self Development
**3.** Living in Harmony with Self, Family and Society
**4.** Values enshrined in the Constitution: Liberty, Equality
**5.** Fraternity and Fundamental Duties.

**(10Hours)**

**UNIT-B**

**Value – based living**

**1.** Vedic values of life
**2.** *Karma Yoga* and *Jnana Yoga*
**3.** *AshtaMarga* and *Tri-Ratna*

**Ethical Living:**

**1.** Personal Ethics
**2.** Professional Ethics
**3.** Ethics in Education

**(12Hours)**

**UNIT-C**

**General Geography**

**World Geography**

The Universe, The Solar System, The Earth, Atmosphere, The World we live in, Countries rich in Minerals, Wonders of the World, Biggest and Smallest.

**Indian Geography**

Location, Area and Dimensions, Physical Presence, Indian States and Union Territories, Important sites and Monuments, Largest-Longest and Highest in India.

**General History**

Glimpses of India History, Ancient Indian, Medieval India, Modern India, Various Phases of Indian National Movement, Prominent Personalities, Glimpses of Punjab history with special reference to period of Sikh Gurus

**Glimpses of World History**

Important Events of World History, Revolutions and Wars of Independence, Political Philosophies like Nazism, Fascism, Communism, Capitalism, Liberalism etc.

**Indian Polity: Constitution of India**

Important Provisions, Basic Structure, Union Government, Union Legislature and Executive, State Government: State Legislature and Executive, Indian Judiciary, The Election Commission, Panachayati Raj System, RTI etc.

**General Economy**

The process of liberalization, privatization, globalization and Major World Issues, Indian Economy, Indian Financial System, Major Economic Issues, Economic Terminology.

**(12Hours)**

**UNIT-D**

**General Science**

General appreciation and understandings of science including the matters of everyday observation and experience, Inventions and Discoveries

**Sports and Recreation**

The World of Sports and recreation, Who's Who is sports, Major Events, Awards and Honours. Famous personalities, Festivals, Arts and Artists

**Current Affairs**

National and International Issues and Events in News, Governments Schemes and Policy Decisions

**Miscellaneous Information**

**Who is who?**

Books and Authors, Persons in News, Awards and Honours, Abbreviations and Sports

**(12Hours)**

**REFERENCES:**


1. Human Values, A N Tripathi, New Age International Publishers, New Delhi, Third Edition, 2009
2. Professional Ethics, R. Surbiramanian, Oxford University Press, New Delhi, 2013.
3. Human Values and Professional Ethics, RishabhAnand, SatyaPrakashan, New Delhi, 2012
4. Human Values and Professional Ethics, SanjeevBhalla, SatyaPrakashan, New Delhi, 2012.
5. Human Values and Professional Ethics, RituSoryanDhanpatRai& Co. Pvt. Ltd., First Edition, 2010.
6. Human Values and Professional Ethics by Suresh Jayshree, Raghavan B S, S Chand & Co. Ltd. , 2007.
7. Human Values and Professional Ethics, Yogendra Singh, AnkurGarg, Aitbs publishers, 2011.
8. Human Values and Professional Ethics, Vrinder Kumar, Kalyani Publishers, Ludhiana, 2013.
9. Human Values and Professional Ethics, R R Gaur, R. Sangal, GP Bagaria, Excel Books, New Delhi 2010.
10. Values and Ethics, Dr.BramwellOsula, Dr.SarojUpadhyay, Asian Books Pvt. Ltd., 2011.
11. Indian Philosophy, S. Radhakrishnan, George Allen &Unwin Ltd., New York: Humanities Press INC, 1929.

12. Essentials of Hinduism, Jainism and Buddhism, A N Dwivedi, Books Today, New Delhi – 1979
13. Dayanand : His life and work, SurajBhan, DAVCMC, New Delhi – 2001.
14. Esence of Vedas, KapilDevDwivedi, Katyayan Vedic SahityaPrakashan, Hoshiarpur, 1990.
15. Vedic Concepts, Prof. B BChaubey, Katyayan Vedic SahityaPrakashan, Hoshiarpur, 1990.
16. Advance Objective General Knowledge, R. S. Aggarwal, S. Chand Publisher (2013)
17. Concise General Knowledge Manual 2013, S. Sen, Unique Publishers,2013
18. Encyclopedia of General Knowledge and General Awareness by R P Verma, Penguin Books Ltd (2010)
19. General Knowledge Manual 2013-14, Edgar Thorpe and Showick Thorpe, The Pearson, Delhi.
20. General Knowledge Manual 2013-14, MuktikantaMohanty, Macmillan Publishers India Ltd., Delhi.
21. India 2013, Government of India (Ministry of Information Broadcasting), Publication Division, 2013.
22. Manorama Year Book 2013-14, MammenMethew, Malayalam Manorama Publishers, Kottayam, 2013.
23. Spectrum's Handbook of General Studies – 2013-14, Spectrum Books (P) Ltd., New Delhi

**CURRENT AFFAIRS**

**Magazines**

- Economic and Political Weekly, Yojna, the Week, India Today, Frontline, Spectrum.
- Competition Success Review, Competition Master, Civil Services Chronicle, Current Affairs, World Atlas Book

**Newspapers**

- The Hindu, Times of India, The Hindustan Times, The Tribune

**Course Title**: **Manufacturing Practice**
**Course Code: MEC104**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Course Objective:**

1. Know basic workshop processes, Read and interpret job drawing.
2. Identify, select and use various marking, measuring, holding, striking and cutting tools & equipment's
3. Operate and control different machines and equipment's.

**CARPENTRY SHOP**

- **a)** Preparation of half lap joint
- **b)** Preparation of Mortise and Tenon Joint
- **c)** Preparation of a Dove & Tail joint
- **d)** To prepare a White board duster

**Welding Shop:**

- **a)** Preparation of Joint by Arc Welding
- **b)** Preparation of Joint by using Gas Welding
- **c)** Preparation of Joint by MIG/ TIG Welding
- **d)** Preparation of Joint by Spot/ Seam Welding

**Smithy Shop**

- **a)** To Forge the L – Hook
- **b)** To Forge a Chisel
- **c)** To Forge a Cube from a M.S Round
- **d)** To forge a screw driver

**Fitting Shop**

- **a)** Filing a dimensioned rectangular or square piece and prepare a sq. fitting
- **b)** Preparation of T fitting male part
- **c)** Preparation of U fitting Female part
- **d)** Internal thread Cutting in Square piece and external thread cutting on a rod and assembling as a paper weight

**Foundry Shop:**

- **a)** To make a Mould of solid pattern
- **b)** To prepare a mould of sleeve fitting using gating system
- **c)** To make a Mould of Split Pattern using Cope & Drag
- **d)** To check the Hardness of the Mould
  To check the Moisture Content in the Molding Sand
  To check the Compressive Strength of Molding Sand

**Sheet-Metal Shop**

- **a)** Preparation of a funnel from G.I. sheet
- **b)** Preparation of a book rack stand from G.I. Sheet
- **c)** Preparation of a leak proof tray with inclined edges from G.I. Sheet
- **d)** Preparation of a square pen stand from G.I. Sheet with riveting at corners

**Machine Shop**

- **a)** To make a job using step turning and grooving
- **b)** To make a job using knurling and threading
- **c)** To make a multi operation job on a Lathe machine
- **d)** To make V – slot by using shaper machine

**Electrical Shop**

- **a)** Layout of electrical tube light wiring
- **b)** Layout of stair case wiring using two way switch
- **c)** Testing and rectification of simulated faults in electrical appliances such as 'Electric Iron' Ceiling Fan. Electric kettle
- **d)** To fabricate a circuit for the electrical wiring of, Fan with regulator and Bulb through a main switch and its testing using a series lamp

**REFERENCES:**


1. Johl K. C., "Mechanical Workshop Practice", Prentice Hall India, 1st Edition.
2. Bawa H.S., "Workshop Technology", Tata McGraw Hill, 7th Edition.

**Course Title: Engineering Physics Lab**
**Course Code: PHY152A**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objective:** The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

**Note**:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

**List of Experiments:**

**Experimental skills**: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

1. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
2. To determine the Dispersive Power and resolving power of the Material of a given Prism using Mercury Light.
3. To determine wavelength of sodium light using Fresnel Biprism.
4. To determine wavelength of sodium light using Newton's Rings.
5. To determination Wavelength of Sodium Light using Michelson's Interferometer.
6. To determine the wavelength of Laser light using Diffraction of Single Slit.
7. To determine the wavelength of (1) Sodium and (2) Mercury Light using Plane Diffraction Grating.
8. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.
9. To study the wavelength of spectral lines of sodium light using plane transmission grating.
10. To study the specific rotation of sugar solution Laurent's half shade Polari meter method
11. To study the numerical aperture and propagation losses using HeNe laser Optical fiber set up.
12. To compare the focal length of two lenses by Nodal slide method.
13. To find the unknown low resistance by Carey Foster bridge.
14. To determine the beam divergence of the HeNe laser.
15. To study the Meissner's effect in superconducting sample.
16. To study the Faraday law of electromagnetic induction.
17. To study the capacitance by flashing/quenching of Neon bulb kit
18. To compare the two unknown capacitances of two capacitors by using DeSauty's bridge.
19. To find our out the unknown inductance by using the Anderson's bridge method.
20. To study the numerical aperture and propagation losses for He-Ne laser by using the optical fibre set up for
21. To study the Planck's constant by using photoelectric cell method.

**Course Title: Electrical and Electronics Technology Lab**
**Course Code: ELE106**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objective:** This course provides a practical aspect of Circuit Analysis using Ohm's law, Kirchhoff's laws and network theorems, to understand the constructional detail of Electrical machines.

**List of Experiments**

1. To verify Ohm's Law, Kirchhoff's Current Law and Kirchhoff's Voltage Law.
2. To verify Thevenin's and Norton's theorems.
3. To verify Superposition theorem.
4. To verify Maximum Power Transfer theorem.
5. To study frequency response of a series R-L-C circuit and determine resonant frequency and Q-factor for various values of R, L and C
6. To study frequency response of a parallel R-L-C circuit and determine resonant frequency and Q-factor for various values of R, L and C.
7. To perform direct load test of a transformer and plot efficiency versus load characteristics.
8. To perform open circuit and short circuit test on transformer.
9. To perform speed control of DC motor.
10. Measurement of power in a three phase system by two wattmeter method.
11. To plot the V-I characteristics of PN-junction diode.
12. To verify the truth table of logic gates.
13. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
14. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor)

**Course Title**: **Object Oriented Programming**
**Course Code: CAI201**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** To understand the basic concepts of object oriented programming language.
**Learning Outcomes:** Students will feel comfortable working with computers and will have practical knowledge about Object-Oriented programming language (C++/Java Language).

**UNIT-A**

**Object-Oriented Programming Concepts**

Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, Basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, abstraction, encapsulation, data hiding, inheritance, overloading and polymorphism.

**Arrays, Pointers and Functions**

Array declaration, character array, multidimensional array, Declaring and initializing pointers, accessing data through pointers, arrays and pointers, types of pointers- generic, void and function, Pointers to pointers. Defining a function, Actual and Formal Arguments, Local and global variables, Nested functions, Recursive functions, Inline functions.

**(12Hours)**

**UNIT-B**

**Classes and Objects**

Specifying a class, creating class objects, accessing class members, access specifiers, static members, nested classes, local classes, abstract classes.

**Constructors and Destructors**: copy constructor, dynamic constructors, and explicit constructors.

**Operator Overloading and Type Conversion**

Overloading operators, rules for overloading operators, Overloading of various operators, Type conversion.

**(12Hours)**

**UNIT-C**

**Inheritance**

Introduction, defining derived classes, Types of inheritance, virtual base class, pure virtual functions, Friend functions, overriding member functions.

**Polymorphism**

Concept of binding - early binding and late binding, Virtual functions, abstract classes, Virtual destructors.

**Standard Input/output Operations**

Concept of streams, hierarchy of console stream classes, Input/output using overloaded operators >> and << of I/O stream classes, formatting output, Manipulators**.**

**(15Hours)**

**UNIT-D**

**Working with Files**

File streams, hierarchy of file stream classes, Error handling during file operations, Reading/writing of files, updating files.

**Exception Handling**

Review of traditional error handling, basics of exception handling, Exception handling mechanism, throwing mechanism, catching mechanism.

**Standard Template Library**

Overview of Standard Template Library, Containers, Iterators, Other STL Elements, Vectors.

**(10Hours)**

**REFERENCES:**


1. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill.
2. D. Ravichandran, "Programming in C++"
3. Lafore R., "Object Oriented Programming in C++", Waite Group.
4. Herbert Schildt, "The Complete Reference to C++ Language", McGraw Hill-Osborne.
5. BjarneStroustrup, "The C++ Programming Language", Addison Wesley.
6. Lippman F. B, "C++ Primer", Addison Wesley.

**Course Title**: **Computer Organization & Architecture**
**Course Code: CAI203**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:** This course offers a good understanding of the various functional units of a computer system and prepares the student to be in a position to design a basic computer system.
**Learning Outcomes:** After the completion of this course the participants would gain the knowledge of the working of the each functional and finally the student will be exposed to the recent trends in parallel and distributed computing and multithreaded application.

**UNIT-A**

**Introduction**
Basic organization of computers, Block level description of the functional units as related to the execution of a program; Fetch, decode and execute cycle.

**Register Transfer and Micro operations**
Register transfer language, Inter-Register Transfer, Arithmetic Micro-operations, Logic and Shift micro-operations Language, Control functions.

**Arithmetic Logic Unit**
Arithmetic, logic and shift micro operations. Constructing an arithmetic logic shift unit.

**(10Hours)**

**UNIT-B**

**Basic Computer Architecture and Design**
Computer registers, Computer Instructions-Instruction Set Completeness. Classifying Instruction Set Architecture. Basic steps of Instruction Execution. Hardwired Control. Micro programmed Control. Horizontal and Vertical Microprogramming. Interrupts.

**Central Processing Unit**
General Register Organization. Stack Organized CPU. Instruction Formats, Addressing Modes. Data Transfer and Manipulation, RISCVs CISC.

**(11Hours)**

**UNIT-C**

**Pipelining**
Parallel and pipeline Processing, Pipeline Control, Pipeline Implementations, Conflicts Resolution, and Pipeline Hazards. Vector Processing, and Array Processors.

**Memory Organization**
Memory Systems: principle of locality, principles of memory hierarchy Caches, associative memory, main memory, Virtual memory, Paging and Segmentation, Memory Interleaving.

**(10Hours)**

**UNIT-D**

**Input Output Organization**
I/O performance measures, types and characteristics of I/O devices, I/O Modes-Programmed I/O, Interrupt Initiated I/O and DMA. Buses: connecting I/O devices to processor and memory, interfacing I/O devices to memory, processor, and operating system.

**Parallel Computers**
Classification, SIMD, MIMD Organizations, Instruction and Arithmetic Pipeline, Parallel Processing.

**(15Hours)**

**REFERENCES:**


1. M Moris Mano, "Computer System Architecture", Pearson Education, 3rd Edition 1993.
2. David A. Patterson and John L. Hennessy, "Computer Organization & Design-The Hardware/Software Interface", Morgan Kaufmann, 2nd Edition 1997.
3. William Stallings, "Computer Organisation and Architecture, Designing for Performance", Pearson Education Asia, 6th Edition 2003.
4. Harry F. Jordan and Gita Alaghband, "Fundamentals of Parallel Processing", Pearson Education, 1st Edition 2003.
5. J.P. Hayes, "Computer System Architecture", Prentice Hall of India, New Delhi.

**Course Title**: **Data Structure and Algorithms**
**Course Code: CAI205**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objective**:-To impart knowledge of Data Structure and How to design Algorithms to solve different types of problems and to differentiate linear and nonlinear data structure.
**Learning outcomes**:-After reading data structure, student will be able to explain data structure and its scope in computer science. After completion of data structure, students will be able to find the best solution about specific types logical and mathematical problems.

**UNIT-A**

**Introduction**
Basic terminology: Elementary Data Organizations,Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off Algorithms, Control Structure and Complexity of Algorithms.

**Array**
Representation of Linear array in memory, Traversing linear Array, Searching Techniques: Linear search, Binary Search, Complexity of linear search and binary search and their analysis and 2D-Array, Representation of 2D-Array in memory. Records, Record Structures.

**(10Hours)**

**UNIT-B**

**Linked List**
Representation of Linear Linked List, Traversing a linked list, Operations on linked list, Memory Allocation, Garbage collection, Overflow and Underflow. Doubly linked list, Operations on 2-way linked list, Advantages and disadvantages of 2-way linked list, Circular Linked List, Header Linked Lists, types of header linked list and Application of linked list**.**

**(11Hours)**

**UNIT-C**

**Stacks and Queues**
Array representation of stacks/Operation on Stack: Push and pop, Arithmetic Expressions; Polish Notation, Evaluation of a postfix expression, Transforming infix expression into postfix expressions. Quick Sort: An Application of Stack, Complexity of Quick Sort, Recursion: Factorial function, Fibonacci sequence and Towers of HANOI. Representation of Queue, Operations performed on Queues, Deques and Priority Queues.

**Trees**
Basic terminology, Binary Trees, Complete Binary Trees, Extended Binary Trees: 2-Trees, Representation of binary trees in memory. Traversing Binary Trees: Pre order, In order and Post order. Binary Search Trees, Searching& Inserting in Binary Search Tree, Deleting in a binary search tree. Heap, Heapsort,deleting the root of a Heap, General trees and Computer representation of General trees.AVL Tree; Applications of Binary Trees. B Tree, B+ Tree.

**(11Hours)**

**UNIT-D**

**Graph**
Basic Terminology, Representation of Graph, Traversing of Graph: Breadth-First Search and Depth-First Search and Applications of Graphs etc.

**Sorting and Hashing**

Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Bucket Sort, Radix Sort, Hashing and Hash Function sets.

**(10Hours)**

**REFERENCES**:


1. LipschutzSchaumseries: TataMcGrawHill.
2. Y.Langsam, M.J.Augenstein, A.M.Tanenbaum,Data Structures using C and C++,2nd Edition, Pearson Education
3. R.Kruse, C.L.Tondo,B.Leung,S.Mogalla,Data Structures & Program Design in C.2nd Edition, Pearson Education
4. Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Science Press.
5. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
6. Data Structures, RS Salaria, Khanna Publishing House

**Course Title**: **Digital Electronics**
**Course Code: CAI207**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objectives:** The purpose of this course is to develop a strong foundation in analysis and design of digital electronics.
**Learning Outcomes:** At the end of the course students should be able to:

- Understand concepts of combinational and sequential circuits.
- Analyse the synchronous and asynchronous logic circuits.

**UNIT-A**

**Number System and Binary Code:** Introduction, Binary, Octal, Hexadecimal & some nonstandard Number:-Conversions, Addition, Subtractions, Multiplication, Division, Weighted-Non weighted codes, Signed - unsigned numbers, Binary Subtractions using 1's and 2's compliment, ASCII code, Excess 3 code, Grey code, BCD code and BCD additions & BCD Subtractions.**Minimization of logic function:** Review of gates: - OR, AND, NOT, NOR, NAND, EX-OR, EX-NOR, Universal gates.

**(14Hours)**

**UNIT-B**

**Minimization of logic function:** Basic theorem of Boolean algebra, Sum of Products and Product of Sums, canonical form, Minimization using: - Boolean algebra, K-map and Q-M method.
**Combinational Circuits:** Introduction, Combinational circuit design, Encoders, decoders, Adders, Sub tractors and Code converters, Parity checker, seven segment display, Magnitude comparators. Multiplexers, De-multiplexer, Implementation of Combinational circuit using MUX & De-MUX.

**(14Hours)**

**UNIT-C**

**Sequential Circuits:** Introduction, flip flops, Clocked flip flops, SR, JK, D, T and edge triggered flip-flops, Conversions of Flip flops, Shift Registers, Type of Shift Registers, Ring Counter, Twisted Ring Counter, Counters, Counter types, counter design with state equation and state diagrams.Serial to parallel converter, parallel to serial converter, sequence generator,ripple(Asynchronous) counters, synchronous counters, counters design using flip flops,specialcounter IC's, asynchronous sequential counters, applications ofcounters.
**D/A and A/D Converters:** Introduction, Weighted register D/A converter, binary ladder D/A converter, steady state accuracy test, monotonicity test, D/A accuracy and resolution, A/D converter:- Simultaneous, Counter type, Continuous, Successive approximation, Single and dual slope A/D converter, A/D accuracy and resolution.

**(14Hours)**

**UNIT-D**

**Semiconductor Memories:** Introduction, Memory organization, Classification and characteristics of memories, Sequential memories, ROMs, R/W memories, Content addressable memories, PLA and PAL, charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).
**Logic Families:** RTL, DCTL, DTL, Schottky TTL, TTL, ECL, CMOS and its various types, Comparison of logic families.

**(14Hours)**

**REFERENCES:**


1. Morris Mano, Digital Design, Prentice Hall of India Pvt. Ltd
2. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 5 ed., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
3. R.P.Jain, Modern Digital Electronics, 3 ed., Tata McGraw–Hill publishing Company limited, New Delhi, 2003.
4. Thomas L. Floyd, Digital Fundamentals, Pearson Education, Inc, New Delhi, 2003
5. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Digital System -Principles and Applications, Pearson Education.
6. Roth, Fundamentals of Logic Design, Cengage Learning

**Course Title: Discrete Mathematics**
**Course Code: CAI209**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** The purpose of this course is to develop a strong foundation in analysis and design of digital electronics, basic mathematic theories and their applications in Computer Science.

**UNIT-A**

**Set Theory and Logic:** Propositional Logic, First Order Logic, Predicate Calculus and Qualifiers; Proof Methods; Sets, Functions, Relations, Cardinality, Induction and Recursion; Modular Arithmetic; Boolean algebra, Infinity and Diagonalisation.

**(12Hours)**

**UNIT-B**

**Coding Theory and Counting:** Coding Theory: Error correcting coding, Hamming codes, Hamming bound; Basic Counting- Pigeon hole principle; advanced counting- recurrence relations, generating functions, inclusion –exclusion.

**Information Theory and Probability**: Basic information theory, entropy, inequality, mutual information, upper and lower bounds; Probability – sample space, conditional probability, variance, Markov, Chebyshev, probabilistic methods.

**(14Hours)**

**UNIT-C**

**Number System and Binary Code:** Introduction, Binary, Octal, Hexadecimal & some nonstandard Number:-Conversions, Addition, Subtractions, Multiplication, Division, Weighted-Non weighted codes, Signed - unsigned numbers, Binary Subtractions using 1's and 2's compliment, ASCII code, Excess 3 code, Grey code, BCD code and BCD additions & BCD Subtractions.

**Minimization of logic function:** Review of gates: - OR, AND, NOT, NOR, NAND, EX-OR, EX-NOR, Universal gates.

**(12Hours)**

**UNIT-D**

**Graph Theory:** Graphs and digraphs, incidence and adjacency matrices, isomorphism; Connectivity: Cut vertices, cut edges; Paths and Cycles; Traveling Salesman problem, diameter and maximum degree, shortest paths; Eulerian, Hamiltonian & Planar graphs, duality, Euler's formula, Kuratowski's theorem, Edge and vertex coloring; Trees- Binary and Spanning

**(10Hours)**

**REFERENCES**

1. Seymour Lipschutz, Set Theory and Related Topics, McGraw Hill Education.
2. V. K. Balakrishnan, Introductory Discrete Mathematics, Dover Publications Inc.
3. Seymour Lipschutz, Essential computer Mathematics, McGraw Hill Education.
4. NarsinghDeo, Graphy Theory with Applications To Engineering And Computer Science, Prentice Hall India Learning Private Limited

**Course Title**: **Object Oriented Programming Lab**
**Course Code: CAI211**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Instruction for Students:** The candidate will be attending a laboratory session of 4 hours weekly and students have to perform the practical related to the following list.

**List of Experiments**

1. Introduction to basic structure of C++ program, utility of header and library files.
2. Implementation of programs related to the basic constructs in C++
3. Programs using different data types in C++
4. Programs using Loops and Conditional Statements in C++
5. Programs using Manipulators in C++
6. Programs using arrays in C++.
7. Programs to illustrate the usage of pointers in C++
8. Programs to illustrate the types of functions in C++
9. Program to differentiate the usage of call by value method and call by reference method.
10. Programs related to string handling in C++
11. Programs to illustrate the concept of function and operator overloading
12. Program to demonstrate the objects of the class and their working
13. Programs to implement the working of constructor & destructor
14. Program to implement the concept of function overriding.
15. Programs to implement Inheritance and its types
16. Programs using early and late binding
17. Programs to show the working of abstract classes
18. Programs to show the working of Exception Handling
19. Program to illustrate the concept of File handling
20. At least one example of large program development.

**This is only the suggested list of practicals. Instructor may frame additional practical relevant to the course contents.**

**Course Title**: **Data Structures Lab**
**Course Code: CAI213**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Course Objectives:-**Algorithm development in all areas of data structures covered in the course. Emphasis should be given on the following matters. Development of recursive as well as non-recursive algorithms involving linked list trees and graphs. Use of pointers for dynamic allocations of storage. Development of classes for some of the data structures using the concept of abstract data types.

**List of Experiments**

**1** W.A.P and algorithm to check whether the number is greater or not.
**2** W.A.P and algorithm to print whether the given number is even or odd.
**3** W.A.P and algorithm to check whether the entered number is prime or not.
**4** W.A.P to perform various types of Arithmetic operations.
**5** W.A.P to store the marks of a student in array and then print the result.
**6** W.A.P to traversing of linear array.
**7** W.A.P to implement Linear Search.
**8** W.A.P to implement Binary Search.
**9** W.A.P to implement Bubble Sort.
**10** W.A.P to implement Selection sort.
**11** W.A.P to generate the Fibonacci series using Array.
**12** W.A.P to find the transpose of matrix.
**13** W.A.P to addition, subtraction and multiplications of two matrix.
**14** W.A.P to know length of given string.
**15** W.A.P to demonstrate the operation performed on stack.
**16** W.A.P to implement TOWER of HANOI.
**17** W.A.P to implement PUSH and POP operations of stack.
**18** W.A.P to evaluation of a Postfix Expression.
**19** W.A. P to implement one-way linked list.
**20** W.A.P to implement various operations performed on one-way linked list.
**21** W.A. P to implement two- way linked list.
**22** W.A.P to implement various operations performed on two-way linked list.
**23** W.A.P to insert and delete node from graph.
**24** W.A.P to implement Breadth First Search.
**25** W.A.P to implement Depth First Search.

**Course Title**: **Digital Electronics Lab**
**Course Code: CAI215**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:** To reinforce learning in the accompanying CSE231 course through hands-on experience with digital electronic circuit analysis, design, construction, and testing. To provide the student with the capability to use simulation tools in digital electronic circuit analysis and design.
**Learning Outcomes:** To develop necessary skill in designing, analysing and constructing digital electronic circuits**.**

**List of Experiments**

1. Verification of the truth tables of TTL gates, e.g., 7400, 7402, 7404, 7408, 7432, 7486.
2. Verify the NAND and NOR gates as universal logic gates.
    a) Verification of the truth table of the Multiplexer 74150.
    b) Verification of the truth table of the De-Multiplexer 74154.
3. Design and verification of the truth tables of Half and Full adder circuits.
4. Design and verification of the truth tables of Half and Full subtractor circuits.
5. Design and test of an S-R flip-flop using NOR/NAND gates.
    a) Verify the truth table of a J-K flip-flop (7476)
    b) Verify the truth table of a D flip-flop (7474)
6. Operate the counters 7490, 7493 and 74194. Verify the frequency division at each stage and with a low frequency clock (say 1 Hz) display the count on LEDs.
7. Verify the truth table of decoder driver 7447/7448. Hence operate a 7 segment LED display through a counter using a low frequency clock.
8. Repeat the above with the BCD to Decimal decoder 7442 and an array of LEDs
9. Design and test D/A converter using R-2R Ladder Network
10. Study and test of A/D converter.

**Course Title: Community Engagement Course**
**Course Code: CEC101**

| L | T | P | Credits |
|---|---|---|---|
| 1 | 0 | 0 | 1 |

## Course Objectives:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

**Learning Outcomes:** After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

**Course Weightages:**

**Seminar/Assignment/Project: 45%** **Attendance: 5%** **End Semester Examination: 50%**

### UNIT-A

**Appreciation of Rural Society:** Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages' (Gandhi), rural infrastructure.

**Teaching Methodology:** Classroom Discussions

**(2 hours)**

**Assignment:** Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.

**Mode of Assignment Submission:** Written Assignment

**(2 hours)**

### UNIT-B

**Understanding rural economy & livelihood:** Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets

**Teaching Methodology:** Group Discussions in Class

**(4 hours)**

**Assignment:** Describe your analysis of rural household economy, its challenges and possible pathways to address them.

**Mode of Assignment Submission:** Written Assignment

**(1 hour)**

### UNIT-C

**Rural Institutions:** Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration.

**Teaching Methodology:** Classroom Discussions

**(2 hours)**

**Assignment:** How effectively are Panchayati raj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual).

**Mode of Assignment Submission:** Group presentations of Assignment

**(2 hours)**

### UNIT-D

**Rural Developmental Programmes:** History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM AwaasYojana, Skill India, Gram panchayat Decentralised Planning, NRLM, MNREGA, etc.

**Teaching Methodology:** Classroom Discussions

**(2 hours)**

**Assignment:** Describe the benefits received and challenges faced in the delivery of one of these programmes in the rural community; give suggestions about improving implementation of the programme for the rural poor.
**Mode of Assignment Submission:** Written Assignment

**(2 hours)**

**RECOMMENDED READINGS**

**BOOKS:**

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015 un.org/sdgs/
4. M.P.Boraian, Best Practices in Rural Development, Shanlax Publishers, 2016.

**JOURNALS:**

1. Journals of Rural development, (published by NIRD & PR Hyderabad)
2. Indian Journal of Social Work, (by TISS, Bombay)
3. Indian Journal of Extension Education (by Indian Society of Extension Education)
4. Journal of Extension Education (by Extension Education Society)
5. Fostering Social Responsibility & Community Engagement in Higher Education Institutions in India
6. Kurukshetra (Ministry of Rural Development, GoI)
7. Yojana (Ministry of Information and Broadcasting, GoI)

**Course Title: Community Engagement Field Activities**
**Course Code: CEC102**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 1 | 1 |

**Course Weightage:**

Practical CA: 50% End Term Practical Examination: 50%

The students are required to spend a total of 15 hours in field and select any 5 activities from among the following:

- Interaction with SHG women members, and study of their functions and challenges; planning for their skill building and livelihood activities
- Visit MGNREGS project sites, interact with beneficiaries and interview functionaries at the work site
- Field visit to Swachh Bharat project sites, conduct analysis and initiate problem solving measures
- Conduct Mission Antyodaya surveys to support under Gram Panchayat Development Plan (GPDP)
- Interactive community exercise with local leaders, panchayat functionaries, grass-root officials and local institutions regarding village development plan preparation and resource mobilization
- Visit Rural Schools / mid-day meal centres, study Academic and infrastructural resources and gaps
- Participate in Gram Sabha meetings, and study community participation
- Associate with Social audit exercises at the Gram Panchayat level, and interact with programme beneficiaries
- Attend Parent Teacher Association meetings, and interview school drop outs Fostering Social Responsibility & Community Engagement in Higher Education Institutions in India
- Visit local Anganwadi Centre and observe the services being provided
- Visit local NGOs, civil society organisations and interact with their staff and beneficiaries,
- Organize awareness programmes, health camps, Disability camps and cleanliness camps
- Conduct soil health test, drinking water analysis, energy use and fuel efficiency surveys
- Raise understanding of people's impacts of climate change, building up community's disaster preparedness
- Organise orientation programmes for farmers regarding organic cultivation, rational use of irrigation and fertilizers and promotion of traditional species of crops and plants.
- Formation of committees for common property resource management, village pond maintenance and fishing.

**Course Title**: **Introduction to Artificial Intelligence and Data Science**
**Course Code: CAI202**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objective:** To provide strong foundation for data science and application area related to it and understand the underlying core concepts and emerging technologies in data science.

**Learning Outcomes:** After the completion of this course the participants would gain the knowledge regarding insights of Data Science.

**UNIT-A**

**Introduction to Artificial Intelligence**: Definitions of AI, Intelligent Agents, Problem solving. Knowledge, Reasoning and Planning: Logical Agents, Classical Planning, Knowledge Representation and Reasoning.

**Learning**: Learning from examples, Knowledge in learning. Communicating, Perceiving and Acting: Communication, Natural Language Processing, Perception, Computer Vision, Robotics.

**(10Hours)**

**UNIT-B**

**AI Applications (General)**: Speech Recognition, Image Recognition, Natural Language Processing, Autonomous Transportation. Natural Language understanding, recognizing objects and describing images, Dimensionality reduction, feature selection and feature extraction.

**AI Applications (Specific):** Virtual Personal Assistants/ Chatbots, Gaming, Smart Cars, Drones, Fraud Detection, Software Testing and Development, Business, Health Care, Education, Finance.

**(12Hours)**

**UNIT-C**

**Introduction to Data Science**: Data Science-a discipline, Landscape-Data to Data science, Data Growth-issues and challenges, data science process. Foundations of data science.

**Data Exploration and Preparation**: Structured vs. unstructured data, Quantitative vs. qualitative data. Four levels of data – nominal, ordinal, interval, ration. Messy data, Anomalies and artifacts in datasets. Cleaning data.

**(11Hours)**

**UNIT-D**

**Data Representation and Transformation**: Forms of data-tabular, text data, graph-based data. Modern databases- text files, spreadsheets, SQL databases, NoSQL databases, distributed databases, live data streams. Representation of data of special types-acoustic, image, sensor and network data. Computing with Data: Overview of various tools. Basics of Generative modeling and Predictive modeling.

**Applications of Data Science:** Applications in in Business, Insurance, Energy, Health care, Biotechnology, Manufacturing, Utilities, Telecommunication, Travel, Governance, Gaming, Pharmaceuticals, Geospatial analytics and modeling

**(13Hours)**

**REFERENCES:**


1. Jeffrey S. Saltz, Jeffrey M. Stanton, 2018, An Introduction to Data Science, SAGE Publications
2. 2. Chirag Shah, 2020, A Hands-On Introduction to Data Science, Cambridge University Press
3. An Introduction to Statistical Learning: with Applications in R, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer, 1st edition, 2013
4. Data Science from Scratch: 1st Principles with Python, Joel Grus, O'Reilly, 1st ed., 2015.

**Course Title**: **Data Communication**
**Course Code: CAI204**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objective:** This course provides knowledge about various types of Network, Network Topologies, and protocols.
**Learning Outcomes:** After the completion of this course the participants would gain the knowledge of how a network works during data communication.

**UNIT-A**

**Introduction**
Data Communication: Components, Data Flow; Network Categories: LAN, MAN, WAN (Wireless / Wired); Network Software: Concept of layers, protocols, interfaces and services; Reference Model: OSI, TCP/IP and their comparison.

**Physical Layer**
Concept of Analog & Digital Signal; Bit rate, Bit Length; Transmission Impairments: Attenuation, Distortion, Noise; Data rate limits: Nyquist formula, Shannon Formula; Multiplexing: Frequency Division, Time Division, Wavelength Division; Transmission media: Twisted pair, coaxial cable, fiber optics, wireless transmission (radio, microwave, infrared);Circuit Switching & Packet Switching.

**(14Hours)**

**UNIT-B**

**Data Link Layer**
Error correction & Detection; Flow & Error Control; Sliding window protocols: Stop & Wait ARQ, Go back n ARQ, Selective repeat ARQ; Examples of DLL Protocols-HDLC, PPP;Medium Access Sub layer: Channel Allocation; Random Access: ALOHA, CSMA protococails; Controlled Access: Polling, Reservation, Token Passing.

**(10Hours)**

**UNIT-C**

**Network Layer:** Routing algorithms- Distance vector, Link State Routing, Hierarchical Routing, Broadcast & Multicast Routing; Congestion Control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket &Token bucket algorithms**.**

**(10Hours)**

**UNIT-D**

**Transport Layer:** Addressing, flow control & buffering, multiplexing & de-multiplexing, crash recovery; Example transport protocols: TCP, SCTP and UDP.
**Application Layer:** Network Security; Domain Name System; Simple Network Management Protocol; Electronic Mail.

**(14Hours)**

**REFERENCES:**


1. Andrew S. Tanenbaum "Computer Networks" Ed Pearson Education 4th Edition, 2003.
2. James F. Kurose and Keith W. Ross "Computer Networking" Pearson Education, 2002.
3. William Stalling, "Data and Computer Communication", Pearson Education, 7th Edition, 2nd Indian Reprint 2004.
4. Miller "Data and Network Communication" Ed Thomson Learning, 2001.
5. Douglas E Comer, "Computer Networks and Internets", Pearson Education 2nd Edition, 5th Indian Reprint 2001

**Course Title**: **Operating System Concepts**
**Course Code: CAI206**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:** This course should provide the students with good understanding of Operating System including its architecture and all its components.
**Learning Outcomes:** After the completion of this course the participants would understand the overall architecture of the operating system and its main components, Functions of Kernel, file system architecture and implementation, concurrent programming and concurrency.

**UNIT-A**

**Introduction:** What is an O.S., O.S. Functions; Different types of O.S.: batch, multi-programmed, time sharing, real-time, distributed, parallel; General structure of operating system, O/S services, system calls.
**Process Management:** Introduction to processes - Concept of processes, process scheduling, Process control block, operations on processes; Inter process communication, Critical sections, Semaphores, Message passing; CPU scheduling- scheduling criteria, preemptive & non-preemptive scheduling, Scheduling algorithms (FCFS, SJF, RR and priority). Multiprocessor scheduling: Real Time scheduling: RM and EDF.

**(13Hours)**

**UNIT-B**

**Inter-process Communication:**Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer-Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.
**Memory Management:** Background, logical vs. physical address space, swapping; contiguous memory allocation, internal & external fragmentation, memory-compaction, paging, segmentation, Virtual Memory, demand paging, page replacement, page replacement algorithms (FIFO, Optimal, LRU); Thrashing.

**(10Hours)**

**UNIT-C**

**File Systems:** Files - file concept, file structure, file types, access methods, File attributes, file operations; directory structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), Protection mechanisms.
**Secondary Storage:**Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, and LOOK).

**(11Hours)**

**UNIT-D**

**Deadlocks:** Introduction to deadlocks, Conditions for deadlock, Resource allocation graphs, Deadlock Detection and Recovery, Deadlock Avoidance, Deadlock Prevention.
**Case Studies:**Brief introduction of MS-DOS, Windows (9x, XP, 2000), UNIX and LINUX

**(11Hours)**

**REFERENCES:**


1. Silberchatz/Galvin/Gagne, "Operating System Concepts", John Wiley 6th Edition2001
2. Peterson and Silberschatz, "Operating System Concepts", Addison-Wesley 4th Edition 1994.
3. Milenkoviac, "Operating Systems Concepts and Design", Tata McGraw-Hill 1992.
4. Charles Crowley, "Operating Systems a Design Oriented Approach", Tata McGraw-Hill 1996.

**5.** Andrews S. Tanenbaum, "Modern Operating Systems", Pearson Education, 2nd edition 2001.
**6.** W Richard Stevens, "Linux Network Programming" PHI, Ist Edition 2003

**Course Title**: **Python Programming**
**Course Code: CAI208**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objectives:** To impart knowledge of PYTHON programming methodologies and their significance.
**Learning outcomes: -** This course offers a good understanding of the concepts, methods and techniques of PYTHON.

**UNIT-A**

**Introduction to Python Installation and Working** with Python, Understanding Python variables, Python basic Operators, Understanding python blocks
**Python Data Types** Declaring and using Numeric data types: int, float, complex, using string data type and string operations, Defining list and list slicing, Use of Tuple data type
**Python Program Flow Control** Conditional blocks using if, else and elif**,** simple for loops in python, for loop using ranges, string, list and dictionaries Use of while loops in python, Loop manipulation using pass, continue, break and else Programming using Python conditional and loops block

**(11Hours)**

**UNIT-B**

**Python Functions, Modules and Packages** Organizing python codes using functions**,** organizing python projects into modules, importing own module as well as external modules, Understanding Packages, Powerful Lambda function in python Programming using functions, modules and external packages
**Python String, List and Dictionary Manipulations Building** blocks of python programs**,** understanding string in build methods**,** List manipulation using in build methods**,** Dictionary manipulation**,** Programming using string, list and dictionary in build functions
**Python File Operation** Reading config files in python**,** Writing log files in python**,** Understanding read functions, read(), readline() and readlines()**,**Understanding write functions, write() and writelines()**,**Manipulating file pointer using seek**,** Programming using file operations

**(11Hours)**

**UNIT-C**

**Python Object Oriented Programming – Oops** Concept of class, object and instances Constructor, class attributes and destructors, Real time use of class in live projects**,** Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support
**Python Regular Expression** Powerful pattern matching and searching Power of pattern searching using regex in python, Real time parsing of networking or system data using regex, Password, email, URL validation using regular expression, Pattern finding programs using regular expression

**(11Hours)**

**UNIT-D**

**Python Exception Handling** Avoiding code break using exception handling, safe guarding file operation using exception handling, Handling and helping developer with error code, Programming using Exception handling
**Python Database Interaction** SQL Database connection using python, creating and searching tables, Reading and storing config information on database, Programming using database connections

**Python Multithreading** Understanding threads**,** forking threads**,** synchronizing the threads Programming using multithreading

**(10Hours)**

**TEXT BOOKS:**

1. Allen B. Downey, ``Think Python: How to Think like a Computer Scientist‘‘, 2ndedition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python –Revised and updated for Python 3.2, Network Theory Ltd., 2011.

**REFERENCES:**

1. John V Guttag, —Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, —Exploring Python||, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
4. Kenneth A. Lambert, —Fundamentals of Python: First Programs||, CENGAGE Learning, 2012.
5. Charles Dierbach, —Introduction to Computer Science using Python: A ComputationalProblem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3||, Second edition, Pragmatic Programmers, LLC, 2013.

**Course Title**: **Engineering Mathematics-III**
**Course Code: MTH252A**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:**
The objective of the course is to enable the students to understand the basic concepts related to Laplace transforms, Fourier series, ordinary differential and partial differential equations and their applications.

**UNIT-A**

**Laplace Transforms**
Laplace transforms of various standard functions, Linear property of Laplace transforms, Shifting property and change of scale, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

**(14Hours)**

**UNIT-B**

**Fourier series**
Periodic functions, Euler's formula. Dirichlet's conditions. Fourier series of discontinuous functions. Fourier series of Even and Odd functions, half range expansions, Fourier series of different wave forms, Complex form of Fourier series. Fourier Transformation.

**(14Hours)**

**UNIT-C**

**Partial Differential Equations**
Formulation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients. Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation and their applications, solution by the method of separation of variables.

**(14Hours)**

**UNIT-D**

**Functions of Complex Variable**
Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, and harmonic functions.

**Conformal Mapping**
Definition, standard transformations, translation, rotation, inversion, bilinear.

**Complex Integration**
Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions (without proofs), singular points, poles, residue, Integration of function of complex variables using the method of residues.

**(14Hours)**

**REFERENCES:**


1. Kreyzig E.: Advanced Engineering Mathematics, John Wiley and Sons.
2. Ponnusamy S.: Foundations of Complex Analysis, Narosa Publishers.
3. Sneedon I.N.: Elements of Partial Differential Equations, McGraw-Hill.
4. Grewal B.S. Higher Engineering Mathematics, Khanna Publishers.

**Course Title**: **Operating Systems Concepts Laboratory**
**Course Code: CAI212**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**List of Experiments**

**1.** Simulation of the CPU schedulingalgorithms
   a) RoundRobin b)SJF c)FCFS d)Priority
**2.** Simulation of MUTEX andSEMAPHORES.
**3.** SimulationofBankersDeadlockAvoidanceandPreventionalgorithms.
**4.** Implementation of Process Synchronization (Reader-Writer, Sleeping Barber and Dining Philosopher'sProblem)
**5.** SimulationofpageReplacementAlgorithmsa)FIFOb)LRUc)LFU
**6.** Simulationofpagingtechniquesofmemorymanagement.
**7.** SimulationoffileallocationStrategiesa)Sequentialb)Indexedc)Linked
**8.** Simulation of file organizationtechniques
   a) SingleLevelDirectory b)TwoLevel c)Hierarchical d)DAG
**9.** ToautomatetheallocationofIPaddressesi.e.tosetandconfiguretheDHCPserverand DHCPclient.
**10.** BasicIntroductiontoLinuxOperatingSystemandShellscripting.

**This is only the suggested list of Practicals. Instructor may frame additional Practicals relevant to the course contents.**

**Course Title**: **Python Programming Lab**
**Course Code: CAI214**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:**

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, and dictionaries.
5. Read and write data from/to files in Python.

**LIST OF PROGRAMS:**

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

**This is only the suggested list of practicals. Instructor may frame additional practicals relevant to the course**

**Course Title**: **Data Communication Laboratory**
**Course Code: CAI216**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**List of Experiments**

1. Making Straight, Rollover and Cross-Over cables
2. Cable & RJ-45 Jack outlet installation
3. Basic LAN Setup and IP Addressing
4. Write a program for error detecting code using CRC
5. Write a program for Hamming Code generation for error detection and correction
6. Write a program for congestion control using Leaky bucket algorithm.
7. Study of Amplitude Modulation
8. Study of Frequency Modulation
9. Study of ASK Modulation
10. Study of FSK Modulation
11. Implementation of STOP and Wait protocol
12. Implementation of Sliding Window protocol

**This is only the suggested list of practicals. Instructor may frame additional practicals relevant to the course**

**Course Title**: **Machine Learning**
**Course Code: CAI301**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective** - The objective of the course is to provide basic understanding of the concepts of machine learning. The students will be made familiar with the concept of classification and the various algorithms used for classification.

**Learning Outcome-** The student will develop the understanding of the concepts of machine learning and various algorithms used in it.

**UNIT-A**

**Introduction**: Introduction to Machine Learning, Example Problems, Applications and its types. Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models, Features: Feature types, Construction and Transformation. Binary and Multiclass Classification, Assessing Classification performance, Class probability Estimation.

**Supervised Learning**: Training, Testing and Validation data, Data Cleaning-Handling Text and categorical attributes, Regression and its types, Cost Function, Gradient Descent-Batch, Stochastic, Mini-batch, Learning Curves, Support Vector Machines.

**(12Hours)**

**UNIT-B**

**Dimensionality Reduction:** Curse of dimensionality, Approaches- Projection, Manifold Learning, PCA Prinicipal Components, Explained variance ratio, choosing number of dimensions, Kernel PCA.

**Unsupervised Learning**: Clustering- K-Means, Hierarchical, Objective function. Rule Based Models: Rule learning for subgroup discovery, Association rule mining.

**(12Hours)**

**UNIT-C**

**Decision Tree Learning:** Introduction, Decision Tree Representation, Appropriate problem for Decision tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Leaning, Inductive Bias in Decision Tree Leaning, Issues in Decision Tree Leaning.

**Artificial Neural Networks:** Introduction, Natural Network Representations, Appropriate Problems for Neural Network Learning, Perceptions, Multilayer Network and the BACKPROPAGATION Algorithm.

**(12Hours)**

**UNIT-D**

**Bayesian Learning:** Introduction, Bayes Theorem, Bayes Optimal Classifier, Native Bayes Classifier, An Example: Learning to Classify Text.

**Instance-Based Learning:** Introduction, K-NEAREST NEIGHBOUR Learning, Distance Weighted NEAREST NEIGHBOUR Algorithm. Genetic Algorithms: Motivation, Genetic Algorithms, Genetic Programming, Parallelizing Genetic Algorithms.

**(12Hours)**

**REFERENCES:**

1. Yuxi (Hayden) Liu, “Python Machine Learning By Example”, Packt

2. Allen Downey, Jeffrey Elkner and Chris Meyers, “How to Think Like a Computer Scientist, Learning
with Python”, Green Tea Press Wellesley, Massachusetts

3. David Longbow, “Machine Learning: A Beginners Guide to the Fundamentals of Machine Learning”, PaperbacK

**Course Title**: **Database Management System**
**Course Code: CAI303**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objective:**

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

**Learning Outcomes:** After the completion of this course the participants would gain the knowledge of how to use a DBMS and how to build a DBMS.

**UNIT-A**

**Introduction to Database Systems:** Introduction to Database Systems: Introduction and applications of DBMS, Purpose of database, Data Independence, Database System architecture-levels, Mappings, Database users and DBA, File Systems Versus a DBMS, Advantages of a DBMS, DBMS Layers, Data independence.

**Relational query languages:** Relational algebra, Tuple and domain relational calculus.

**(10Hours)**

**UNIT-B**

**Data Models:** Data Models Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities, Comparison of Models, Database Design with the ER Model, Keys.

**(12Hours)**

**UNIT-C**

**Database Design:** Normalization and Normal Forms, Various dependencies in database (i.e. Functional dependencies, Multi-valued Dependency, Join Dependency, etc.) First, Second and Third Normal Forms, BCNF, Fourth and Fifth Normal Forms, Armstrong's axioms, Dependency preservation, Lossless design.

**Transaction Management:** ACID Properties, Serializibility, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem , Read-Write Locks, Deadlocks Handling, 2PL protocol and Introduction to Database Recovery and its techniques.

**(14Hours)**

**UNIT-D**

**Database Protection:** Database Threats, Access Control Mechanisms, Grant and Revoke, Firewalls, Encryption and and Digital Signatures, Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

**(12Hours)**

**REFERENCES:**

1. Date C J, “An Introduction To Database System”, Addision Wesley, Eighth Edition
2. Korth, Silbertz, Sudarshan, “Database Concepts”, McGraw Hill,
3. Elmasri, Navathe, “Fundamentals Of Database Systems”, Addision Wesley, Fifth Edition
4. Bipin C. Desai, “An introduction to Database Systems”, Galgotia Publication
5. Rob and Coronel, “Database Systems 5th Edition”,Cengage Learning, New Delhi

**Course Title**: **Software Engineering**
**Course Code: CAI305**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:** To understand the basic concepts of software engineering and software development life cycle.
**Learning Outcomes:** Students will learn about the different activities of software development and about the risk management. They will get aware about the different case tools.

**UNIT-A**

**Introduction to Software Engineering:** Software Problem, Software Engineering, Approach, Software process, Characteristics of Software Engineering Process, Software Applications, Software Crisis: Problem and Causes.
**Software Development Life Cycle:**
The waterfall model, Incremental process models, Evolutionary process models, Spiral Model.
**Requirements engineering process**:Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

**(10Hours)**

**UNIT-B**

**Software Requirements:** Functional and non-functional requirements, User requirements, System requirements, Interface specification, documenting Software Requirement Specification (SRS).
**Software Project Planning:** Cost estimation, cost estimation models, Project scheduling, Software Configuration management, Team Structure, Risk Management.
**System models:** Context Models, Behavioural models, Data models, Object models, structured methods
**Design Engineering:** Design Concepts, design models for architecture, component, data and user interfaces; Problem Partitioning, Abstraction, Cohesiveness, Coupling, Top Down and Bottom Up design approaches; Functional Versus Object Oriented Approach, Design Specification, 4GL.

**(10Hours)**

**UNIT-C**

**Creating an architectural design:**
Software architecture, Data design, Architectural styles and patterns, Architectural Design
**Object-Oriented Design:**
Objects and object classes, An Object-Oriented design process, Design evolution.
**Performing User interface design:**
Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation
**Coding and Testing Strategies:**
Code reviews, 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.
**Product metrics:** Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics forsource code, Metrics for testing, Metrics for maintenance.
**Metrics for Process and Products:** Software Measurement, Metrics for software quality

**(10Hours)**

**UNIT-D**

**Risk Management:** Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection and risk refinement.

**Quality Management:**
Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards. **CASE Tools:** Types of CASE tools, advantages and components of CASE tools, Unified Modelling Language (UML)

**(10Hours)**

**REFERENCES:**


1. Software Engineering- K.K. Agarwal &Yogesh Singh, New Age International Publishers.
2. Software Engineering, an Engineering Approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill
4. Software Engineering Approach, By R. S Pressman.
5. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition. McGraw Hill International Edition.
6. Software Engineering- Sommerville, 7th edition, Pearson education.
7. An Integrated Approach to software Engineering. PankajJalote

**Course Title**: **Algorithm Design & Analysis**
**Course Code: CAI307**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:** The subject will give an insight into performance analysis, measurements and optimization of the various algorithm development techniques.
**Learning Outcomes:** After the completion of this course the participants will be able to choose one algorithm technique for any kind of problem

**Unit-A**

**Introduction**
Concept of Algorithm, Role of Algorithms in Computing, Algorithm Specification, Performance Analysis (Time and space complexities), and Growth of functions: Asymptotic Notation, Standard notation & common functions; Introduction to Recurrences: substitution method, recursion-tree method, master method, Brute-Force, Branch and Bound, Randomizing Algorithms, Depth First Search (DFS) and Breadth First Search (BFS), Topological sorting. Divide and Conquer, General Method, Binary Search, Merge sort, Quick sort, Selection sort.

**(12 Hours)**

**Unit-B**

**Greedy Algorithms:** Elements of Greedy strategy, Activity Selection Problem, Knapsack problem, Minimum Cost Spanning Trees (Prim's Algorithm, Kruskal's Algorithm), Single source Shortest paths problem and analysis of these problems.

**(11 Hours)**

**Unit-C**

**Dynamic Programming:** Elements of dynamic programming, Assembly-line scheduling problem, Matrix-chain multiplication, Multistage Graph, All Pairs Shortest paths, Longest common subsequence, Bin Packing, 0/1 Knap Sack and Travelling Salesman Problem.

**(11 Hours)**

**Unit-D**

**Back Tracking:** General method, 8 queen's problem, Graph coloring and Hamiltonian Cycles, 0/1 Knap Sack Problem, NP-Completeness ,Polynomial Time, polynomial-time verification, NP completeness &reducibility, NP-complete problems, Cook's theorem, Approximation algorithms.

**(11 Hours)**

**REFERENCES:**

1. Fundamentals of Computer Algorithm, Latest edition, By Horowitz Sahni, Galgotia Publication.
2. Introduction to Algorithms, By Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest.
3. Algorithms, Latest Edition, Byknuth.
4. Design & Analysis of Algorithm, Latest Edition, By Goodman, and McGraw hill Publication.
5. D.Rogers and J. Adams, Mathematical Elements for Computer Graphics, McGraw -Hill International Edition.

**Course Title**: **Computer Graphics**
**Course Code: CAI309**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Outcomes:** Through this course students should be able to

- Classify and describe various Computer Graphics tools and techniques.
- Analyze and apply various algorithms of 2D and 3D Transformations on different type of objects.
- Determine and apply appropriate 2D and 3D clipping algorithms and various projection techniques on different types of objects.
- Observe and Understand and differentiate various visibility and shading techniques and models.

**UNIT -A**

**Introduction:** Introduction, Application areas of Computer Graphics, overview of graphics systems, video-display devices, and raster-scan systems, random scan systems, graphics monitors and work stations and input devices**.**

**Scan Conversion:** Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms

**(10 Hours)**

**UNIT- B**

**Two dimensional transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations

**Two dimensional viewing and Clipping:** The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland – Hodgeman polygon clipping algorithm

**Three dimensional transformations:** Geometric transformations,shear transformations, composite transformations.

**Projections**: Perspective Projection and Parallel projection

**Three dimensional Viewing**: Three dimensional Viewing, clipping, Viewing transformations.

**(15 Hours)**

**UNIT-C**

**Curve and Surface design:** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces

**Hidden Surfaces:** Z-Buffer algorithm, back-face detection, scan-line, The Painter's algorithm, area sub-division rendering of mathematical surfaces

**(10 Hours)**

**UNIT-D**

**Color and Shading models:** Introduction to shading models- Light and Colour, The Phong model, Interpolative shading models, Texture, Ray tracing

**(5 Hours)**

**REFERNCES:**


1. Hearn,Donald and Baker, M. Pauline. *Computer Graphics.* second Edition, PHI/Pearson Education.
2. Zhigandxiang, Plastock, Roy. *Computer Graphics Second edition.* Schaum's outlines, Tata Mc- Graw hill edition.
3. Rogers, David F. *Procedural elements for Computer Graphics.* Tata McGraw hill, 2nd edition.

**4.** Neuman and Sproul. *Principles of Interactive Computer Graphics.* TMH.
**5.** Foley, VanDam, Feiner and Hughes. *Computer Graphics Principles & practice.* second edition in C, Pearson Education.
**6.** David F. Rogers, Procedural Elements for Computer Graphics, McGraw HillBook Company.
**7.** Alan Watt and Mark Watt, Advanced Animation and Rendering Techniques, Addison-Wesley.

**Course Title: Machine Learning Laboratory**
**Course Code: CAI311**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Overview:**
This course introduces the fundamental concepts and methods of machine learning, including the description and analysis of several modern algorithms, their theoretical basis, and the illustration of their applications. Machine learning as a field is now incredibly pervasive, with applications spanning from business intelligence to text and speech processing, bioinformatics, and other areas in real-world products and services. This will familiarize students with a broad cross-section of models and algorithms for machine learning, and prepare students for research or industry application of machine learning techniques.

**Course Objectives:**
The students will try to learn:

I. The underlying mathematical principles from probability, linear algebra and optimization.
II. The underlying mathematical relationships within and across machine learning algorithms and the paradigms of supervised and un-supervised learning.
III. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples.
IV. To implement the Candidate Elimination Algorithm
V. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
VI. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
VII. Write a program to implement the naïve Bayesian classifier for a sample training data set.
VIII. Apply EM algorithm to cluster a set of data stored in a file. Use the same data set for clustering using kMeans algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
IX. Write a program to implement k-Nearest Neighbour algorithm to classify the data set. Print both correct and wrong predictions.
X. Write a program to for automatically determining the number of clusters.
XI. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameter k.

**This is only the suggested list of programs. Instructor may frame additional Practicals relevant to the course contents**

**Course Title: Database Management System Laboratory**
**Course Code: CAI313**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**List of Experiments**

1. Introduction to SQL and its Data Types.
2. Write the queries for Data Definition and Data Manipulation language.
3. Write SQL queries using Logical operators (=, <,>, etc.).
4. Write SQL queries using SQL operators (Between, AND, IN (List), Like, ISNULL and also with negating expressions).
5. Write SQL query using character, number and group functions.
6. Write SQL queries for Relational Algebra (UNION, INTERSECT, and MINUS, etc.).
7. Write SQL queries for extracting data from more than one table (Equi-Join, Non-Equi- Join , Outer Join)
8. Write SQL queries for sub queries, nested queries(using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET)
9. Concepts for ROLL BACK, COMMIT & CHECK POINTS.
10. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
11. Queries (along with sub Queries) Constraints. Example: - Select the roll number and name of the student who secured fourth rank in the class.
12. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING clauses.
13. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, and substr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
14. Create Views, Cursors, And Triggers and Stored Procedures in PL/SQL.

* **Students are advised to use Developer 2000/Oracle-10i or higher version or other latest version for above listed experiments. This is only the suggested list of Practicals. Instructor may frame additional Practicals relevant to the course contents**

**Course Title: Algorithm Design & Analysis Laboratory**
**Course Code: CAI315**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objective:** To get a first-hand experience of implementing well-known algorithms in a high-level language. To be able to compare the practical performance of different algorithms for the same problem.

**List of Experiments:**

1. Code and analyse to compute the greatest common divisor (GCD) of two numbers.
2. Code and analyse to find the median element in an array of integers.
3. Code and analyse to find the majority element in an array of integers.
4. Code and analyse to find the edit distance between two character strings using dynamic programming.
5. Code and analyse to find an optimal solution to matrix chain multiplication using dynamic programming.
6. Code and analyse to do a depth-first search (DFS) on an undirected graph.
7. Code and analyse to do a breadth-first search (BFS) on an undirected graph.
8. Code and analyse to find shortest paths in a graph with positive edge weights using Dijkstra's algorithm.
9. Code and analyse to find shortest paths in a graph with arbitrary edge weights using Bellman-Ford algorithm.
10. Code and analyse to find the minimum spanning tree in a weighted, undirected graph.

This is only the suggested list of programs. Instructor may frame additional Practicals relevant to the course contents

**Course Title: Graphics with Python Laboratory**
**Course Code: CAI317**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**List of Experiments**

1. To draw a line using DDA Algorithm.
2. To draw a line using Bresenham's Algorithm.
3. To draw a circle using trigonometric Algorithm.
4. To draw a circle using Bresenham's Algorithm.
5. To draw a circle using Midpoint Algorithm.
6. To draw an ellipse using Trigonometric Algorithm.
7. To draw an ellipse using Midpoint Algorithm.
8. To translate an object with translation parameters in X and Y directions.
9. To scale an object with scaling factors along X and Y directions.
10. To rotate an object with a certain angle.
11. To perform composite transformations of an object.
12. To clip line segments against windows.
13. Demonstrate the properties of Bezier Curve.

**This is only the suggested list of programs. Instructor may frame additional Practicals relevant to the course contents**

**Course Title: Theory of Computation**
**Course Code: CAI302**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** To understand the basic concepts of grammar, automata, languages and expressions.
**Learning Outcomes:** Students will learn about all three theories of computer science – automata, formal languages and computation.

**UNIT- A**

**Sets, Relations and Languages:** Sets, Relations and functions, finite and infinite sets, Closures and algorithms, alphabets and languages
**Finite Automata:** Finite automata and it applications, Deterministic Finite Automata (DFA), Non Deterministic Finite Automata (NDFA), Conversion of NDFA to DFA, Moore and Mealy Machine, Conversion from Mealy to Moore and Moore to Mealy.

**(12Hours)**

**UNIT- B**

**Grammar:** Definition of Grammars, Derivation & Language generated by Grammars, Chomsky Classification of Languages
**Regular Expression and Languages:** Regular expression, finite Automata and Regular expression, Properties of Regular Languages, Pumping lemma for regular languages, application of pumping lemma, Closure properties of regular languages, Minimization of finite Automata

**(14Hours)**

**UNIT-C**

**Context free Grammar and Languages:** Context free grammar: Parse Trees, Ambiguity in Grammar and Languages, Construction of Reduced Grammars
**Properties of Context free languages** – Normal forms for Context Free Grammars, Chomsky Normal Form (CNF), and Greibach Normal Form (GNF)

**(12Hours)**

**UNIT- D**

**Pushdown Automata:** Pushdown Automata: Deterministic Push down Automata, Equivalence of Push Down automata and Context free Grammar.
**Turing Machines:** Definition of Turing Machine, Application of Turing Machine in language accepting and computing.

**(12Hours)**

**REFERENCES:**


1. J E Hopcroft and J D Ullman, "Introduction to Automata Theory, Languages and Computation", Narosa Publishers 2002.
2. K L P Mishra and N Chandrasekaran, "Theory of Computer Science", Prentice Hall Inc, .2002
3. Harry R Lewis and Chritos H Papadimitriou, "Elements of the Theory of Computation", Pearson Education 2001.
4. Adesh K. Pandey, "Automata Theory & Formal Language", S. K. Kataria& Sons
5. Hopcroft, "Introduction to Automata Theory, Languages, and Computation", Pearson Education India
6. MichaelSipser, "Introduction to the theory of computation ", Cengage Learning, New Delhi

**Course Title: Data Mining** `
**Course Code: CAI304**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objective:** This course will be an introduction to data mining. Topics will range from statistics to database, with a focus on analysis of large data sets. Another objective is to study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems.

**Learning Outcomes:**

- Describe the theoretical constructs and core processes of data mining
- Understand the basic statistical concepts related to data mining.
- Describe the predictive modelling functions of data mining.

**UNIT-A**

**Introduction:** Data Mining Concepts, Input, Instances, Attributes and Output, Knowledge Representation & Review of Graph Theory, Lattices, Probability & Statistics

**Machine learning concepts and approaches:** Supervised Learning Framework, concepts & hypothesis, Training & Learning, Boolean functions and formulae, Monomials, Disjunctive Normal Form & Conjunctive Normal Form, A learning algorithm for monomials

**(12Hours)**

**UNIT-B**

**Data Preparation:** Data Cleaning, Data Integration & Transformation, Data Reduction

**Mining Association Rules:** Associations, Maximal Frequent & Closed Frequent item sets, Covering Algorithms & Association Rules, Linear Models & Instance-Based Learning, Mining Association Rules from Transactional databases, Mining Association Rules from Relational databases & Warehouses, Correlation analysis & Constraint-based Association Mining.

**(12Hours)**

**UNIT-C**

**Classification and Prediction:** Issues regarding Classification & Prediction, Classification by Decision Tree induction, Bayesian classification, Classification by Back Propagation, k-Nearest Neighbour Classifiers, Genetic algorithms, Rough Set & Fuzzy Set approaches

**Cluster Analysis:** Types of data in Clustering Analysis, Categorization of Major Clustering methods, Hierarchical methods, Density-based methods, Grid-based methods, Model-based Clustering methods

**(12Hours)**

**UNIT-D**

**Mining Complex Types of Data:** Multidimensional analysis & Descriptive mining of Complex data objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-series & Sequence data, Mining Text databases, Mining World -Wide Web

**Data Mining Applications and Trends in Data Mining:** Massive Datasets/Text mining, Agent-Based Mining

**(10Hours)**

**REFERENCES:**


1. M.H.Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education
2. Jiawei Han, MichelineKamber, Data Mining Concepts & Techniques, Elsevier
3. C. M. Bishop, Pattern Recognition and Machine Learning, Springer
4. S. Theodoridis and K. Koutroumbas, Pattern Recognition, 4th Edition, Academic Press, 2009.
5. Arun k. Pujari, Data Mining Techniques, Universities Press Private Limited.

**Course Title: Deep Learning**
**Course Code: CAI306**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective** - The objective of the course is to provide basic understanding of the concepts of Deep learning including the basics of Artificial Neural Networks and the Convolution Neural Networks. The course will also make students familiar with the various applications of deep learning.

**Learning Outcome -** The students will develop the understanding of the basic concepts of artificial neural networks, convolutional neural networks and recurrent neural networks and will be able to implement deep learning algorithms for developing various deep learning based applications.

## UNIT-A

**Introduction**: Basics of Machine Learning, Overfitting and Underfitting, Estimators, Bias, Variance, Maximum Likelihood Estimation, Bayesian Statistics, Stochastic Gradient Decent. Artificial neural networks, Functional units of ANN for pattern recognition tasks.

**Feedforward neural networks:** Pattern classification using perceprton, Multilayer feedforward neural networks, Backpropagation learning, Empirical risk minimization, Gradient-based Learning, Hidden Units, Architecture Design, Computational Graphs, Regularization.

**(12Hours)**

## UNIT-B

**Deep neural networks (DNNs):** Difficulty of training DNNs, Greedy layerwise training, Optimization for training DNNs, Newer optimization methods for neural networks, Second order methods for training, Regularization methods (dropout, drop connect, batch normalization)

**Convolution neural networks (CNNs):** Introduction, convolution, pooling, Basic Convolution Function , Convolution Algorithm, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG, PlacesNet,

**(12Hours)**

## UNIT-C

**Training a CNNs:** weights initialization, batch normalization, hyperparameter optimization, Understanding and visualizing CNNs.

**Sequence modeling:** Recurrent neural networks (RNNs), Sequence modeling using RNNs, Back propagation through time, Long Short Term Memory (LSTM), Bidirectional LSTMs, Bidirectional RNNs, Gated RNN Architecture.

**(12Hours)**

## UNIT-D

**Deep Generative models:** Boltzmann Machines ,Restrictive Boltzmann Machines (RBMs), Stacking RBMs, Belief nets, Learning sigmoid belief nets, Deep belief nets, Deep Boltzmann Machines, Sigmoid Belief Networks.

**Applications**: Applications in vision, speech and natural language processing

**(12Hours)**

**TEXT BOOKS:**

1. Goodfellow L., Bengio Y. and Courville A., Deep Learning, MIT Press (2016).
2. Patterson J. and Gibson A., Deep Learning: A Practitioner's Approach, O'Reilly (2017) 1st ed.

**REFERENCES:**

1. S. Haykin, Neural Networks and Learning Machines , Prentice Hall of India, 2010
2. Satish Kumar, Neural Networks - A Class Room Approach, Second Edition, Tata McGraw-Hill, 2013
3. B. Yegnanarayana, Artificial Neural Networks, Prentice- Hall of India, 1999
4. C.M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006

**Course Title: Principles of Soft Computing**
**Course Code: CAI308**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:** To introduce the concepts in Soft Computing such as Artificial Neural Networks, Fuzzy logic based systems, genetic algorithm-based systems and their hybrids.
**Learning Outcomes:** Learn about soft computing techniques and their applications, analyze various neural network architectures, define the fuzzy systems, understand the genetic algorithm concepts and their applications.

**UNIT-A**

**Introduction to Soft Computing:** Artificial neural networks - biological neurons, Basic models of artificial neural networks – Connections, Learning, Activation Functions, McCulloch and Pitts Neuron, Hebb network. Perceptron networks – Learning rule – Training and testing algorithm, Adaptive Linear Neuron Back propagation Network – Architecture, Training algorithm.

**(10Hours)**

**UNIT-B**

**Fuzzy logic** - fuzzy sets - properties - operations on fuzzy sets, fuzzy relations - operations on fuzzy relations. Fuzzy membership functions, fuzzification, Methods of membership value assignments – intuition – inference – rank ordering, Lambda –cuts for fuzzy sets, Defuzzification methods.

**(10Hours)**

**UNIT-C**

**Truth values and Tables in Fuzzy Logic**: Fuzzy propositions, Formation of fuzzy rules - Decomposition of rules Aggregation of rules, Fuzzy Inference Systems - Mamdani and Sugeno types, Neuro-fuzzy hybrid systems – characteristics – classification.

**(10Hours)**

**UNIT-D**

Introduction to genetic algorithm, operators in genetic algorithm - coding - selection - cross over – mutation, Stopping condition for genetic algorithm flow, Genetic neuro hybrid systems, Genetic-Fuzzy rule based system.

**(10Hours)**

**REFERENCES:**


1. S.N.Sivanandam and S.N.Deepa, Principles of soft computing-Wiley India.
2. Timothy J. Ross, Fuzzy Logic with engineering applications-Wiley India.
3. N. K. Sinha and M. M. Gupta, Soft Computing & Intelligent Systems: Theory & Applications-Academic Press /Elsevier. 2009
4. Bart Kosko, Neural Network and Fuzzy Systems- Prentice Hall, Inc., Englewood Cliffs
5. Goldberg D.E., Genetic Algorithms in Search, Optimization, and Machine Learning AddisonWesley

**Course Title: Relational Database Management System**
**Course Code: CAI310**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:** To learn how to use a RDBMS and how to build a RDBMS.
**Learning Outcomes:** It will help to make carrier in database administration & related data base designing & maintenance places.

**UNIT-A**

**Basic Introduction:** Database system architecture, data independence, storage structures, data representation, indexing, relational data structure, relations, attributes, keys, embedded SQL, Relational Algebra, Query by example, relational calculus, normalization & normal forms, functional dependence, over view of security, integrity, recovery, backup, etc.

**(10Hours)**

**UNIT-B**

**Introduction to PL/SQL concepts:** PL/SQL architecture, Declares Variables, Control Structures, Iteration Control, Introduction to SQL Server and Oracle Server, Introduction to Subprograms (Functions and Procedures), Functions vs. Procedures.

**(12Hours)**

**UNIT-C**

**PL/SQL Constructs:**Indexes, Views and its types, UnderstandingCursors and its types, Introduction to triggers along with Before/ After/Delete/ Update/Row-Level Triggers, Storage strategies (Indices, B-trees, hashing).

**(12Hours)**

**UNIT-D**

**Packages and Exception Handling:** Packages Specification, Package body and Overloading Package, Exceptions, Errors, User – Defined Exceptions.

**(10 Hours)**

**REFERENCES:**


1. Korth, Abraham, and Silberschatz.Database System Concepts.McGraw Hall, 1991.
2. Date, C.J. An Introduction to Database Systems. Addison Wesley, Vol.-1.
3. Elmasri, Ramez, Shamkant, B, and Navathe.Fundamentals of Database System.The Benjamin Cummings Publishing Co., 2nd Edition.1994.
4. Bayross, Ivan. PL/SQLthe Programming Language of ORACLE, BPB Publication.

**Course Title: Relational Database Management System Lab**
**Course Code: CAI312**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:**

- To learn basic OO analysis and design skills through an elaborate practical applications.
- To use the UML design diagrams
- To apply the appropriate design patterns

**List of Experiments**

1. Introduction to TCL and DCL Commands in oracle.
2. Implementation of nested and join queries.
3. To execute and verify the SQL commands for views.
4. To write a PL/SQL block using different control (if, if else, for loop, while loop,) statements.
5. To write a PL/SQL procedure block and its types.
6. To write a procedure for Cursor implementation in PL/SQL.
7. To implement Implicit and Explicit Cursors in Oracle.
8. Implementation of Functions, Packages and Triggers in Oracle.

This is only the suggested list of programs. Instructor may frame additional Practicals relevant to the course contents

**Course Title**: **Data Mining Lab**
**Course Code**: **CAI314**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**Students are required to perform practical in Oracle/MS SQL Server and STATISTICA Data Miner**

**List of Experiments**

1. Building a Database Design using ER Modelling and Normalization Techniques
2. Implementation of functions, Procedures, Triggers and Cursors
3. Load Data from heterogeneous sources including text files into a predefined warehouse schema.
4. Feature Selection and Variable Filtering (for very large data sets)
5. Association mining in large data sets
6. Interactive Drill-Down, Roll up, Slice and Dice operations
7. Generalized EM & k-Means Cluster Analysis
8. General Classification

**Course Title: Natural Language Processing**
**Course Code: CAI401**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objectives:** To impart knowledge of Natural Language processing and its significance.
**Learning outcomes: -** This course offers a good understanding of the concepts, methods and techniques of Natural Language processing.

**UNIT A**

**Introduction to NLP:** Definition, History, Applications, Goals. Regular expressions and Automata, Morphology and Finite State Transducers.
**N-grams:** Introduction, Simple (Unsmoothed) N-Grams, Smoothing: Add-one smoothing, Witten-Bell Discounting, Good-Turing Discounting, Back off, Deleted Interpolation. Entropy
**HMM:** Overview, Viterbi Algorithm
**Syntax:** Word Classes and Part-of Speech Tagging, Context Free Grammars for English, Parsing with Context-Free Grammars.
**Word Sense Disambiguation:** Selection Restriction Based Disambiguation, Robust WSD: Machine Learning, Supervised Learning Approaches, Bootstrapping Approaches, Unsupervised Methods, Dictionary Based Approaches.
**Machine Translation:** Introduction, Language Similarities and Differences, Approaches, Steps involved in machine translation system design.

**11Hours**

**UNIT B**

**Language Processing: Computing with Language:** Texts and Words, Simple Statistics, Automatic Natural Language Understanding.
**Accessing Text Corpora and Lexical Resources:** Accessing Text Corpora, Conditional Frequency Distributions, Lexical Resources, Wordnet.
**Processing Raw Text:** Accessing Text from the Web and from Desk, Strings: Text processing at the Lowest level, Text Processing with Unicode, Regular Expression for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, regular Expressions for Tokenizing Text, Segmentation.

**11Hours**

**UNIT C**

**Categorizing and Tagging Words:** Using a Tagger, Tagged Corpora, mapping Words to Properties, Automatic Tagging, N-Gram Tagging, Transformation Based Tagging, How to determine the category of a word.
**Learning to Classify Text:** Supervised Classification, Further Examples of Supervised Classification, Evaluation, Decision Trees, Naïve Bayes Classifiers, Maximum Entropy Classifiers, Modeling Linguistics Patterns.
**Extracting Information from Text:** Information Extraction, Chunking, Development and Evaluating Chunkers, Recursion in Linguistics Structure, Named Entity Recognition, Relation Extraction.

**11Hours**

**UNIT D**

**Analyzing Sentence Structure:** Some Grammatical Dilemmas, Use of Syntax, Context Free Grammar, Parsing with Context Free Grammar, Dependencies and Dependency Grammar, Grammar Development.
**Building Feature Based Grammar:** Grammatical Features, Processing Feature Structures, Extending a Feature-Based Grammar.

**Analyzing the meaning of Sentences:** Natural Language Understanding, Propositional Logic, First Order Logic, The Semantics of English Sentences, and Discourse Semantics.
**Managing Linguistic Data: Corpus Structure:** A Case Study, The Life Cycle of Corpus, Acquiring Data, Working with XML, Working with Toolbox Data, Describing Language Resources using OLAC Metadata.

**12Hours**

**TEXT BOOKS:**


1. Jurafsky, D. & J. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing Computational Linguistics, and Speech Recognition" Prentice Hall.
2. Steven Bird, Ewan Klein, Edward Loper. Natural Language Processing with PythonAnalyzing Text with the Natural Language Toolkit, Shroff Publications and Distributors -O'Reilly Media.


**REFERENCE BOOKS:**


1. Grosz, B.J., Sparck Jones, K. & Webber, B.L. (eds) "Readings in natural language processing", Los Altos, CA. Morgan Kaufmann.
2. Allen, J., "Natural Language Understanding", Redwood City, Benjamin/Cummings.
3. Bharti, Akshar,ChaitanyaVineet, Sangal Rajeev, "Natural Language Processing", Prentice Hall.
4. Palash Goyal, Sumit Pandey, Karan Jain. Deep Learning for Natural Language Processing. Apress.

**Course Title: COMPILER DESIGN**
**Course Code: CAI403**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**Course Objective:** This course should provide the students with a fairly good concept of fundamental concepts and compiler design issues of programming languages and become familiar with major programming paradigms.
**Learning Outcomes:** At the end of the course the student will be able to design and implement a Simple Compiler

**UNIT-A**

**Introduction and Lexical Analysis**
Introduction to Compilers, Analysis of the source program, the phases of a compiler, grouping of phases, The role of the lexical analyzer, Specification of tokens, Recognition of tokens, A language for specifying lexical analyzer, Scanning Process, Regular Expressions, Finite Automaton (NFA and DFA),LEX.

**(14Hours)**

**UNIT-B**

**Syntax analysis:** CFG's, Ambiguity, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.
**Syntax directed definitions:** Inherited and Synthesized Attributes, Dependency Graph, Bottom up & Top down evaluation of attributes, L- and S-attributed definitions.

**(14Hours)**

**UNIT-C**

**Type Checking** -Type Systems, Specification of a simple type checker.
**Run time system:** Storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.

**(14Hours)**

**UNIT-D**

**Intermediate Code Generation:** Intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls.
**Code Generation and Optimization:** issues, basic blocks and flow graphs, register allocation, code generation, DAG representation of programs, and code generation from DAG, Peep-hole optimization, and code generator generators.

- CASE Study of Gcc Compiler

**(14Hours)**

**REFERENCES:**


1. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools, Addison-Wesley, 1988.
2. Fischer and R. LeBlanc. Crafting a Compiler , Benjamin Cummings, 1991..
3. C. Holub. Compiler Design in C , Prentice-Hall Inc., 1993.
4. Appel. Modern Compiler Implementation in C: Basic Design , Cambridge Press.
5. Fraser and Hanson. A Retargetable C Compiler: Design and Implementation , Addison-Wesley.

**Course Title: Information Security**
**Course Code: CAI405**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objective:** The aim of this course is to provide attendees with a thorough understanding of the issues associated with the design, provision and management of security services for modern communication and information systems. Students will learn the different aspects of information and network security and you will be able to speak about a multitude of security attacks and the defensive strategies used to combat them.

**Learning Outcomes:** After completing this course the student should be able to:

- Describe the fundamental concepts of information system security.
- Understand the following terms: security policy, host based security, firewall, and packet filtering and intrusion detection.

**UNIT-A**

**Overview:** Services, Mechanisms, and Attacks, the OSI Security Architecture, a Model for Network, Security.

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

**Block Ciphers and The Data Encryption Standard:** Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.

**Introduction To Finite Fields:** Groups, Rings, and Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields of the Form GF(p), Polynomial Arithmetic, Finite Fields of the Form GF(2n).

**(10Hours)**

**UNIT-B**

**Advanced Encryption Standard**: Evaluation Criteria for AES, The AES Cipher.

**Contemporary Symmetric Ciphers:** Triple DES, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers, RC4 Stream Cipher.

**Public-Key Encryption**: Introduction to Number Theory: Prime Numbers, Format's and Euler's Theorems, Testing for primarily, the Chinese Remainder Theorem, and Discrete Logarithms.

**Public-Key Cryptography and RSA:** Principles of Public-Key Cryptosystems, the RSA Algorithm.

**Key Management and Other Public-Key Crypto systems:** Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

. **(12Hours)**

**UNIT-C**

**Message Authentication and Hash Functions:** Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs.

**HashAlgorithms:**MD5 Message Digest Algorithm, Secure Hash Algorithm and HMAC.

**Digital Signatures and Authentication Protocols:** Digital Signatures, Authentication Protocols, Digital Signature Standard.

**(10Hours)**

**UNIT-D**

**Network Security Practice:** Authentication Applications: Kerberos, X.509 Authentication Service, Electronic Mail Security: Pretty Good Privacy, S/MIME.

**IP Security:** IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management,

**Web Security:** Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.

**System Security:** Intruders: Intruders, Intrusion Detection, Password Management, Malicious Software: Viruses and Related Threats, Virus Countermeasures, Firewalls: Firewall Design Principles, Trusted Systems.

**(9Hours)**

**REFERENCES:**


1. William Stallings, "Cryptography and network Security", Pearson Education 2003.
2. Trappe & Washington, "Introduction to Cryptography with Coding Theory", Prentice-Hall 2001
3. D Stinson, "Cryptography: Theory and Practice", Second Edition Chapman & Hall 2002.
4. Kaufman, Perlman, and Speciner, "Network Security", Prentice-Hall Second Edition 2001.
5. Michael E. Whitman, "Principles of information Security" ,Cengage Learning, New Delhi

**Course Title: Information Security Lab**
**Course Code: CAI407**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**List of Experiments**

**Implementation of the followings in any High Level Programming Language:**

1. Implementation of symmetric techniques (Ceaser cipher, monoalphabetic, polyalphabetic, hill-Cipher, vigenere cipher)
2. Implementation of transposition techniques (Rail-fence, transposition of columns)
3. Implantation of Block Cipher techniques (Play fair cipher, Data Encryption Standard)
4. Implementation of algorithm used for Random Number Generation (Blum blum shub)
5. Implementation of algorithm used for calculating GCD (Euclidean algorithm).
6. Implementation of algorithm used for calculating multiplicative inverse (Extended-Euclidean)
7. Implementation of algorithm used for testing for Primarily (Chinese Remainder Theorem)
8. Implementation of RSA Algorithm.
9. Elliptic Curve Cryptography.
10. HashAlgorithms:MD5 Message Digest Algorithm, Authentication Protocols.
11. System Security: Firewalls: Firewall Design Principles

**This is only the suggested list of programs. Instructor may frame additional Practicals relevant to the course contents**

**Course Title: Natural Language Processing with Deep Learning Lab**
**Course Code: CAI409**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**LIST OF PROGRAMS:**

1. Understanding and using string handling functions.
2. Handling Unicode data: Input, process and output Unicode data.
3. File handling: reading corpus from file and writing processed data on output file.
4. Tokenization of corpus.
5. Implementation of n-gram, HMM for word sense disambiguation.
6. Using online corpus.
7. Implementing Regular Expression for Detecting Word Patterns, Normalizing Text, regular Expressions for Tokenizing Text and Segmentation.
8. Working with XML.
9. Working with Toolbox Data.
10. Describing Language Resources using OLAC Metadata.

**This is only the suggested list of programs. Instructor may frame additional Practicals relevant to the course contents**

**Course Title: Project**
**Course Code: CAI450**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 8 | 4 |

**Project should include following phases:**

- System Analysis and Design
- Coding - Implementation
- Testing

**a.** It should be a working project

**b.** Must have a future perspective

**c.** The Domain of project can be from:

- **Databases**
- **Application software**
- **System software**
- **Multimedia**
- **Web Applications, etc.**

**d.** A complete project report must be submitted along with softcopy of project. Project report may include Requirements of Project, Flow Chart, DFD's, Coding and Test Results.

**Course Title: R Programming**
**Course Code: CAI402**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:**
This course introduces R, which is a popular statistical programming language. The course covers data reading and its manipulation using R. The course also covers different control structures and design of user-defined functions. Loading, installing and building packages are covered.

**Learning Outcomes:**
On successful completion of the course, students will be able to do following:
Develop an R script and execute it, install, load and deploy the required packages, and build new packages for sharing and reusability, extract data from different sources using API and use it for data analysis, visualize and summarize the data

**UNIT-A**

**Introduction:** R interpreter, Introduction to major R data structures like vectors, matrices, arrays, list and data frames, Control Structures, vectorized if and multiple selection, functions.

**(11Hours)**

**UNIT-B**

**Matrices, Arrays And Lists:** Matrices, Arrays And Lists Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists.

**(11Hours)**

**UNIT-C**

**Data Frames:** Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions

**(12Hours)**

**UNIT-D**

**Control statements, Functions, R graphs:** Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues –Writing Upstairs - Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R Creating Graphs – Customizing Graphs – Saving graphs to files – Creating three-dimensional plots

**(11Hours)**

**REFERENCES:**


1. Norman Mat off, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.
2. Mark Gardener, " Beginning R – The Statistical Programming Language", Wiley, 2013
3. Robert_Knell, "Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R", Amazon Digital South Asia Services Inc, 2013.'
4. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Data & Analytics Series, 2013

**Course Title: Professional Communication**
**Course Code: ENG352**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective: This paper, with a practice-oriented approach, aims to hone students' skills in the major dimensions of professional communication.**
**Learning Outcome: Students will show adequate understanding of professional communication skills.**

**Unit-1**

- Professional Communication: Technical Communication and Business Communication
- Verbal and Non-Verbal Communication
- Barriers to Communication

(**N.B.** As the topics are largely theoretical, teacher shall introduce the topics in classroom in the form of lectures and encourage students to read on their own from the reference books. All these topics will be supported by examples from real life situations.)

**Unit-2**

- Reading Skills: Active & Passive Reading, Reading strategies, and Developing a Good Reading Speed
- Listening Skills: Types of Listening & Effective Listening Strategies
- Speaking Skills: Basics in Phonetics
- Writing Skills: Topic Sentence and Paragraph (descriptive, narrative, expository, and persuasive)

(**N.B.** Teacher will encourage students to apply the theoretical knowledge while practicing the four skills. Opportunities to practice the language skills should be created for students in the classroom.)

**Unit-3**

- Conversation: Formal and Informal
- Panel Discussion and Group Discussion
- Oral Presentation

(N.B. Teacher will give supporting examples from the industry and encourage students to do relevant exercises.)

**Unit-4**

- C.V. and Cover Letter
- Interview Skills
- Professional Letters
- Report Writing and Memo

(N.B. Teacher will give supporting examples from the industry and encourage students to do relevant exercises.)

**Testing**: The examinations will be conducted as per the norm of the university.

**REFERENCES:**


- Crystal, David. *The Gift of the Gab – How Eloquence Works*. Connecticut: Yale University, 2016. Print.
- Gangal, J. K. *A Practical Course in Spoken English*. India: Phi Private Limited, 2012. Print.
- Hosler, Mary Margaret. *English Made Easy*. Delhi: McGraw, 2013. Print.
- Koneru, Aruna. *Professional Communication*. Delhi: McGraw, 2008. Print.
- Mahanand, Anand. *English for Academic and Professional Skills*. Delhi: McGraw, 2013. Print.
- Rani, D Sudha, TVS Reddy, D Ravi, and AS Jyotsna. *A Workbook on English Grammar and Composition*. Delhi: McGraw, 2016. Print.
- Rizvi, M. Ashraf. *Effective Technical Communication*. Delhi: McGraw, 2018. Print.
- Sharma, R.C. and Krishna Mohan. *Business Correspondence and Report Writing*. Delhi: McGraw, 2013. Print.
- Suzana, Roopa. *A Practical Course in English Pronunciation*. Delhi: McGraw Hill Education, 2017. Print.
- Tyagi, Kavita and Padma Misra. *Basic Technical Communication*. Delhi: PHI Learning, 2013. Print.


**e. WEBSITES**

- www.youtube.com (to watch standard videos)
- http://learnenglish.britishcouncil.org/en
- https://owl.english.purdue.edu/

# DISCIPLINE SPECIFIC ELECTIVE-I

**Course Title: Introduction to Java Programming**
**Course Code: CAI342**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objective:** The course is an introduction to Computer Science that exposes students to the concept of computing and programming using JAVA. This course is for those with little or no programming experience. The exercises are designed to help the students get a solid grasp of declaring and using methods and also learn the fundamental concepts of object oriented programming. Students will learn to use Java technologies in the real world and write numerous programs throughout the semester to demonstrate mastery of the concepts discussed in the classroom.

**Learning Outcomes:** Upon successful completion of this course, students should be able to: Analyse and explain the behaviour of programs involving the fundamental program, write programs that use the fundamental program constructs including standard conditional and iterative control structures, Identify and correct syntax and logic errors in short programs and they will be able to Design and implement program by using packages, interfaces, events, applets and swings. Students will also be able to handle exceptions in programs.

**UNIT-A**

**Overview of Basic OO Concepts**

Need for object-oriented paradigm: Architecture, Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, user input through command line arguments and Scanner class, type conversion and casting.

**Features of OOP language**

Classes and objects, constructors, methods, access control, Overloading methods and constructors, parameter passing, recursion, this keyword, garbage collection, inheritance, super keyword, polymorphism- method overriding, final keyword, abstract methods and classes.

**(12Hours)**

**UNIT-B**

**String Handling**

The string constructors, string length, special string operations, character extraction, string comparison, searching string, modifying string, data conversion, changing the case of characters, string buffer.

**Interfaces**:

Differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interface.

**Packages:**

Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, exploring packages – Java.io, Java.util.

**Exception handling:**

Concepts of exception handling, benefits of exception handling, Termination models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

**(15Hours)**

**UNIT-C**

**Multithreading**

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

**I/O and Applets**

I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files, Applet Fundamentals, Applet Architecture, The HTML Applet tag, passing parameters to Applets.

**User interface components using AWT and Swings**

Labels, buttons, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, dialogs, menu bar, graphics, layout manager and its types – border, grid, flow, card and grid bag.

**(10Hours)**

**UNIT-D**

**Event Handling and Collection Framework**

Event, components of event, Event Classes, Listener Interfaces, Adapter Classes and Inner Classes. Lists, Vectors, Sets and Maps. Overview of MVC architecture.

**Networking**

Basics of network programming, addresses, ports, sockets, simple client server program, multiple clients, and Java .net package Packages – java.util, Database connectivity.

**(12 Hours)**

**REFERENCES:**


1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley& sons.
2. An Introduction to OOP, second edition, T. Budd, pearson education.
3. Introduction to Java programming 6th edition, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object oriented application development, R.A. Johnson-Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventh Edition, Pearson Education**.**

**Course Title: C# Programming**
**Course Code: CAI344**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objectives:** This course offers a good understanding of Visual Programming concepts and prepares students to be in a position to write GUI applications.
**Learning Outcomes:** At the end of the course students will be have thorough knowledge of fundamental concepts of C# and its importance in real life.

**UNIT-A**

**Introduction to .NET Environment-** .Net Architecture, The Relationship of C# To .Net , The Common Language Runtime, Advantages of Managed Code, Use of Attributes, Deployment. The Common Language Runtime, Framework Base Classes, User and Programs Interface, Visual Studio .NET, .NET Languages, Benefits of The .NET Approach

**(10Hours)**

**UNIT-B**

**C# Fundamentals-** C# Basics, Variables, Predefined Data Types: Value Types and Reference Types, CTS Types, Namespaces, Using Statement, The main () Method, Multiple Main Methods, Passing Arguments toMain (). More on Compiling C# Files, C# Programming Guidelines, C# Pre-processor Directives.
Operator Shortcuts, The Ternary Operator, The Checked and unchecked Operators, The Is Operator, The as Operator, The Sizeof Operator, The Type of Operator, Nullable Types and Operators, The Null Coalescing Operator, Operator Precedence. Type Safety, Type Conversions, Console I/O, Using Comments. Conditional Statements, Loops, Jump Statements Boxing and Unboxing.
Difference between C++ and C#, Difference between Java and C#

**(13Hours)**

**UNIT-C**

**Object oriented aspects of C#-** Classes, Objects, Partial Classes, Static Classes, and Object Class Inheritance: Types of Inheritance, Method Overloading, Virtual Methods, Hiding Methods, and Calling Base Versions of Functions. Sealed Classes and Methods, Constructors of Derived Classes, Modifiers, Interfaces, Derived Interfaces. Operator Overloading, Delegates, Events, Errors and Exceptions

**(10Hours)**

**UNIT-D**

**I/O and Object serialization-** I/O: System. I/O, Streams, Text Writer, Text Reader Writing Windows Forms Applications: Understanding Windows Forms, Window Form Controls, Menus, MDI Forms Using Inheritance in Windows Forms, Using Common Dialog Controls,
Deploying Windows Forms Applications

**(12Hours)**

**REFERENCES:**


1. Nagel Christian, Evgen Bill and Giynn Jay, Professional C# 2005, Wrox Publications, 2006
2. Dietel&Dietel , C# How to Program, New Delhi: Pearson Education, 2007.
3. Sharp John & Jagger John,Visual C#.Net, New Delhi: PHI, New Delhi, 2005.
4. Francisco, Visual Studio .Net, Microsoft Publication, 2012.
5. Jones, Bradley L, Teach Yourself C# in 21 Days. Sams publishing, 2001
6. Balagurusamy, E., Programming in C#, New Delhi:Tata McGraw-Hill (UNIT I, II),2004

**Course Title: Network Programming**
**Course Code: CAI346**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objective:** The course is an introduction to Computer Science that exposes students to the concept of Network Programming. It will focus on the concepts of Socket Programming.
**Learning Outcomes:** Upon successful completion of this course, students should be able to write socket address and structures and also can perform IPv4 and IPv6 interoperability.

**UNIT-A**

**Introduction:** Overview of UNIX OS – Environment of a UNIX process – Process control – Process relationships Signals – Interprocess Communication – overview of TCP/IP protocols

**Introduction to Socket Programming**: Introduction to Sockets – Socket address Structures – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write , close functions – Iterative Server – Concurrent Server.

**(10Hours)**

**UNIT-B**

**Application development TCP Echo Server**: TCP Echo Client – Posix Signal handling – Server with multiple clients – boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown – I/O multiplexing – I/O Models – select function shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing)

**(12Hours)**

**UNIT-C**

**Sockets:** Socket options, elementary UDP sockets: Socket options – getsocket and setsocket functions – generic socket options – IP socket options, ICMP socket options – TCP socket options Elementary UDP sockets – UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system, get host by name function – Ipv6 support in DNS gethostbyadr function getservbyname&getservbyport

**(12Hours)**

**UNIT-D**

**Advanced sockets :**IPv4 and IPv6 interoperability – threaded servers – thread creation and termination –TCP echo server using threads – Mutexes – condition variables – raw sockets – rawsocket creation – raw socket output – raw socket input – ping program – trace route program.

**(10Hours)**

**REFERENCES:**

1. W. Richard Stevens, “Advanced Programming in The UNIX Environment”, AddisonWesley, 1999.
2. W. Richard Stevens, “UNIX Network Programming - Volume 1”, Prentice HallInternational, 1998.

**Course Title: C SHELL PROGRAMMING**
**Course Code: CAI348**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 1 | 0 | 3 |

**Course Objective:** To understand the basic concepts of shell programming.
**Learning Outcomes:** Students will learn about UNIX file system, C shell programming and file management.

**UNIT- A**

**Introduction to UNIX:** Architecture of Unix, Features of Unix , Unix Commands – PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.
**UNIX Utilities:** Introduction to unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, unmount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text processing utilities and backup utilities , detailed commands to be covered are tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, Cpio
**Introduction to Shells:** UNIX Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

**(13Hours)**

**UNIT- B**

**Filters:** Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines,
Count characters, Words or Lines, Comparing Files.
**Grep:** Operation, grep Family, Searching for File Content.
**Sed:** Scripts, Operation, Addresses, commands, Applications, grep and sed.
**awk:**Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk,
Applications, awk and grep, sed and awk.
**Interactive Korn Shell:** Korn Shell Features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process.

**(15Hours)**

**UNIT- C**

**Korn Shell Programming:** Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.
**Interactive C Shell:** C shell features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startupand Shutdown Scripts, Command History, Command Execution Scripts.

**(10Hours)**

**UNIT- D**

**C Shell Programming:** Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

**File Management:** File Structures, System Calls for File Management– create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask

**(8 Hours)**

**REFERENCES:**


1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
2. Your UNIX the ultimate guide, Sumitabha Das, TMH. 2nd Edition.
3. UNIX for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education.
4. UNIX programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Beginning shell scripting, E. Foster – Johnson & other, Wile Y- India

**Course Title: Introduction to Java Programming Lab**
**Course Code: CAI362**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objective:**

To make the student learn the application of advanced object oriented concepts for solving problems.

To teach the student to write programs using advanced Java features to solve the problems

**List of Experiments**

1. Write a simple java program to generate Fibonacci series.
2. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
3. Write a Java program that checks whether a given string is a palindrome or not.
4. Write a Java program for sorting a given list of names in ascending order.
5. Write a simple program to implement the concept of classes, inheritance, packages and interfaces.
6. Write a java program to implement the concept of super, this keyword, method overloading and overriding and dynamic method dispatch.
7. Write a program to implement the concept of exception handling using try, catch, and throw, throws.
8. Write a simple program to create your own exception subclass.
9. Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.
10. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.
11. Write a Java program for handling mouse events.
12. Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.
13. Write a Java program to implement the concept of multithreading using Runnable interface and extending thread class.
14. Write a simple program to implement the concept of socket programming in java.
15. Write a simple program to connect the Database using JDBC.

**This is only the suggested list of practical. Instructor may frame additional practical relevant to the course contents.**

**Course Title: C# Programming Lab**
**Course Code: CAI364**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**List of Experiments**

1. Writing basic C# programs demonstrating the concepts of functions, arrays, classes, inheritance, polymorphism, namespaces, etc.
2. Writing graphical programs demonstrating the concepts of event handling, Labels, Textboxes, Buttons, Group Boxes, Panels, Checkboxes and Radio Buttons, Picture Boxes, ToolTips.
3. Writing MDI Applications and demonstration of controls like: Month Calendar, DateTimePicker, Link Label, List Box, CheckedListBox, Combo Box, Tree View, List View, and Tab Control.
4. Programs using Structures and Enumerations
5. Program to implement Delegates and Events
6. Program to implement Exception Handling

**Course Title: Network Programming Lab**
**Course Code: CAI366**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:**

• To teach students various forms of IPC through UNIX and socket Programming

Recommended Systems/Software Requirements:

• Intel based desktop PC with minimum of 166 MHZ or faster processor with at least 64 MB RAM and 100 MB free disk space LAN Connected

• Any flavour of UNIX / LINUX

1. Implement the following forms of IPC.
   a. Pipes
   b. FIFO
2. Implement file transfer using Message Queue form of IPC
3. Write a programme to create an integer variable using shared memory concept and increment the variable simultaneously by two processes. Use semaphores to avoid race conditions
4. Design TCP iterative Client and server application to reverse the given input sentence
5. Design TCP iterative Client and server application to reverse the given input sentence.
6. Design TCP client and server application to transfer file
7. Design a TCP concurrent server to convert a given text into upper case using multiplexing system call "select"
8. Design a TCP concurrent server to echo given set of sentences using poll functions
9. Design UDP Client and server application to reverse the given input sentence
10. Design UDP Client server to transfer a file
11. Design using poll client server application to multiplex TCP and UDP requests for converting a given text into upper case.
12. Design a RPC application to add and subtract a given pair of integers

**Course Title: C SHELL PROGRAMMING LAB**
**Course Code: CAI368**

| L | T | P | Credits |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Instruction for Students:** The students will be attending a laboratory session of 2 hours weekly and they have to perform the practical related to the following list.

1. a) Login to the system
b) Use the appropriate command to determine your login shell
c) Use the /etc./password file to verify the result of step b.
d) Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.
e) Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.

2. a) Write a sed command that deletes the first character in each line in a file.
b) Write a sed command that deletes the character before the last character
in each line in a file.
c) Write a sed command that swaps the first and second words in each line in a file.

3. a) Pipe your /etc/passwd file to awk, and print out the home directory of each user.
b) Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word.
c) Repeat
d) Part using awk

4. a) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.
b) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
c) Write a shell script that determines the period for which a specified user
is working on the system.

5. a) Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.
b) Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.

6. a) Write a shell script that computes the gross salary of a employee according to the following rules:
i) If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.
ii) If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic. The basic salary is entered interactively through the key board.
b) Write a shell script that accepts two integers as its arguments and computers the value of first number raised to the power of the second number.

7. a) Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the user for the necessary information, such as the file name, new name and so on.

b) Write shell script that takes a login name as command – line argument and reports when that person logs in
c) Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.

8. a) Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
b) Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.
c) Write a shell script to perform the following string operations:
i) To extract a sub-string from a given string.
ii) To find the length of a given string.

9. Write a C program that takes one or more file or directory names as command line input and reports the following information on the file:
i) File type
ii) Number of links
iii) Read, write and execute permissions
iv) Time of last access
(Note: Use stat/fstat system calls)

10. Write C programs that simulate the following unix commands:
a) mv
b) cp (Use system calls)

11. Write a C program that simulates ls Command (Use system calls / directory API)

# DISCIPLINE SPECIFIC ELECTIVE-II

**Course Title: AI in Healthcare Informatics**
**Course Code: CAI451**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:**
The goal of this course is to introduce the underlying concepts, methods, and the potential of intelligent systems in healthcare. We will explore foundational methods in artificial intelligence (AI) with greater emphasis on machine learning and knowledge representation and reasoning, and apply them to specific areas in medical science and healthcare sector.

**UNIT-A**

**Introduction to Human and Artificial Intelligence:** Terminologies, computational models of intelligence; conceptual frameworks from cognitive and educational psychology, neuroscience, information theory, and linguistics; philosophical foundations of AI.

**(10 Hours)**

**UNIT-B**

**Applications:** Unique characteristics and challenges in medicine and healthcare; History and status quo of intelligent and expert systems in medicine. Risk stratification, patient outcome prediction, disease progression modeling, Clinical decision-making and intelligent systems to support evidence-based medicine, Remote Monitoring of Patient, Analysis of tissue morphology and other medical imaging applications

**(11Hours)**

**UNIT-C**

**Implementation:** Tools and Technologies for implementing AI methods, Model evaluation and performance metrics, cross-validation, model interpretability, Ethics of AI: bias, fairness, accountability, and transparency in machine learning; Ethical, Legal, and Social Issues of AI in medicine and healthcare

**(10 Hours)**

**UNIT-D**

**Case Studies:** AI in Diabetes Diagnosis, AI in Image Processing, AI in Drug-Drug Interaction, AI in Cardiology, AI in Human Psychological Disorders, AI in COVID-19, AI in medicine and pharmaceuticals.

**(11Hours)**

**REFERENCES:**


1. Machine Learning and AI for Healthcare(Big Data for Improved Health Outcomes) by Arjun Panesar, 4842-3799-1 Publisher Apress Berkeley, CA, Edition-1(2019)
2. Artificial Intelligence in Healthcare by Chitresh Banerjee, Lalit Garg, Sebastian Basterrech, Tarun K. Sharma; 2021; Publisher:Springer Nature Singapore
3. Artificial Intelligence in Healthcare by Parag Suresh Mahajan; Publisher MedMantra, LLC, 2021
4. AI in Healthcare: How Artificial Intelligence Is Changing IT Operations and Infrastructure Services; by Robert Shimonski; Publisher Wiley(2021)

**Course Title: AI in Humanities**
**Course Code: CSE455**

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:**
The goal of this course is to introduce the underlying concepts, methods, and the potential of intelligent systems for humanity. We will explore foundational methods in artificial intelligence (AI) with greater emphasis on machine learning and knowledge representation and reasoning, and apply them to specific areas for the betterment of humanity.

**UNIT-I**

AI and Humanity, What is AI and Humanity? Transforming world through AI, How Artificial Intelligence is helping humanity? Collaborative Intelligence, how AI will improve humanity, Implications and Challenges of AI in Humanity, Benefits of AI in humanity, Artificial Intelligence and the Future of Humans

**(11Hours)**

**UNIT-II**

Human Computer Interaction, How Artificial Intelligence Transform Human Society Inevitable, Brief history of HCI, User interface Design (Models, Principles, Practices), Cognitive Framework of HCI, Perception & Representation, Evaluation with Cognitive Models, Socio-Organizational issues and stakeholder requirements

**(11Hours)**

**UNIT-III**

**Applications:** Impact of AI on human society, AI in Governance, AI in Innovation, AI in Manufacturing, AI in mobility, AI in Arts, Implications and Challenges in implementing AI in Governance, mobility and healthcare.

**(10Hours)**

**UNIT-IV**

**Case Studies:** AI and road safety, AI and Healthcare, AI and Digital Intervention, AI and Transportation, AI for Deaf and Dumb, AI and Combatting Human Trafficking, AI and Disabled People, Optimizing Renewable Energy Generation

**(10Hours)**

**REFERENCES:**


1. AI and Humanity by Illah Reza Nourbakhsh and Jennifer Keating, Publisher The MIT Press
2. Artificial Intelligence in Highway Safety, by Subasish Das, by CRC Press, 2022
3. Human Compatible: Artificial Intelligence and the Problem of Control, by Stuart Russell, Publisher : Viking; Illustrated edition (October 8, 2019)
4. Artificial Intelligence and Digital World, by Dr Ambrish Saxena, Mohd Kamil, Mudita Raj, Publisher : Kanishka Publishers (1 January 2022)

| L | T | P | Credits |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Title: Data Analysis**

**CourseCode:CAI457**

**Course Objective-**To impart practical knowledge about various concepts of data analytics
**Learning outcomes-** After completion of this course, student will be able to apply various concepts of data analytics to solve various problems.

## UNIT I

**Introduction to Data Analytics** - Types of Data Analytics - Predictive Analytics - Simple linear regression - Multiple linear regression - Auto regression - Moving Average - Autoregressive Integrated Moving Average - Data Pre-processing - Data Cleaning - Data Integration and Transformation - Data Reduction - Descriptive data analytics - measures of central tendency - measures of location of dispersions.

**(10Hours)**

## UNIT II

Association Rule Mining: Efficient and Scalable Frequent Item set Mining Methods - Mining Various Kinds of Association Rules - Association Mining to Correlation Analysis - Constraint Based Association Mining - Cluster Analysis: Types of Data in Cluster Analysis - A Categorization of Major Clustering Methods - Partitioning Methods - Hierarchical methods.

**(11Hours)**

## UNIT III

Introduction to Streams Concepts - Stream data model and architecture - Stream Computing - Sampling data in a stream - Filtering streams - Counting distinct elements in a stream - Estimating moments - Counting oneness in a window - Decaying window - Real Time Analytics Platform (RTAP) applications - case studies - real time sentiment analysis - stock market predictions.

**(11Hours)**

## UNIT IV

Using Graph Analytics for Big Data: Graph Analytics - The Graph Model - Representation as Triples - Graphs and Network Organization - Choosing Graph Analytics - Graph Analytics Use Cases - Graph Analytics Algorithms and Solution Approaches - Technical Complexity of Analyzing Graphs - Features of a Graph Analytics Platform - Considerations: Dedicated Appliances for Graph - Graph QL

**(11Hours)**

## REFERENCES:


1. Jiawei Han, MichelineKamber, Jian Pei, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.
2. A. Rajaraman, J. Ullman, “Mining Massive Data Sets”, Cambridge University Press, 2012.
3. David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, No SQL, and Graph”, 2013.

# DISCIPLINE SPECIFIC ELECTIVE-III

**Course Title: Parallel Computing**
**Course Code: CAI442**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objectives:** To impart knowledge of parallel computing systems and techniques.
**Learning outcome: -**Student will able to find parallelism approaches and use of parallel programming.

**UNIT-A**

Introduction: Paradigms of parallel computing: Synchronous - vector/array, SIMD, Systolic; Asynchronous- MIMD, reduction paradigm. Hardware taxonomy: Flynn's classifications, Handler's classifications. Software taxonomy: Kung's taxonomy, SPMD.

**(8 Hours)**

**UNIT-B**

Abstract parallel computational models: Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one, Sorting network, Interconnection RAMs. Parallelism approaches - data parallelism, control parallelism.

**(12 Hours)**

**UNIT-C**

Performance Metrics: Laws governing performance measurements. Metrics - speedups, efficiency, utilization, communication overheads, single/multiple program performances, benchmarks. Parallel Processors: Taxonomy and topology - shared memory multiprocessors, distributed memory networks. Processor organization - Static and dynamic interconnections. Embeddings and simulations.

**(12 Hours)**

**UNIT-D**

Parallel Programming: Shared memory programming, distributed memory programming, object oriented programming, data parallel programming, functional and dataflow programming. Scheduling and Parallelization: Scheduling parallel programs. Loop scheduling. Parallelization of sequential programs. Parallel programming support environments.

**(13 Hours)**

**REFERENCES:**


1. M. J. Quinn. Parallel Computing: Theory and Practice, McGraw Hill, New York, 1994.
2. T. G. Lewis and H. El-Rewini. Introduction to Parallel Computing , Prentice Hall, New Jersey, 1992
3. T. G. Lewis. Parallel Programming: A Machine-Independent Approach, IEEE Computer Society Press, Los Alamitos, 1994.
4. S.G. Akl, “Design and Analysis of Parallel Algorithms”
5. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

**Course Title: Mobile Computing & Communication**
**Course Code: CAI444**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objectives:** To impart knowledge of mobile and wireless computing systems and techniques.

**Learning outcomes: -** This course offers a good understanding of the concepts, methods and techniques of mobile computing and helps to make a good carrier in the field of telecommunication.

**UNIT-A**

Mobility: Issues, challenges, and benefits; Review of mobile and cellular communication technology; Review of distributed/network operating systems, ubiquitous computing. Global System for Mobile Communication (GSM) System Overview: GSM Architecture, Mobility Management, Network Signalling, GPRS.

**(14Hours)**

**UNIT-B**

Mobile IP Networks: Physical mobility, challenges, limits and connectivity, mobile IP and cellular IP in mobile computing. Mobile Transport Layer: Transport layer issues in wireless, Indirect TCP, Snoop TCP, Mobile TCP

**(10Hours)**

**UNIT-C**

Wireless LANs: Introduction to IEEE 802.11, Bluetooth technologies and standards. Mobile Adhoc Networks: Hidden and exposed terminal problems; routing protocols: DSDV, DSR, AODV.

**(10 Hours)**

**UNIT-D**

Mobile Devices and OS: Various types of Devices, Operating System: PalmOS, Windows CE, Windows Mobile. Application Development: WWW programming model, Development Environment for Mobile Devices.

**(12 Hours)**

**REFERENCES:**


1. A. S. Tanenbaum. : Computer Networks, 4th Ed., Pearson Education.
2. D. Milojicic, F. Douglis. : Mobility Processes, Computers and Agents", Addison Wesley
3. Raj Kamal : Mobile Coomputing, Oxford University Press

**Course Title: Cloud Computing**
**Course Code: CAI446**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** Analyse the components of cloud computing showing how business agility in an organization can be created. Compare and contrast the economic benefits delivered by various cloud models based on application requirements, economic constraints and business requirements.

**Learning Outcomes:** This module gives students the skills and knowledge to understand how Cloud Computing Architecture can enable transformation, business development and agility in an organization. .

**UNIT-A**

**Cloud Computing:** Overview, Applications, Intranet and the Cloud, First Movers on the cloud, the need for Cloud Computing, Benefits of cloud Computing, Limitations of the
Cloud Computing, security concerns and regulatory issues, over view of different cloud computing applications which are implemented, Business case for implementing a Cloud.

**(14 Hours)**

**UNIT-B**

**Cloud computing and Service Models:** Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure-as- a- Service (IaaS), Platform- and Software-as-a-Service (Paas, SaaS). Architectural Design of Compute and Storage Clouds: A Generic Cloud architecture Design, Layered Cloud Architectural development, Architectural Design Challenges. Cloud Standards: Applications, Client, Infrastructure, Services.

**(13 Hours)**

**UNIT-C**

**Cloud Computing Mechanisms:** Software as a service: Overview, Driving Forces, Company offerings, Industries, Software + services: Overview, Mobile Device Integration, Providers, Microsoft Online Application development: Google, Microsoft, Intuit Quick base, Cast Iron Cloud, Bungee Connect, Development Platforms: Google, Sales Force, Azure, Trouble shooting, Application management

**(14 Hours)**

**UNIT-D**

**Local Clouds**: Virtualization, server solutions, Thin Clients
**Migrating to the clouds**: Cloud services for individuals, Mid-market, and Enterprise wide, Migration, best practices, analysing the service.

**(15 Hours)**

**REFERENCES:**


1. Cloud Computing a practical approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, Tata McGraw-HILL,2010 Edition
2. Cloud Computing-web Based application that change the way you work and collaborate online, Michael Miller, Pearson Eduction,2009 Edition
3. Cloud Computing for Dummie by Judith Hurwitz, Bloor Robin, Marcia Kaufman & Fern Halper, November 2009.
4. CLOUD COMPUTING Principles and Paradigms by RajkumarBuyya The University of Melbourne and Manjrasoft 2011 by John Wiley & Son

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Title: Green Computing**
**Course Code: CAI448**

**Course Objective:** To learn the fundamentals of Green Computing.
• To analyze the Green computing Grid Framework.
• To understand the issues related with Green compliance.
• To study and develop various case studies.
**Learning Outcomes:** After the completion of this course the participants would gain the knowledge of the various technical and management issues regarding Green Computing.

**UNIT I**

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

**(10Hours)**

**UNIT II**

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

**(11Hours)**

**UNIT III**

**Grid Framework:** Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

**(10Hours)**

**UNIT IV**

**Green Compliance:** Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.
**Case Studies:** The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

**(10Hours)**

**TEXT BOOKS:**


1. Bhuvan Unhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence‖, CRC Press, June 2014.
2. Woody Leonhard, Katherine Murray, ―Green Home computing for dummies‖, August 2012.


**REFERENCES:**


1. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: steps for the Journey‖, Shroff/IBM rebook, 2011.
2. John Lamb, ―The Greening of IT‖, Pearson Education, 2009.
3. Jason Harris, ―Green Computing and Green IT- Best Practices on regulations & industry‖, Lulu.com, 2008
4. Carl speshocky, ―Empowering Green Initiatives with IT‖, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), ―Green computing: Large Scale energy efficiency‖, CRC Press

# DISCIPLINE SPECIFIC ELECTIVE-IV

**Course Title: Operational Research**
**Course Code: CAI452**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**UNIT-A**

**Introduction to Operations Research:** Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, Big-M method, two-phase method, degeneracy and unbound solutions.

**Transportation Problem. Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions** – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method.

Assignment model. Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem and assignment problem.

**(14 Hours)**

**UNIT-B**

**Sequencing models. Solution of Sequencing Problem –** Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines – Processing n Jobs through m Machines.

**Dynamic programming-**Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems

**(12 Hours)**

**UNIT-C**

**Games Theory-**Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, and value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

**Replacement Models-** Replacement of Items that deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

**(14 Hours)**

**UNIT-D**

**Inventory models-**Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

**(10 Hours)**

**REFERENCES:**


1. P. SankaraIyer, "Operations Research", Tata McGraw-Hill, 2008.
2. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.
3. J K Sharma., "Operations Research Theory & Applications , 3e", Macmillan India Ltd, 2007.
4. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.
5. J K Sharma., "Operations Research, Problems and Solutions, 3e", Macmillan India Ltd.
6. N.V.S. Raju, "Operations Research", HI-TECH, 2002.

**Course Title: Fuzzy Logic and Neural Networks**
**Course Code: CAI454**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Outcomes:**

1. To Expose the students to the concepts of feed forward neural networks
2. To provide adequate knowledge about feedback networks.
3. To teach about the concept of fuzziness involved in various systems. To provide adequate knowledge about fuzzy set theory.
4. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
5. To provide adequate knowledge of application of fuzzy logic control to real time systems.

**UNIT -A**

Neural networks characteristics, History of development in neural networks principles, Artificial neural net terminology, Model of a neuron, Topology, Learning, types of learning, Supervised, Unsupervised, Re-enforcement learning. Knowledge representation and acquisition.

**(12Hours)**

**UNIT -B**

Basic Hop field model, Basic learning laws, unsupervised learning, Competitive learning, K-means clustering algorithm, Kohonen's feature maps.

**(12Hours)**

**UNIT -C**

Radial basis function neural networks, Basic learning laws in RBF nets, Recurrent back propagation, Introduction to counter propagation networks, CMAC network, and ART networks. Fuzzy Logic I: Basic concepts of fuzzy logic, Fuzzy Vs Crisp set, Linguistic variables, Membership functions, Operations of fuzzy sets.

**(14Hours)**

**UNIT- D**

Fuzzy Logic II: Fuzzy IF-THEN rules, Variable inference techniques, De-Fuzzification, Basic fuzzy inference algorithm, Fuzzy system design, PID control, Antilock Breaking system (ABS)

**(12Hours)**

**REFERENCES:**


1. S. N. Sivanandam, S. N Deepa,"Introduction To Neural Net With Matlab 6.0", Tata McGraw-Hill Education
2. George k klir ,"Fuzzy Sets and Fuzzy Logic Theory and Applications".
3. Yegnanarayana B, "Artificial Neural Networks", Prentice Hall of India Private Ltd., New Delhi
4. S.N Sivanandam, SN Deepa : Principles of Soft Computing, Wiley India, 2nd Edition
5. S. Rajasekaran, G.A. VijayalakshmiPai : Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications, 15th Edition, PHI Learning.
6. James Freeman A. and David Skapura : Neural Networks - Algorithms, Applications & Programming Techniques, Addison Wesley
7. Simon Haykin,"Neural Networks".
8. ROSS J.T,"Fuzzy logic with engineering application", Tata Mc.
9. Bart Kosko,"Neural Networks & Fuzzy Logic".

**Course Title: Database Administration**
**Course Code: CAI456**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** This course uses the latest database tools and techniques to prepare the student to understand, develop, and manage more advanced database applications. Students gain considerable hands-on experience with the Oracle family of databases, and define, design, and implement databases. Students learn how to use object-oriented technologies to design relational databases, and how to design relational databases to support object-oriented applications.

**Learning Outcomes**: Upon completion of this course the student will be able to:

- Properly install, configure and tune a database
- Properly administer servers and server groups
- Properly manage and optimize schemas, tables, indexes, and views

**UNIT-A**

**Introduction to Database:** Client/Server Concept, Types of Databases, Relational Vs. Flat File Database. Background of SQL Server, Versions of SQL Server and Clients Supported by SQL Server
**SQL Server 2000:** Installation & Configuring SQL Server: Installing SQL Server 2000, Unattended Installations, SQL Server Services. Configuring SQL Server Network Protocol Settings. Installing SQL Server Clients.

**(10Hours)**

**UNIT-B**

**SQL Server Tools and Utilities:** Managing SQL Server with Enterprise Manager, Query Analyzer, SQL Server Groups. Tools Menu, Action Menu. Introduction to Transact –SQL (T-SQL)
**Managing Database:** Creating Database, Database File Placement (RAID 0, RAID 1 RAID 5), Creating Database using T-SQL and Enterprise Manager. Altering, Renaming, Dropping Database.
**Creating Objects in Database:** Tables, Views, Constraints, Indexes.

**(11hours)**

**UNIT-C**

**Managing Security:** Understanding Security Modes, Windows Authentication Modes, Mixed Mode, SQL Server Logins, Windows Logins, Fixed Server Logins, Creating Users, Database Roles, (Grant, Revoke ,Deny) N-Tier Security..
**Database Backups and Restore:** Copying Database with Copy Database Wizard. SQL Database Backup Modes (Full, Differential, Transactional Log Backup).Backing up of the Database. Restoring Database. DTS: Its meaning, DTS Packages. DTS Storage and Designer.

**(12hours)**

**UNIT-D**

**SQL Server Agent:** Configuring Understanding Alerts, Jobs and Events.
**Creating Jobs:** Multi Server Jobs, Creating, Editing and Deleting of Jobs. SQL Server and IIS. Understanding the Static Page and Dynamic Pages of the Internet. Internet Database Connector.
**Replication and Performance Optimization:** Overview of Replication Installing.
**Types of Replication:** Merge Replication, Snapshot Replication, Transactional Replication.
**Using Windows System Monitor:** Monitor with SQL Profiler and Query Analyzer. Optimization Techniques: Queries and Stored Procedure, Proper Indexing, Locks and Defragmentation

**(12hours)**

**REFERENCES:**


1. Kreines, David,.andLaskey, Brian. Oracle Database Administration. Oreilly Media.
2. Mullins, Craig S. Database Administration: The Complete Guide to Practices and Procedures. Powell's books.
3. Rajan, Claire. Oracle 10g Database Administrator II: Backup/recovery &Network Administration. Thomson.
4. Alapati, Sam R. Expert Oracle9i Database Administration. New York:Apress,2003
5. Wood, Dan. Begininig SQL Server 2005 Administration. USA: Wrox publication, 2009.

**Course Title: Network Security**
**Course Code: CAI458**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** The objective of this course is to gain an understanding of various methods, and protocols used in network security.
**Learning Outcomes:** After the completion of this course the participants would gain the knowledge of various protocols of networking, security issues and password authentication protocols.

**UNIT-A**

**Overview of computer networks,** seven-layer architecture, TCP/IP suite of protocols. Introduction to information Security, Types of information security controls, need of Information Security, Allocation of information security responsibilities, Security mechanisms, Identification of Security threats and their effects on security, Technologies and Security policies, real time Communication security. An introduction to LAN/WAN Security and internet Security, Security Management for the World Wide Web and Internet firewalls and how to get past the firewall, Steganography, Layers and Cryptography.

**(11Hours)**

**UNIT-B**

**Overview of Authentication schemes:** Password and address based Authentication, Cryptographic Authentication protocols, Trusted Intermediaries and session key establishment.
**Authentication of people:** Passwords, Online and offline password guessing, eavesdropping, password and careless users, authentication tokens and biometrics.

**(12Hours)**

**UNIT-C**

**Security handshake pitfalls:** Mutual authentication, Integrity for data, Mediated Authentication, Strong password protocols: EKE, SRP, SPEKE and PDM.
**Public key infrastructure (PKI):** Terminology, PKI trust models, Revocation and Authorization futures.
**IPsec:** Overview of IPsec, IP and IPv6, AH and ESP, IKE, SSL/TLS.

**(12Hours)**

**UNIT-D**

**Overview of IT Security,** Hacking, Hackers and Types of Hackers, Attacks, Denial of Service Attacks(DoS), types of DOS attacks, Viruses and their characteristics, impact they can have on operations and business, Detection and Prevention Mechanisms, types of virus, The self-Hack Audit, VPN.
**Intrusion:** Intruders, Audit records, Intrusion detection, distributed intrusion detection, honeypots.
**Electronic Mail Security:** PEM, Structure of PEM Message and S/MIME, PGP etc.

**(14Hours)**

**REFERENCES:**


1. Charlie Kaufman, Radia Perlman, Mike Speciner," Network Security", Pearson Education, 2006
2. S. Cimato and C. Galdi, "Security in Communication Networks", Springer, 2003.
3. H. Chan and V. Gligor, "Information Security", Springer, 2002.
4. UPTEC Computer Consultancy Limited, "Information Technology Tools and Applications", ELSEVIER2005.
5. Rajaraman, "Introduction to Information technology", Prentice Hall of India, Ed., 2005

**Course Title: Wireless Network Communication**
**Course Code: CAI460**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

Course Objective: This course is designed to provide the students with a basic understanding and experiential learning of wireless communications and networking.
Learning Outcomes: After the completion of this course the participants would gain the knowledge of how a Wireless networks work during data communication between wireless end points and how to implement the Security on it.

**UNIT-A**

Introduction: Differences between wireless and fixed telephone networks, Evolution of wireless networks, Examples of Wireless Communication Systems: Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems, Comparison of common Wireless Communication systems, Traffic routing in wireless networks: circuit switching and packet switching.

**(12 Hours)**

**UNIT-B**

Wireless Local Area Networks: Introduction, WLAN topologies, requirements, working and function of physical layer and MAC layer, IEEE standards for wireless networks, Wi-Fi, Bluetooth, WiMax.

**(12 Hours)**

**UNIT-C**

Wireless Internet: Mobile IP components, process of agent discovery, registration and de-registration, care-of-address, concept of tunneling, Limitations of Mobile IP, introduction to micro-mobility protocols.

**(12 Hours)**

**UNIT-D**

Ad Hoc Wireless Networks: Introduction, Challenges in ad hoc networks: spectrum allocation, media access, routing, multicasting, energy efficiency, security and privacy; problems in ad hoc channel access, receiver-initiated MAC protocols, sender-initiated MAC protocols and existing ad hoc MAC protocols; Ad hoc routing protocols: Destination sequenced distance vector (DSDV), Ad hoc on demand distance vector routing (AODV), Dynamic source routing (DSR), Temporally ordered routing algorithm (TORA).

**(10Hours)**

**REFERENCES:**


1. Pahlavan and Krishnamurthy.Principles of Wireless Networks.Prentice Hall,2002.
2. Schiller,J.MobileCommunications.Addison-Wesley, 2000.
3. Gibson,JerryD.The Mobile Communications Handbook.CRCPress, 1999.
4. Held,G.Data over Wireless Networks.McGraw-Hill, 2001.
5. Blake.Wireless Communication Systems.NewDelhi :Cengage Learning

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# DISCIPLINE SPECIFIC ELECTIVE-V

**Course Title: IMAGE PROCESSING and PATTERN RECOGNITION**
**Course Code: CAI462**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Learning Outcomes:**

1. Identify and describe operation of different smoothing and sharpening filters.
2. Students are able to analyze the different segmentation techniques
3. Students are able to apply different de-noising models to recover original image.
4. Identify different pattern recognition methods and apply them in problem areas.

**UNIT-A**

**Introduction**: Digital Image- Steps of Digital Image Processing Systems-Elements of Visual Perception -Connectivity and Relations between Pixels. Simple Operations- Arithmetic, Logical, Geometric Operations. 2D Linear Space Invariant Systems - 2D Convolution - Correlation 2D Random Sequence - 2D Spectrum.

**Image Transforms**: 2D Orthogonal and Unitary Transforms-Properties and Examples. 2D DFT-FFT – DCT, Histogram Equalization Technique- Point Processing-Spatial Filtering-In Space and Frequency -Nonlinear Filtering-Use of Different Masks.

**(12Hours)**

**UNIT-B**

**Image Restoration**: Image Observation And Degradation Model, Circulant And Block Circulant Matrices and Its Application In Degradation Model - Algebraic Approach to Restoration- Inverse By Wiener Filtering – Generalized Inverse-SVD And Interactive Methods - Blind Deconvolution-Image Reconstruction From Projections.

**Image Compression**: Redundancy and Compression Models -Loss Less and Lossy. Loss Less-Variable-Length, Huffman, Arithmetic Coding - Bit-Plane Coding, Loss Less Predictive Coding Lossy Transform (DCT) Based Coding, JPEG Standard - Sub Band Coding.

**(12Hours)**

**UNIT-C**

**Image Segmentation**: Edge Detection - Line Detection - Curve Detection - Edge Linking and Boundary Extraction,

**Boundary Representation**, Region Representation and Segmentation, Morphology-Dilation, Erosion, Opening and Closing. Hit and Miss Algorithms Feature Analysis

**(11Hours)**

**UNIT-D**

**Colour and multispectral image processing:** Colour Image-Processing Fundamentals, RGB Models, HSI Models, Relationship Between Different Models.

**Pattern Recognition** Representation Feature extraction and Pattern Representation, Concept of Supervised and Unsupervised Classification Introduction to Application Areas

**Statistical methods for Pattern Recognition** Bayes Decision Theory, Minimum Error and Minimum Risk Classifiers, Discriminant Function and Decision Boundary ,Normal Density, Discriminant Function for Discrete Features ,Parameter Estimation

**(11Hours)**

**REFERENCES:**


1. Digital Image Processing By Rafael C.Gonzales, Richard E. Woods, Pearson Education.
2. Digital Image Processing and Computer Vision by Sonka, Hlavac, Boyle Cengage Learning
3. Fundamentals of Digital Image Processing By Jain, Pearson Education
4. Digital Image Processing and Analysis by Chanda&Majmuder, PHI
5. Digital Image Processing by W. K. Pratt, John Wiley

**6.** Pattern Classification, Duda, R.D. and Hart, P.E., Stork, D. G.
**7.** Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", JohnWiley& Sons, 2001.
**8.** Earl Gose, Richard Johsonbaugh and Steve Jost, "Pattern Recognition and ImageAnalysis", Prentice Hall, 1999

**Course Title: Mobile Application Development**
**Course Code: CAI464**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Learning Outcomes:**

1. Be exposed to technology and business trends impacting mobile applications
2. Be competent with the characterization and architecture of mobile applications.
3. Be competent with understanding enterprise scale requirements of mobile applications.
4. Be competent with designing and developing mobile applications using one application development framework.

**UNIT-A**

**Introduction:** Mobile operating system, Operating system structure, Constraints and Restrictions, Hardware configuration with mobile operating system, Features: Multitasking Scheduling, Memory Allocation, File System Interface, Keypad Interface, I/O Interface, Protection and Security, Multimedia features.

**(12Hours)**

**UNIT-B**

Introduction to Mobile development IDE's, Introduction to Work light basics, Optimization, pages and fragments , Writing a basic program- in Work light Studio, Client technologies, Client side debugging, Creating adapters, Invoking adapters from Work light Client application, Common Controls, Using Java in adapters, Programming exercise with Skins, Understanding Apache Cordova, Offline access, Encrypted cache deprecated, Using JSON Store

**(12Hours)**

**UNIT-C**

Understanding Apple iOS development, Android development, Shell Development, Creating Java ME application, Exploring the Work light Server, Working with UI frameworks, Authentication, Push notification, SMS Notifications, Globalization, Web View overlay , Creating Authentication application: development for Apple iOS by using a login module, Device Analytics, Work light Server Administration

**(11Hours)**

**UNIT-D**

**Android:** Introduction to Android, Architecture, memory management, communication protocols, application development methods, deployment. Case Study: Design and development of Application using mobile application development platforms e.g. Work Light, Kendo, Appcon, Xcode, Xpages Unit VI: iOS: Introduction to iOS, Architecture, memory management, communication protocols, application development methods, deployment. Case Study: Design and development of Application using mobile application development platforms e.g. Work Light, Kendo, Appcon, Xcode, Xpages

**(11Hours)**

**REFERENCES:**

1. Anubhav Pradhan, Anil V Deshpande, “Mobile Apps Development” Edition: I
2. Jeff McWherter, Scott Gowell “Professional Mobile Application Development”, John Wiley & Sons, 2012.
3. Barry Burd, “Android Application Development All in one for Dummies”, Edition: I
4. Teach Yourself Android Application Development In 24 Hours, Edition: I, Publication: SAMS 5. Neal Goldstein, Tony Bove, “iPhone Application Development All-In-One for Dummies”, John Wiley & Sons

6. Henry Lee, Eugene Chuvyrov, “Beginning Windows Phone App Development”, Apress, 2012. 7. JochenSchiller,“Mobile Communications”, Addison-Wesley, 2nd edition, 2004.
8. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2002, ISBN 0471419028.

**Course Title: Cyber Laws & IPR**
**Course Code: CAI466**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** This syllabus presents the meaning and definition of cybercrime, the legislation in India dealing with offences relating to the use of or concerned with the abuse of computers or other electronic gadgets. The Information Technology Act 2000 and the I.T. Amendment Act 2008 have been dealt with in detail and other legislations dealing with electronic offences have been discussed in brief.

**Learning Outcomes:** Upon successful completion of this course, students will be aware of present cyber laws, Cyber Crimes, Cyber Security, Criminal Liability, Corporate policies.

**UNIT-A**

**Cyber laws:** Introduction to the Cyber World and Cyber Law, Information Technology Act, 2000 –Digital Signature; E-Governance; Regulation of Certifying Authorities; Duties of pub scribers; Penalties and Adjudications; Offences under the Act; Making of Rules and Regulations etc. Cyber Crimes Introduction–computer crime and cybercrimes; Classification of cybercrimes. Cyber forensic, Cyber criminals and their objectives Kinds of cybercrimes –cyber stalking; cyber pornography; forgery and fraud; crime related to IPRs; Cyber terrorism; computer vandalism.

**(11Hours)**

**UNIT-B**

**Cyber Security:** Cyber Security and its problem-Intervention Strategies: Redundancy, Diversity and Autarchy. Private ordering solutions, Regulation and Jurisdiction for global Cyber security, Copy Right-source of risks, Pirates, Internet Infringement, Fair Use, postings, criminal liability, First Amendments, Data Losing

**(11Hours)**

**UNIT-C**

**Copy Right:** Source of risks, Pirates, Internet Infringement, air Use, postings, Criminal Liability, First Amendments, Losing Data, Trademarks, Defamation, Privacy-Common Law Privacy, Constitutional law, Federal Statutes, Anonymity, Technology expanding privacy rights. Duty of Care, Criminal Liability, Procedural issues, Electronic Contracts & Digital Signatures, Misappropriation of information, Civil Rights, Tax, Evidence. Information security policies and procedures: Corporate policies-Tier 1, Tier 2 andTier3 policies -process management-planning and preparation-developing policies-asset classification policy developing standards.

**(13Hours)**

**UNIT-D**

**Corporate policies**-Tier 1, Tier 2 and Tier3 policies -process management-planning and preparation-developing policies-asset classification policy developing standards.

**(10Hours)**

**REFERENCES:**

1. Rosenoer,Jonathan.Cyber Law: The law of the Internet. Springer, 1997.
2. Grady,Mark.AndPeltier, F FransescoParisi Thomas R.The Law and Economics of Cyber Security. Cambridge University Press, 2005.
3. Knapp,Kenneth J. Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions.IGI Global, 2009.
4. Peltier,Thomas R Justin Peltier,andblackley,John."InformationSecurityFundamentals", 2nd Edition, Prentice Hall, 1996.

**Course Title: Web Technology**
**Course Code: CAI468**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Outcomes:** Upon successful completion of this course, the student will be able to:

- Plan, design, create, and implement a web site;
- Use the concept of XML, CSS and DHTML
- Develop a static and dynamic websites.
- Establish the database connectivity over a website.

**UNIT-A**

**Introduction to HTML:** HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets; Introduction to JavaScript: Scripts, Objects in Java Script, Dynamic HTML with Java Script XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX

**(12Hours)**

**UNIT-B**

**Java Beans:** Introduction to Java Beans, Advantages of Java Beans, BDK Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API, Introduction to EJB's Web Servers and Servlets: Tomcat web server, Introduction to Servelets: Lifecycle of a Serverlet, JSDK, The Servelet API, The javax.servelet Package, Reading Servelet parameters, and Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues

**(12Hours)**

**UNIT-C**

**Introduction to JSP:** The Problem with Servelet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment: Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations

**(11Hours)**

**UNIT-D**

Database Access: Database Programming using JDBC, Studying Javax.sql.* package, Accessing a Database from a JSP Page, Application – Specific Database Actions, Deploying JAVA Beans in a JSP Page, Introduction to struts framework. One android application development

**(11Hours)**

**REFERENCES:**

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech
2. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH
3. Java Server Pages –Hans Bergsten, SPD O'Reilly.
4. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia
5. JoclSklar, "Web Warrier guide to web design technologies", Cengage Learning, New Delhi

**Course Title: Big Data Analytics**
**Course Code: CAI470**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:**
To explore the fundamentals concepts of big data analytics. To learn and understand the concept of big data intelligent techniques, various search methods and visualization techniques.
Learning Outcomes:

1. This course provides an overview of approaches facilitating data analytics on huge datasets.
2. Different strategies are presented including sampling to make classical analytics tools amenable for big datasets, analytics tools that can be applied in the batch or the speed layer of a lambda architecture, stream analytics, and commercial attempts to make big data manageable in massively distributed or in-memory databases.
3. Learners will be able to realistically assess the application of big data analytics technologies for different usage scenarios and start with their own experiments

**UNIT – A**

**Introduction to Big Data**: Overview of Big Data, Stages of analytical evolution, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs. Reporting, Modern Data Analytic Tools, Statistical Concepts: Sampling Distributions - Re-Sampling, Statistical Inference - Prediction Error

**(14Hours)**

**UNIT – B**

**Mining Data Streams:** Introduction To Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform(RTAP) Applications

**(12Hours)**

**UNIT – C**

**Hadoop:** History of Hadoop, The Hadoop Distributed File System, Components of Hadoop, Analyzing the Data with Hadoop, Scaling Out- Hadoop Streaming, Design of HDFS-Java interfaces to HDFSBasics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run-Failures, Job Scheduling-Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features

**(14Hours)**

**UNIT – D**

**Frameworks:** Applications on Big Data Using Pig and Hive, Data processing operators in PigHive services, HiveQL, Querying Data in Hive, Fundamentals of HBase and Zookeeper, Visualizations:Visual data analysis techniques, interaction techniques. Systems and applications

**(12Hours)**

**REFERENCES:**


1. Michael Berthold, David J. Hand, *Intelligent Data Analysis*, Springer, 2007.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data*, 2012.
3. Tom White, *Hadoop: The Definitive Guide* Third Edition, O'reilly Media, 2012.
4. AnandRajaraman and Jeffrey David Ullman, *Mining of Massive Datasets*, Cambridge University Press, 2012.

**5.** Bill Franks, *Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics*, JohnWiley& sons, 2012.
**6.** Michael Minelli (Author), Michele Chambers (Author), AmbigaDhiraj (Author), *Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses*,Wiley Publications, 2013.
**7.** Jiawei Han, MichelineKamber, *Data Mining Concepts and Techniques*, Second Edition, Elsevier, Reprinted 2008.

# GENERIC ELECTIVE-I

**Course Title: Software Engineering & Project Management**
**Course Code: CAI801**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** To understand the basic concepts of software engineering and software development life cycle.
**Learning Outcomes:** Students will learn about the different activities of software development and about the risk management. They will get aware about the different case tools.

**UNIT – A**

**Introduction to Software Engineering:** Software Problem, Software Engineering, Approach, Software process, Characteristics of Software Engineering Process.
**Process models:** The waterfall model, Incremental process models, Evolutionary process models, The Unified process.
**Software Requirements:** Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document

**(12Hours)**

**UNIT – B**

**Software Project Planning:** Cost estimation, cost estimation models, Project scheduling, Software Configuration management, Team Structure, Risk Management.
**Requirements engineering process**: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.
**System models:** Context Models, Behavioural models, Data models, Object models, structured methods

**(15Hours)**

**UNIT – C**

**Creating an architectural design:** Software architecture, Data design, Architectural styles and patterns, Architectural Design
**Object-Oriented Design:** Objects and object classes, An Object-Oriented design process, Design evolution.
**Performing User interface design:** Golden rules, User interface analysis and design, interface analysis, interface design steps.
**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing.
**Product metrics:** Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.
**Metrics for Process and Products:** Software Measurement, Metrics for software quality.

**(12Hours)**

**UNIT – D**

**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.
**CASE Tools:** Types of CASE tools, advantages and components of CASE tools, Unified Modelling Language (UML)

**(11Hours)**

**REFERENCES:**


1. Software Engineering- K.K. Agarwal &Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, the McGraw-Hill Companies.
4. Software Engineering Approach, By R. S Pressman
5. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition. McGraw-Hill International Edition.
6. Software Engineering- Somerville, 7th edition, Pearson education.
7. An Integrated Approach to software Engineering. Pankaj Jalote

# GENERIC ELECTIVE-II

**Course Title: Computer Networks**
**Course Code: CAI802**

| L | T | P | Credits |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**Course Objective:** This course should provide the knowledge of various networking components, protocols and their working.
**Learning Outcomes:** After the completion of this course the participants would gain the knowledge of how to implement a network and understand the functioning of the network.

**UNIT-A**

**Introduction**

Introduction to Computer Network Introduction to Computer Network , Logical Addressing: IPv4 and IPv6; Packet Formats & their comparison: IPv4 and IPv6, Subnetting and Supernetting, Logical Addressing: IPv4 and IPv6; Packet Formats & their comparison: IPv4 and IPv6, Subnetting and Supernetting

**Architecture and Reference Models**

Layered architecture- OSI reference model, TCP/IP reference model –Internet Protocol Stack – Network Entities in Layers- Connection oriented and Connection less services

**ATM**

Protocol Architecture, ATM Logical Connections, ATM Cells, Transmission of ATM Cells, ATM Adaptation Layer, Traffic and Congestion Control, ATM LAN Emulation

**(12Hours)**

**UNIT-B**

**Internetworking**

Principles of Internetworking, Connectionless Internetworking, the Internet Protocol, Routing Protocol, IPv6 (IPng), ICMPv6

**Distributed Applications**

Abstract Syntax Notation One (ASN.l), Network Management-SNMPV2, Electronic Mail-SMTP and MIME, Uniform Resource Locators (URL) and Universal Resource Identifiers (URI), Hypertext Transfer Protocol (HTTP)

**(10Hours)**

**UNIT-C**

**Network Layer and Routing**

Network Service model – Datagram and Virtual circuit service-Routing principles-Link state routing-distant vector routing-hierarchical routing-multicast routing-IGMP Internet Protocol (IP): IPv4 addressing-routing and forwarding datagram-datagram format-datagram fragmentation- ICMP- DHCP- Network Address Translators (NATs)-IPv6 packet format-transition from IPv4 to IPv6-Mobile IP. Routing in the Internet: Intra Autonomous System Routing: RIP and OSPF-Inter Autonomous System Routing: BGP – Network layer in ATM.

**(10Hours)**

**UNIT-D**

**Transport Layer**

Transport Layer Services-Relationship between Transport Layer and Network Layer-Transport Layer in Internet-Multiplexing and De multiplexing. Connectionless Transport: UDP-Segment structure-Checksum Connection Oriented Transport: TCP-TCP connection-TCP Segment Structure-Round trip Time estimation and Time out-Reliable Data transfer-Flow control-TCP connection Management. Congestion Control: Causes and costs of congestion- Approaches to congestion control- TCP congestion control: Fairness-TCP delay modeling. ATM ABR congestion control. ATM AAL Layer protocols.

**Application Layer and Network Security:** Application Layer Protocols - WWW and HTTP-File transfer Protocol: FTP Commands and Replies – Domain Name System (DNS)- SMTP - SNMP-multimedia. Remote Procedure Call. Security in Computer Networks: Principles of Cryptography-Symmetric key-Public key-authentication protocols -Digital Signatures – Firewalls. Security in different Layers: Secure E-mail- SSL – IP security.

**(12Hours)**

**REFERENCES:**


1. James F. Kurose and Keith W. Ross, Computer Networking – A Top-Down Approach Featuring the Internet, 2/e Pearson Education ,2003
2. S. Keshav, An Engineering Approach to Computer Networking, Pearson education ,2002
3. F. Halsall, Data Communication, Computer Networks and Open Systems, Addison Wesley, 1996
4. Andrew S. Tanenbaum, Computer Networks , 4/e, Pearson education, 2003
5. Behrouz A. Fourouzan ,Data Communications and Networking, 2/e Tat McGrawhill,2000

# APPENDIX-A