# Department of Master of Computer Applications

## SCHEME & SYLLABUS

## OF

## I - IV SEMESTER

(Two years MCA program)

**2020-2022**

Department of Master of Computer Applications

**Siddaganga Institute of Technology**

B.H. Road, Tumakuru

# VISION STATEMENT

***"To effectively mould quality and responsible Computer Professionals, with a mind of service and spirituality for nurturing the technological competence"***

# MISSION STATEMENT

***"Imparting quality education to students to make them professionals in their domain replete with IT and computational skills par excellence"***

# Program Educational Objectives

| | |
|---|---|
| **PEO 1** | *Pursue career in computer applications domain by developing abilities that are in synchrony with changing needs of Industry or academia* |
| **PEO 2** | *Demonstrate professionalism when working with teams and align with ethical principles.* |
| **PEO 3** | *Engage in lifelong learning to upgrade the professional skills* |

# Program Outcomes (POs)

**PO1:** ***Computational knowledge:*** Apply fundamental knowledge of mathematics, computing and domain knowledge appropriate to computing specialization to abstract and conceptualize computational models from defined problems and requirements.

**PO2:** ***Problem analysis:*** Use the fundamental principles of mathematics, computing sciences, and relevant domain principles, to identify, formulate and to solve complex computing problems to reach substantiate conclusions.

**PO3:** ***Design/Development of solutions:*** Design and evaluate solutions for complex computing problems, systems, components or processes that meet specified needs with respect to public health , safety, cultural, societal and environmental considerations.

**PO4:** ***Conduct investigations of complex computing problems:*** Use research based knowledge and research methods to analyze and interpret data and synthesize Information to provide valid conclusions.

**PO5:** ***Modern Tool Usage:*** Create, select, adapt and apply appropriate techniques , resources, and modern IT tools to complex computing activities with an understanding on limitations.

**PO6:** ***Professional ethics:*** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

**PO7:** ***Lifelong learning:*** Engage in lifelong learning independently for continual development to improve the competence as a computing professional.

**PO8:** ***Project management and finance:*** Apply the management principles for managing projects as an individual, as a member and as a leader in a team under multidisciplinary environments.

**PO9:** ***Communication efficacy:*** Communicate effectively with computing community and with society at large about complex computing system activities confidently by writing effective reports, design documents and to make effective presentations and to deliver, receive and understand clear instructions.

**PO10:** ***Societal and Environmental Concern***: Understand responsibilities and consequences based on societal, environmental, health, safely, legal and cultural issues within local and global contexts relevant to professional computing practices.

**PO11:** ***Individual and Team work:*** Function effectively as an individual as a member or leader in diverse teams and in multidisciplinary environments.

**PO12:** ***Innovation and Entrepreneurship:*** Identify a timely opportunity for entrepreneurship and innovate pursue and create value addition for the betterment of the individual and society at large.

# SCHEME OF TEACHING OF
# I-II SEMESTER MCA PROGRAMME

| SEMESTER-I | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SL NO | Course Code | Title of the Course | Teaching Hours/Week | | | Examination | | | | Credits |
| | | | L | T | P | Duration in hours | SEE marks | CIE marks | Total mark | |
| 1 | 1TMCA01 | Foundations of Mathematics | 3 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 2 | 1TMCA02 | Unix and shell programming | 3 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 3 | 1TMCA03 | Computer Networks | 3 | - | - | 03 | 50 | 50 | 100 | 3 |
| 4 | 1TMCA04 | Object Oriented programming with Java | 3 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 5 | 1TMCA05 | Operating Systems | 3 | - | - | 03 | 50 | 50 | 100 | 3 |
| 6 | 1TMCAE1* | Elective -1 | 3 | - | - | 03 | 50 | 50 | 100 | 3 |
| 7 | 1TMCAL1 | Java Programming Lab | - | - | 4 | 03 | 50 | 50 | 100 | 2 |
| 8 | 1TMCAL2 | Unix programming Lab | - | - | 4 | 03 | 50 | 50 | 100 | 2 |
| 9 | 1TMC01 | Problem solving using Programming Techniques. | 1 | 2 | - | 03 | 50 | 50 | 100 | 0 |
| | | | | | | | | | Total credits | 25 |
| | | | | | | | | | Total lecture hours/week | 19 |
| | | | | | | | | | Total tutorial hours/week | 08 |
| | | | | | | | | | Total contact hours/week | 36 |

| Elective 1 | |
|---|---|
| 1TMCAE11 | Professional communication and ethics |
| 1TMCAE12 | Discrete Mathematics |
| 1TMCAE13 | Research Methodology and IPR |
| 1TMCAE14 | Fundamentals of Computer Organization |
| 1TMCAE15 | Green Computing |

| SEMESTER-II | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SL NO | Course Code | Title of the Course | Teaching Hours/Week | | | Examination | | | | Credits |
| | | | L | T | P | Duration in hours | SEE marks | CIE marks | Total mark | |
| 1 | 2TMCA01 | Data Structures and Algorithms | 3 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 2 | 2TMCA02 | Database Management Systems | 3 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 3 | 2TMCA03 | Web Technologies | 3 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 4 | 2TMCA04 | Software Engineering | 3 | - | - | 03 | 50 | 50 | 100 | 3 |
| 5 | 2TMCAE2X | Elective 1 | 3 | - | - | 03 | 50 | 50 | 100 | 3 |
| 6 | 2TMCAE3X | Elective 2 | 3 | - | - | 03 | 50 | 50 | 100 | 3 |
| 7 | 2TMCAL1 | DBMS Lab with Mini Project | | | 3 | 03 | 50 | 50 | 100 | 1.5 |
| 8 | 2TMCAL2 | Web Technologies Lab | | | 3 | 03 | 50 | 50 | 100 | 1.5 |
| 9 | 2TMCAL3 | Data Structures and Algorithm Lab | | | 4 | 03 | 50 | 50 | 100 | 2 |
| 10 | 2TMC02 | Aptitude related Analytical Skills | 3 | - | - | 03 | 50 | 50 | 100 | 1 |
| Total credits | | | | | | | | | | 27 |
| Total lecture hours/week | | | | | | | | | | 21 |
| Total tutorial hours/week | | | | | | | | | | 06 |
| Total contact hours/week | | | | | | | | | | 30 |

| Elective-2 | | Elective-3 | |
|---|---|---|---|
| 2TMCAE21 | Operation Research | 2TMCAE31 | Artificial Intelligence |
| 2TMCAE22 | Enterprise Resource Planning | 2TMCAE32 | Cyber Security |
| 2TMCAE23 | Optimization Techniques | 2TMCAE33 | Distributed Operating Systems |
| 2TMCAE24 | Computer Oriented Numerical and Statistical Methods | 2TMCAE34 | Digital Marketing |
| 2TMCAE25 | Management Information system and E- commerce | 2TMCAE35 | Programming with C# using .Net |
| 2TMCAE26 | Design and Analysis of Algorithms | 2TMCAE36 | User Interface Design |

# SCHEME OF TEACHING OF
# III-IV SEMESTER MCA PROGRAMME

| **SEMESTER-III** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| SL NO | Course Code | Title of the Course | Teaching Hours/Week | | | Examination | | | Credits |
| | | | L | T | P | Duration in hours | SEE marks | CIE marks | Total mark | |
| 1 | 3TMCA01 | Machine Learning | 3 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 2 | 3TMCA02 | Mobile Application Development | 3 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 3 | 3TMCA03 | Professional Web Development | 3 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 4 | 3TMCA04 | Big Data | 3 | 2 | - | 03 | 50 | 50 | 100 | 4 |
| 5 | 3TMCAE4X | Elective -4 | 3 | - | | 03 | 50 | 50 | 100 | 3 |
| 6 | 3TMCAE5X | Elective -5 | 3 | | | 03 | 50 | 50 | 100 | 3 |
| 7 | 3TMCAL1 | Machine Learning Lab | - | - | 2 | 03 | 50 | 50 | 100 | 1 |
| 8 | 3TMCAL2 | Mobile Application Lab | - | - | 2 | 03 | 50 | 50 | 100 | 1 |
| 9 | 3TMCAL3 | Professional Web Development Lab | - | - | 2 | 03 | 50 | 50 | 100 | 1 |
| 10 | 3TMCAL4 | Mini Project | - | - | 2 | 03 | 50 | 50 | 100 | 1 |
| Total credits | | | | | | | | | | 26 |
| Total lecture hours/week | | | | | | | | | | 18 |
| Total tutorial hours/week | | | | | | | | | | 08 |
| Total contact hours/week | | | | | | | | | | 34 |

| Elective-4 | | Elective-5 | |
|---|---|---|---|
| 3TMCAE41 | Software Testing | 3TMCAE51 | Augmented Virtual Reality |
| 3TMCAE42 | Software Project Management | 3TMCAE52 | Object oriented Modeling Design |
| 3TMCAE43 | System Simulation and Modeling | 3TMCAE53 | Internet of Things |
| 3TMCAE44 | Soft Computing Techniques | 3TMCAE54 | Cloud Computing |
| 3TMCAE45 | Entrepreneurship and IPR | 3TMCAE55 | User Interface And User Experience |

## SEMESTER-IV

| SL NO | Course Code | Title of the Course | Teaching Hours/Week | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Duration in hours | SEE marks | CIE marks | Total mark | |
| 1 | 4TMCA41 | Major Project | - | - | - | - | 50 | 50 | 100 | 20 |
| 2 | 4TMCAS1 | Technical Seminar | - | - | - | - | - | 50 | 50 | 02 |
| 3 | TMCC | Certification Course | - | - | - | - | - | - | - | - |
| | | | | | | | | | Total credits | 22 |

## TMCC- Certification Courses

- The students will have to register and take up exam through any of the online available certification courses like:

| | |
|---|---|
| NPTEL | FutureLearn (https:// www.futurelearn.com) |
| SWAYAM | Canvas Network (https://canvas.net) |
| Udemy | Cognitive Class |
| Coursera or MOOCs Platforms. | Iversity |
| edX (https:// www.edx.org) | Kadenze |

- The certification course shall be completed by all the students during the course for the award of the degree.
- If the student fails to submit the certificate the degree will not be awarded.
- Students shall register for these courses during Third semester or Fourth Semester.
- Student shall inform the proctor regarding the certification course registration.
- Proctors shall make entry of the online courses registered in the student academic record book.
- Students on successful completion of the course shall submit the certificate to the proctor and the same may be handed over to the Certification Course Coordinator.
- The same copy of the certificate should be attached to the Major Project Report.
- However there will be no separate CIE and SEE for the certification courses but it is mandatory.

| Credits for the Two year MCA Program Scheme 2020 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Total Credits | | | | | | | |
| Semester | Core | Elective | Lab | Mandatory | Project/ Industry/ Internship | Seminar | Total Credits |
| I. | 18 | 03 | 04 | - | - | - | **25** |
| II. | 15 | 06 | 05 | 1 | - | - | **27** |
| III. | 16 | 06 | 03 | - | 01 | - | **26** |
| IV. | - | - | - | - | 20 | 02 | **22** |
| Total | **49** | **15** | **12** | **1** | **21** | **02** | **100** |

# Foundations of Mathematics

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+2(L+T) | Credits | : | 4.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : 26 | SEE Marks | : | 50 |
| Course Code | : 1TMCA01 | | | |

## Course Objectives:

This Course will enable students to:

1. Familiarize the logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions.
2. Use a system of logic to provide a proof for a given situation.
3. Understand the concepts of vectors, matrices, and their operations.

**UNIT** – I 7 Hours

**Set Theory :** Sets and Elements, Universal Set and Empty Set, Subsets, Venn diagrams, Set Operations, Algebra of Sets and Duality, Finite sets, Counting Principle, Classes of Sets, Power Sets, Partitions, Mathematical Induction.

**UNIT** – II 8 Hours

**Relations :** Product Sets, Relations, Pictorial Representations of Relations, Composition of Relations, Types of Relations, Closure Properties, Equivalence Relations, Partial Ordering Relations, n-ary Relations

**UNIT** – III 8 Hours

**Functions :** Functions, One-to-One, Onto, and Invertible Functions, Mathematical Functions, Exponential and Logarithmic Functions, Sequences, Indexed classes of Sets, Recursively Defined Functions, Cardinality.

**UNIT** – IV 8 Hours

**Fundamentals of Logic :** Propositions and Compound Propositions, Basic Logical Operations, Propositions and Truth Tables, Tautologies and Contradictions, Logical Equivalence, Algebra of Propositions, Conditional and Biconditional Statements. Arguments, Logical Implication, Propositional Functions, Quantifiers, Negation of Quantified Statements.

**UNIT** – V 8 Hours

**Vectors and Matrices**

Vectors, Matrices, Matrix Addition and Scalar Multiplication, Matrix Multiplication, Transpose, Square Matrices, Invertible (Nonsingular) Matrices, Inverses, Determinants, Elementary Row Operations, Gaussian Elimination, Boolean (Zero-One) Matrices.

**TEXT BOOK:**

1. Seymour Lipschutz, Marc Lipson: SCHUM'S OUTlines, Discrete Mathematics, 2nd Edition, TATAMcGRAW-HILL. (Chapters: 1, 2, 3, 4, 5)

**REFERENCE BOOKS:**

1. Ralph P Grimaldi, B V Ramana: Discrete and Combinatorial Mathematics, 5th Edition, PEARSON.
2. Kenneth H Rosen: Discrete mathematics and Its Applications, 5th Edition, TATA McGRAW-HILL.
3. T Sengadir: Discrete mathematics and Combinatorics, PEARSON

**WEB LINKS:**

1. https://byjus.com/jee/sets-relations-and-functions/
2. https://learn.careers360.com/maths/sets-relations-and-functions-chapter/
3. https://www.storyofmathematics.com/relations-and-functions
4. https://nptel.ac.in/courses/111/106/111106052/
5. https://www.intmath.com/matrices-determinants/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Apply the fundamentals of set theory to perform various set operations, the concept of mathematical induction to derive various equalities.

CO2. Apply the concept of relations on sets to determine their types and the composition of relations.

CO3. Apply the concept of functions on sets to determine their types, the composition of functions and describe various mathematical functions.

CO4. Derive logical implications and equivalences using laws of logic, describe the use of quantifiers and different ways of proving a given statement.

CO5. Acquire ability to work with vectors and apply basic mathematical operations on Matrices & Determinants to the compute the inverse of a matrix and to solve the simultaneous equations.

# Unix and shell programming

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+2(L+T) | Credits | : | 4.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : 26 | SEE Marks | : | 50 |
| Course Code | : 1TMCA02 | | | |

## Course Objectives:

This Course will enable students to:

1. Describe the architecture of Unix Operating System.
2. Demonstrate and analyses the UNIX commands usage.
3. Illustrate the power of UNIX shell by writing shell scripts.
4. Explain and analyses the process concepts in Unix OS.
5. Illustrate the power of Report generation using sed and awk.

**UNIT** – I 6 Hours

Introduction : The operating system, The UNIX operating system, How it all clicked, The UNIX architecture, Features of UNIX, Locating commands, Internal and external commands, command structure, flexibility of command usage, browsing the manual pages on line *General Purpose Utilities* : cal, date, echo, printf, bc, script, passwd, who, uname, tty, sty

The file system: The file, What's in a file name? The parent – child relationship, pwd, the home directory, cd change the current directory, mkdir : making directories, rmdir : removing directories . absolute pathnames, relative pathnames

Handling Ordinary Files: cat, cp, rm, mv, more, file, wc, od, cmp, comm., diff.

**UNIT** – II 6 Hours

Basic file attributes : ls –l, -d option, File permissions, chmod The vi editor : vi basics, Input Mode : Entering and replacing Text, saving text and quitting – The ex-mode, Navigation, editing Text, undoing, repeating the last command, searching for a pattern, substitution. Simple filters: The sample Database, pr, head, tail, cut, paste, sort, uniq, tr commands. More file attributes: File systems and inodes hard links, symbolic links, umask, find.

**UNIT** – III 15 Hours

The Process: Process basics, ps: Processes status, system processes Mechanism of Process Creation, Internal and External Commands.

The SHELL: The shell's interactive cycle, pattern matching- The-wild-cards, Escaping- The backslash (\), Quoting, Redirection - The three standard files, /dev/null and /dev/tty: Two special files, Pipes, Tee: creating a tee, Command Substitution, Shell Variables.

Essential Shell Programming : Shell Scripts, read, Command Line Arguments, Exit Status of a Command, The Logical Operators && and ||, if and case conditions, expr, while, for, set and shift, The here document

**UNIT** – IV 6 Hours

Filters using Regular expressions: grep, Basic Regular Expression, egrep, fgrep. Sed : The stream editor, Line addressing, context addressing, writing selected lines to a File, Text Editing, substitution

**UNIT** – V 6 Hours

Awk – An advanced filter: Simple awk Filtering, Splitting a Line in to Fields, printf, the comparison Operators, Number Processing, Variables, The –f option, The BEGIN and END sections, Built-in variables

**TEXT BOOK:**

1. Sumitabha Das, UNIX Concepts and Applications, Third Edition, Tata McGraw Hill Chapters : 1, 2.1, 2.4, 2.5, 3.1 to 3.5, 4, 5, 6, 7, 8, 9, 10.1 to 10.5, 13.1, 13.2, 13.3, 13.5, 13.7, 14, 15, 16, 21.1 to 21.9

**REFERENCE BOOKS:**

1. Kenneth Rosan et al, UNIX: The Complete Reference, Osborne/McGraw Hill, 2000
2. M G Venkateshmurthy UNIX and Shell Programming, Pearson Education Asia, 2005

**WEB LINKS:**

1. **To Understand Basics:**
   https://www.youtube.com/watch?v=1hf_0EeOYBY (NPTEL IIT Madras)
2. **UNIX process control related**:
   http://www.youtube.com/watch?v=TIa2mhKCeYo
3. **Shell Script:**
   https://www.youtube.com/watch?v=48zApVSX97s (NPTEL IIT Madras)

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Analyse the role of various components in the architecture of Unix Operating System and use the various UNIX commands to interact with the operating system
CO2. Interpret and manipulate file attributes and execute the programs using vi editor
CO3. Demonstrate the importance of process, shell and essential shell programming
CO4. Develop shell scripts involving regular expressions – grep and sed
CO5. Design Report generation language using awk

# Computer Networks

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 1TMCA03 | | | |

## Course Objectives:

This Course will enable students to:

1. To Impart knowledge on of computer networks by going through basic terminologies and concepts.
2. To study the conceptual and implementation aspects of network applications, including application layer protocols, clients, servers, processes and interfaces.
3. To understand the principles as to how two entities can communicate reliably over a medium through series of complicated scenarios.
4. To understand how forwarding and routing functions of the network layer.
5. To understand two fundamentally different types of link layer channels, broadcast channels and HFCs, To get clear idea about wireless Internet devices, mobility related services.
6. To understand network security related algorithms and protocols.

**UNIT** – I 7 Hours

**Introduction**, nuts-and-bolts description, service oriented description, The network edge, client and server programs, network access. The network core, circuit switching, multiplexing, packet switching.

ISPs, delays in packet switch networks. end-to-end delay. Throughput in computer networks. Layered architecture, 5 layer model, message, segments, networks under attack.

**UNIT** – II 8 Hours

**Application layer**: Network application architectures, client server architectures, peer-to-peer architecture. Client server processes. Network application architectures, client server architectures, peer-to-peer architecture. Client server processes. Application layer protocols, services needed by an application, reliable data transfer, bandwidth, timing, services provided by the Internet. Transport protocols, TCP and UDP services. HTTP , web cashing. File transfer, out of band and in band, FTP commands and replies, electronic mail in the Internet, simple mail transfer protocol, mail message formats.

**Transport Layer:** transport layer services, best effort delivery service, transport layer multiplexing, multiplexing and demultiplexing. Connectionless transport, UDP, UDP segments structure, UDP checksum. Principles of reliable data transfer, reliable data transfer protocol, positive and negative acknowledgements, ARQ protocols, Go_Back_N protocol, SR protocol.

**UNIT** – III 8 Hours

**The network layer:** Introduction, forwarding and routing, forwarding table. VC networks, VC setup and VC tear down. Datagram networks, longest matching prefix rule. The router fundamentals, input ports, switching fabric, routing processor. Output ports, queue management, HOL blocking. The Internet protocol, IPv4 datagram format, fields, functions. IPv6 protocol, format, fields, differences between IPv4 and IPv6.

**UNIT** – IV 8 Hours

**The link Layer**: services offered by the link-layer protocols, framing, link access, reliable delivery, flow control, error detection and correction. Parity checks-one and two dimensional, check summing methods. CRC-example problem, multiple access protocols-channels partitioning protocols.

Random access protocols- ALOHA and slotted ALOHA. Career sense multiple access, space-time- diagram of two CSMA nodes with colliding transmissions. Link layer addressing, MAC

address, address resolution protocol. Dynamic host configuration protocol, address resolution protocol, DHCP client server scenario. The Ethernet, Ethernet frame structure, connectionless service, Manchester encoding. CSMA/CD-Ethernets multiple access protocol.

**UNIT** – V 8 Hours

**Physical layer:** Guided transmission media, magnetic media and twisted pairs, coaxial cables, fiber optic cables, satellite communication. Wireless networks, components of wireless networks, network characteristics, hidden terminal problem.

***Security in computer networks-*** Elements of secure communication. Confidentiality, authentication, message integrity and non-repudiation. Availability and access control Eves dropping, principles of cryptography, plain text, Types of attacks. Symmetric key cryptography, mono-alphabetic cipher,.Block ciphers.

**TEXT BOOK:**

1. **James F. Kurose, Keith W. Ross**: Computer Networking- A Top down Approach, 5th Edition, Pearson Publishing. [1-1- 1.5, 2.1-2.4, 3.1-3.5, 4.1-4.5, 5.1-5.5, 8.1, 8.2]
2. **Andrew S. Tennonbaum and David J. Wetherall,** Computer Networks, 5th Edition, Pearson Publishing. [ Unit 5: 2.2- 2.4, 2.7 ]

**REFERENCE BOOKS:**

1. Behrouz A. Forouzan: Data Communications and Networking, 4th Edition, Tata Mc_Graw Hill, 2006.
2. Larry L.Peterson and Bruce S.David: Computer Networks- A Systems Approach, 4th Edition, Elsevier 2007, Tata MC_Graw Hill , 2004.
3. Nader F.Mir: Computer and Communication, Perason Education, 2007.

**WEB LINKS:**

| | |
|---|---|
| 1. | https://nptel.ac.in/courses/106/105/106105183/ |
| 2. | https://www.youtube.com/watch?v=XMhCC2Q4xJA |
| 3. | https://www.youtube.com/watch?v=0PbTi_Prpgs |
| 4. | https://www.youtube.com/watch?v=k9ZigsW9il0 |

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Elaborate on computer networks in a wholesome manner in terms of its edge, core, the infrastructure, and the functionalities of protocols in different layers.

CO2. Illustrate the functionalities of the predominant protocols of application layer and transportation layer and how they enable connection oriented and connectionless data communication.

CO3. Differentiate IPv4 and IPv6 in terms of their format, enhancements, and functionalities. Also able to decipher about the functioning of routers, as well as routing protocols

CO4. Apply error checking algorithms on a given data bit string and also to illustrate various functionalities of link layer protocols.

CO5. Present on physical layer primitives, wireless communication and also to explain the secure communication related concepts.

# Object Oriented programming with Java

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+2(L+T) | Credits | : | 4.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : 26 | SEE Marks | : | 50 |
| Course Code | : 1TMCA04 | | | |

## Course Objectives:

This Course will enable students to:

1. Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2. Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
3. Describe the concept of interfaces, packages, enumeration, autoboxing and annotations as well as the purpose and usage principles of these concepts.
4. Write java program using String handling and Exception handling.
5. Demonstrate the ability to use IO operations, Threads and synchronization in java.

**UNIT** – I 8 Hours

**Java Programming Fundamentals**

The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, The Java Keywords, Identifies in Java, The Java Class Libraries.

**Introducing Data Types and Operators**

Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast.

**Program Control Statements**

Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops.

**Introducing Classes, Objects and Methods**

Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword.

**More Data Types and Operators**

Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-Each Style for Loop, Strings

**UNIT** – II 8 Hours

**A Closer Look at Methods and Classes:**

Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable-Length Arguments.

**Inheritance:**

Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, overriding equals() method, Using Abstract Classes, Using final, The Object class

**UNIT** – III 8 Hours

**Interfaces**

Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Differences between the Abstract Class and Interfaces, Final

Thoughts on Interfaces.

**Packages**

Package Fundamentals, Packages and Member Access, Importing Packages, Static Import

**Enumerations, Auto boxing and Annotations**

Enumerations, Java Enumeration are class types, The Values() and Valueof() Methods, Constructors, methods, instance variables and enumerations, Auto boxing, Annotations (metadata)

**UNIT** – IV 8 Hours

**String Handling**

String Fundamentals, The String Constructors, Three String-Related Language Features, The Length() Method, Obtaining the characters within a string, String comparison[using equals() and equalsIgnoreCase(), regionMatches(), startsWith() and endsWith(), equals() versus ==, compareTo() methods],Searching Strings[indexOf(), lastIndexOf() methods], Changing the case of characters within a String[toUpperCase(), toLowerCase()],String Buffer – Constructors, length(), capacity(), ensureCapacity(), setLength(), charAt(), setCharAt(), getChars(), append(), insert(), reverse(), delete(), deleteCharAt(), replace(), substring() methods, String Builder

**Exception Handling**

The Exception Hierarchy, Exception Handling Fundamentals, Syntax of Exception handling, Java Keywords for handling Exception( try, catch, throw, throws and finally), Multiple Catch Statements, Using finally Block (Statement), Understanding the usage of throw and throws clause, Declaring methods that might throw exceptions, Creating and throwing user Exceptions. Java's Built-in Exceptions, New Exception features added by JDK 7, Creating Exception Subclasses.

**UNIT** – V 7 Hours

**Java I/O Streams**

File: Directories, Using list() and listFiles() methods, Creating Dirctrories, The Stream Classes: Byte Stream and Character Stream, Byte Streams: Input Stream Classes, Output Stream Classes Character Streams: Reader Classes, Writer Classes, Creating Byte Streams using FileInputStream / FileOutputStream Classes, Creating Character Streams using FileReader / FileWriter Classes, Accepting the input from the keyboard using InputSreamReader, BufferedReader and System.in

**Multithreaded Programming**

Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads.

**TEXT BOOK:**

1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013. (Chapters:1,2,3,4,5,6,7,8,9,10,11,12,13,22,23)
2. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.

**REFERENCE BOOKS:**

1. Java Programming by Hari Mohan Pandey
2. Java 6 Programming
3. Java 2 Essentials

**WEB LINKS:**

1. https://www.javatpoint.com/java-tutorial
2. https://www.w3schools.com/java/
3. https://docs.oracle.com/javase/tutorial/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Describe the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.

CO2. Identify classes, objects, members of a class and the relationships among them needed for a specific problem.

CO3. Exemplify the usage of Packages, Enumerations, Wrappers, Auto boxing and Annotations in building efficient applications.

CO4. Develop programs using String, StringBuffer and Exception Handling

CO5. Demonstrate the ability to use I/O operations, Threads and synchronization in java

# Operating System

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 1TMCA05 | | | |

## Course Objectives:

This Course will enable students to:

1. Learn the fundamentals of Operating Systems.
2. Learn the mechanisms of OS to handle processes and threads and their communication
3. Learn the mechanisms involved in memory management in contemporary OS.
4. Gain knowledge on distributed operating system concepts that includes architecture, mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
5. Know the components and management aspects of concurrency management
6. Learn programmatically to implement simple OS mechanisms

**UNIT** – I 6 Hours

**Introduction :**What is an Operating System, Mainframe systems, Desktop systems, Multiprocessor system, Distributed system, clustered systems, Real Time systems, Handheld systems, Feature Migration, Computing environment, System Components, OS Services, System calls, System Programs, System Structure, Virtual Machines.

**UNIT** – II 7 Hours

**Process Management:** Process concept, Process Scheduling, operation on Processes, Cooperating Processes, Inter process Communication, Threads-Overview, Multithreading models, Threading issues, CPU Scheduling-Basic concepts, Scheduling Criteria, Scheduling algorithms, Multiple processor scheduling, Real Time Scheduling.

**UNIT** – III 7 Hours

**Process Synchronization and Deadlocks:** The critical Section problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Deadlock, Characterization, Methods for handling deadlocks, Dead Lock Prevention, Deadlock avoidance, Deadlock Detection, Recovery from Deadlock

**UNIT** – IV 10 Hours

**Storage Management:** Memory Management: Background, Swapping, contiguous allocation, Paging, Segmentation, Segmentation with paging.

Virtual Memory – Background, Demand Paging, Copy - on-write, Page replacement algorithms, Thrashing.

**UNIT** – V 9 Hours

Mass Storage Structure – Disk Structure, Disk Scheduling, Disk Scheduling algorithms, Disk Management.

File System Interface – File concept, Access Methods, Directory and Disk Structure, File System mounting, File Sharing, Protection,

File System Implementation – File system structure, File system Implementation, Directory Implementation, Allocation Methods, Free space management.

**TEXT BOOK:**

1. Operating System Concept by Avi Silberschartz and Peter Galvin and Greg Gagne, 9th Edition, John Wiley and Sons, 2012. Chapter-1: 1.1 to 1.11, Chapter-2: 2.1 to 2.7, Chapter-3: 3.1 to 3.6, Chapter-4: 4.1 to 4.3, Chapter-5: 5.1 to 5.8, Chapter-6: 6.1 to 6.3, Chapter-7: 7.1 to 7.7, Chapter-8: 8.1 to 8.6, Chapter-9: 9.1 to 9.6 (except 9.5),Chapter-10: 10.1 to 10.5, Chapter-11: 11.1 to 11.6, Chapter-12: 12.1 to 12.5.

**REFERENCE BOOKS:**

1. Operating System concepts and design by Milan Milankovie II Edition McGrawHill 2001
2. Operating Systems by Harvey M Deital, 3rd Edition, Addison Wesley, 2010
3. Operating Systems – A Concept based Approach, D.M. Dhamdhere, 2nd Edition, Tata McGraw Hill, 2006.

**WEB LINKS:**

1. https://nptel.ac.in/courses/106/105/106105214/
2. https://www.coursera.org/learn/os-power-user
3. https://www.youtube.com/watch?v=WJ-UaAaumNA
4. https://www.youtube.com/watch?v=bkSWJJZNgf8&list=PLxCzCOWd7aiGz9donHRrE9I3Mwn6XdP8p

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Interpret the core structure and functionality of operating system.
CO2. Analyze various inter process communication mechanisms and the different techniques for solving CPU scheduling algorithms.
CO3. Analyze the problems that occur in the design of OS based knowledge gained through process synchronization techniques and Design a deadlock free system by applying the principles of concurrency and deadlock related algorithms
CO4. Identify and analyze the performance of different memory management techniques and page replacement algorithms.
CO5. Distinguish various disk scheduling algorithms and file management techniques

# Professional Communication and Ethics

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 1TMCAE11 | | | |

## Course Objectives:

This Course will enable students to:

1. Understand the different types of barriers in communication
2. Effective presentation Strategies, Paralinguistic and teamwork.
3. How to face interviews and behave in the group communication
4. Ethics in business world.

**UNIT** – I 10 Hours

**Basics of Technical Communication:** Introduction, Process of Communication, Language as a Tool, Levels of Communication, The flow of Communication, Communication Networks, Importance of Technical Communication

Barriers to Communication: Definition of Noise, Classification of Barriers.

Active listening: introduction, types of listening, traits of a good listener, active versus passive listening

**UNIT** – II 10 Hours

**Strategies in the job search process.** *:Job search, Building a network of contacts, identifying appropriate jobs, Finding your employer, Preparing the application documents, Constructing the resume.

Interviews: Introduction, Objectives, Types of Interviews, Job Interviews

Group Communication: Introduction, Group Discussion, Organizational Group discussion, Group discussion as part of selection process

**UNIT** – III 7 Hours

**Effective Presentation Strategies:** Introduction, Defining purpose, Analyzing Audience and Locale, Organizing Contents, preparing outline, Visual Aids, Understanding Nuances of Delivery, Kinesics, Proxemics, Paralinguistic, Chronemics

**UNIT** – IV 6 Hours

**An Overview of Ethics:** What are Ethics? Ethics in the Business World, Fostering good business ethics, improving corporate ethics, improving corporate ethics, Ethics in Information Technology (IT)

**UNIT** – V 8 Hours

**Privacy:** Privacy Protection and the Law, The right of privacy, Recent history of privacy protection, Key Privacy and Anonymity Issues, Data encryption, Identity theft, Consumer profiling

**TEXT BOOK:**

1. Meenakshi Raman and Sangeeta Sharma: Technical Communication - Principles an Practices, Oxford University Press, 2011, Chapters: 1, 2, 4, 5, 6, 7
2. Raymond V Lesikar, Flatley, Rentz, Pande : Business Communication :making connections in a digital world, 11th Edition, Tata McGraw-Hill Edition. Chapter: 9
3. George Reynolds: Ethics in Information Technology, Thomson Course Technology, 2n Edition, 2007 Chapters: 1, 4.

**REFERENCE BOOKS:**

1. M.Ashraf Rizivi: Effective Technical Communication, 1st Edition, Tata McGraw Hill, 2005.
2. Mike W Martin and Ronald Schinzinger: Ethics in Engineering, 3rdEdition, Tata McGraw Hil 2003.

**WEB LINKS:**

1. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
2. https://onlinecourses.nptel.ac.in/noc21_hs02/preview
3. https://www.coursera.org/courses?query=soft%20skills
4. https://www.edx.org/learn/soft-skills
5. https://learning.linkedin.com/content-library/online-business-courses/soft-skills

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Exhibit communication skills required for a profession
CO2. Demonstrate on working effectively in groups or teams to solve a problem.
CO3. Identify the factors for the effective presentation strategies.
CO4. Practice the effective presentation strategies
CO5. Adapt ethical and privacy practices in day to day life and profession.

# Discrete Mathematics

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 1TMCAE12 | | | |

## Course Objectives:

This Course will enable students to:

1. Understand basic principles of counting: the rules of sum and product.
2. Learn relationships and applications of finite graphs in many different settings.
3. Learn types of trees which are prominent in the study of data structures, sorting, and coding theory.
4. Establish certain mathematical formulas and theorems by using a technique called mathematical induction.
5. Analyse an algebraic system in which the structure depends primarily on two closed binary operations.

**UNIT** – I 7 Hours

**Counting :**Basic Counting Principles, Factorial Notation, Binomial Coefficients, Permutations, Combinations, The Pigeonhole Principle, The Inclusion-Exclusion Principle, Ordered and Unordered Partitions

**UNIT** – II 8 Hours

**Graph Theory :**Data Structures, Graphs and Multigraphs, Subgraphs, Isomorphic and Homeomorphic Graphs, Paths, Connectivity, Labeled and Weighted Graphs, Complete, Regular, and Bipartite Graphs, Tree Graphs, Planar Graphs.

**UNIT** – III 8 Hours

**Binary Trees :**Binary Trees, Complete and Extended Binary Trees, Representing Binary Trees in Memory, Traversing Binary Trees, Binary Search Trees, Priority Queues, Heaps, Path Lengths, Huffman's Algorithm, General (Ordered Rooted) Trees Revisited

**UNIT** – IV 8 Hours

**Properties of the Integers:**Order and Inequalities, Absolute Value, Mathematical Induction, Division Algorithm, Divisibility, Primes, Greatest Common Divisor, Euclidean Algorithm, Fundamental Theorem of Arithmetic.

**UNIT** – V 8 Hours

**Boolean Algebra:**Basic Definitions, Duality, Basic Theorems, Representation Theorem, Sum-Of-Products Form for Sets, Sum-Of-Products Form for Boolean Algebras, Minimal Boolean Expressions, Prime Implicants, Logic Gates and Circuits, Truth Tables, Boolean Functions, Karnaugh Maps.

**TEXT BOOK:**

1. Seymour Lipschutz, Marc Lipson: SCHUM'S OUTlines, Discrete Mathematics, 2nd Edition, TATA McGRAW-HILL.(Chapters:6, 8, 10, 11, 15)

**REFERENCE BOOKS:**

1. Ralph P Grimaldi, B V Ramana: Discrete and Combinatorial Mathematics, 5th Edition, PEARSON.
2. Kenneth H Rosen: Discrete mathematics and Its Applications, 5th Edition, TATA McGRAW-HILL.
3. T Sengadir: Discrete mathematics and Combinatorics, PEARSON

**WEB LINKS:**

1. https://www.javatpoint.com/discrete-mathematics-tutorial
2. https://www.tutorialspoint.com/discrete_mathematics/index.htm
3. https://nptel.ac.in/courses/106/106/106106094/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Gain complete knowledge on the principles of counting.
CO2. Model the given problem by applying the concepts of graph theory.
CO3. Develop binary trees and to use the same to solve problems related to data structures.
CO4. Apply principles of induction and to solve the problems related to integer arithmetic.
CO5. Summarize the working of basic Logic gates, circuits and simplify the Boolean expressions.

# Research Methodology and IPR

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 1TMCAE13 | | | |

## Course Objectives:

This Course will enable students to:

1. Explore the motivational points of the research
2. Identify an open research problem in the domain of interest
3. Draw out the plans of the progress of research
4. Plan for the appropriate data collection
5. Explore the intellectual aspects of research

**UNIT** – I 8 Hours

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.

**UNIT** – II 8 Hours

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.

Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

**UNIT** – III 7 Hours

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.

Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs

**UNIT** – IV 8 Hours

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation,

Significance of Report Writing, Different Steps in Writing Report, Layout.

Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

**UNIT** – V 8 Hours

Intellectual Property (IP) Acts: Introduction to IP: Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970. Design Act: Industrial Design act 2000. Copy right acts: Copyright Act 1957. Trade Mark Act, 1999

**TEXT BOOK:**

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
2. Research Methodology a step-by- step guide for beginners. (For the topic Reviewing the literature under module 2) Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011 Study Material.
3. Intelectual property, Debirag E. Bouchoux, Cengage learning, 2013.

**REFERENCE BOOKS:**

1. Research Methods: the concise knowledge base Trochim, Atomic Dog Publishing, 2005.
2. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.

**WEB LINKS:**

1. http://edutechwiki.unige.ch/en/Category:Research_methodology_tutorials
2. https://nptel.ac.in/courses/110/105/110105139/
3. https://www.youtube.com/watch?v=qKXB5nuZ7Cs
4. https://www.subhartidde.com/slms/Research%20Methodology_Final%20MBA-202.pdf
5. http://edutechwiki.unige.ch/en/Category:Research_methodology_tutorials

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.
CO2. Carry out literature survey, define the problem statement and suggest suitable solution for the given problem.
CO3. Analyse the problem and conduct experimental design with the samplings.
CO4. Perform the data collection from various sources segregate the primary and secondary data
CO5. Apply some concepts/section of Copy Right Act /Patent Act /Cyber Law/ Trademark to the given case and develop –conclusions

# Fundamentals of Computer Organization

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 1TMCAE14 | | | |

## Course Objectives:

This Course will enable students to:

1. Understand logical operation of basic logic gates and their combination into various types of circuits.
2. Understand the types of computers and basic structure of the computer systems.
3. Understand the concept of memory locations, storage, memory operations, various ways of addressing operands, and the implementation of stacks & queues.
4. Understand the connection of I/O devices to the bus, handling of interrupts, transfer of data and the types of ports.
5. Understand the structure of various types of memory systems along with their operations.

**UNIT** – I 8 Hours

**Logic Gates :** The AND Gate, The OR gate, The inverter and Buffer, The NAND gate, the NOR Gate, The exclusive OR gate, The Exclusive NOR Gate, The NAND Gate as a universal Gate, Gates with More than two inputs, Using Inverters to convert gates.

**Combining Logic Gates :** Constructing Circuits from Boolean Expressions, Drawing a circuit from a Maxterm Boolean Expression, Truth Tables and Boolean Expressions, Sample Problem, Simplifying Boolean Expressions, Karnaugh Maps, Karnaugh Maps with three variables Karnaugh Maps with four variables, more Karnaugh Maps, using Demorgan's Theorems.

**UNIT** – II 7 Hours

**Arithmetic Circuits :** Binary Addition, Half Adders, Full Adders, Three Bit Adders, Binary Subtraction, Parallel Subtractors, IC Adders, Binary Multiplication, Binary Multipliers.

**Basic structure of computers :**Computer types, Functional units, Basic operational concepts, Bus structures

**UNIT** – III 8 Hours

**Machine Instructions & Programs:**Memory locations and addresses(Byte addressability, Big-endian & Little-endian assignments, Word alignment, Accessing numbers, characters & character strings), Memory operations, Instructions and instruction sequencing(Register transfer notation, Assembly language notation, Basic instruction types, Instruction execution & Straight-line sequencing, Branching, Condition codes), Addressing modes(Implementation of variables and constants, Indirection and pointers, Indexing & arrays, relative addressing, Additional modes), Basic Input/Output operations, Stacks and queues

**UNIT** – IV 8 Hours

**Input/Output Organization:** Accessing I/O devices, Interrupts (Interrupt hardware, Enabling and disabling interrupts, Handling multiple devices, Controlling device requests, Exceptions), Direct memory access (Bus arbitration), Buses (Synchronous bus, Asynchronous bus), Interface circuits (Serial port)

**UNIT** – V 8 Hours

**The Memory Systems:**Some basic Concepts, Semiconductor RAM memories (Internal organization of memory chips, Static memories, Asynchronous DRAMs, Synchronous DRAMs, Memory system considerations, Rambus memory), Read Only Memories (ROM, PROM, EPROM, EEPROM, Flash memory), Speed, size & Cost, Cache memories (Mapping functions)

**TEXT BOOK:**

1. Tokheim: Digital Electronics Principles and Applications, TATA McGraw Hill, 6th Edition, 2004. (Chapters: 3-1 to 3-10, 4-1 to 4-9, 4-16, 10-1 to 10-9)
2. Carl Hamacher, Z Varnesic and S Zaky: Computer Organization, 5th Edition, McGraw Hill, 2002. (Chapters: 1.1 to 1.4, 2.2, 2.3, 2.4, 2.5, 2.7, 2.8, 4.1, 4.2(4.2.1 to 4.2.5), 4.4, 4.5(4.5.1,4.5.2), 4.6(4.6.2), 5.1, 5.2(5.2.1 to 5.2.4, 5.2.6, 5.2.7), 5.3, 5.4, 5.5(5.5.1)

**REFERENCE BOOKS:**

1. M Morris Mano: Digital Logic and Computer Design, 10th Edition, Pearson, 2008.
2. Morris Mano and Charles R Kime: Logic and Computer Design Fundamentals, 2nd Edition, Pearson Education, 2001.
3. Mostafa Abd-El-Barr & Hesham El-Rewini, Fundamentals of Computer Organization and Architecture, (2005) Wiley

**WEB LINKS:**

1. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
2. https://www.javatpoint.com/digital-electronics
3. https://www.javatpoint.com/computer-organization-and-architecture-tutorial
4. https://www.learncomputerscienceonline.com/computer-organization-and-architecture/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. ***Design*** the combinational logic circuits for the Boolean expressions by using basic gates, universal gates and interpret the De Morgan's laws, conversion etc.,

CO2. ***Interpret*** the working of various arithmetic circuits, design a few of them and ***differentiate*** the basic structure of computer systems.

CO3. ***Distinguish*** the machine instructions in various formats & ***develop*** machine programs using various addressing modes.

CO4. ***Differentiate*** the organization of input/output devices, handling interrupts and the data transfer operations.

CO5. ***Discriminate*** the structure of various types of memory cells, their organization into chips, the working principle of different types of memory and design the internal organization of a chip.

# Green Computing

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 1TMCAE15 | | | |

## Course Objectives:

This Course will enable students to:

1. To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
2. To examine technology tools that can reduce paper waste and carbon footprint by user.
3. To understand how to minimize equipment disposal requirements.
4. To gain skill in energy saving practices in their use of hardware.

**UNIT** – I 8 Hours

**FUNDAMENTALS:** 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.

**UNIT** – II 8 Hours

**GREEN ASSETS AND MODELING:** 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.

**UNIT** – III 8 Hours

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

**UNIT** – IV 8 Hours

**GREEN COMPLIANCE** Socio-cultural aspects of Green IT–Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

**UNIT** – V 7 Hours

**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

**TEXT BOOK:**

1. Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011.
2. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009

**REFERENCE BOOKS:**

1. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: Steps for the Journey, Shoff/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, 2012

**WEB LINKS:**

1. https://en.wikipedia.org/wiki/Green_computing
2. https://www.tutorialspoint.com/environmental_studies/environmental_studies_towards_sustainable_future.htm
3. http://www.123seminarsonly.com/Seminar-Reports/021/51161349-Green-Computing.pdf
4. https://www.kbmanage.com/concept/green-computing

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Comprehend the concept of green IT and relate it to sustainable development.
CO2. Apply the green computing practices to save energy.
CO3. Recognize the choice of hardware and software to facilitate a more sustainable operation.
CO4. Apply methods and tools to measure energy consumption

# Java Programming Lab

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 4 | Credits | : | 2.0 |
| Total Lecture Hours | : - | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 1TMCAL1 | | | |

## Course Objectives:

This Course will enable students to:

1. Identify classes, objects, members of a class and relationships among them needed for a specific problem
2. Write Java application programs using OOP principles and proper program structuring
3. Demonstrate the concepts of polymorphism and inheritance
4. Write Java programs to implement error handling techniques using exception handling
5. Write Java programs to demonstrate IO Streams and Multithreading

| Sl.no | Programs |
|---|---|
| 1. | Programs on Java fundamentals |
| 2. | Programs on classes and objects |
| 3. | Programs on inheritance |
| 4. | Programs on abstract class and inner class |
| 5. | Programs on interfaces |
| 6. | Programs on packages |
| 7. | Programs on string and string buffer classes |
| 8. | Programs on exception handling |
| 9. | Programs on IO streams |
| 10. | Programs on multithreading |

**WEB LINKS:**

1. https://www.w3schools.com/html/html_examples.asp
2. https://www.geeksforgeeks.org/css-examples/
3. https://www.w3schools.com/js/js_examples.asp

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Demonstrate the fundamental data types and constructs of Java Programming by writing executable/interpretable programs.

CO2. Illustrate the object oriented principles with the help of java programs.

CO3. Develop java programs to demonstrate the concepts of interfaces, inner classes and I/O streams.

CO4. Develop reusable and efficient applications using inheritance and multi-threading concepts of java.

# Unix programming Lab

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 4 | Credits | : | 2.0 |
| Total Lecture Hours | : - | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 1TMCAL2 | | | |

## Course Objectives:

This Course will enable students to:

1. Interpret the basic UNIX commands and its environment
2. Obtain complete knowledge on Shell programming
3. Develop the programs using awk and sed

Sl.no Programs

1. Following exercises may require referring to man pages of commands for syntax and options and their usage
   - I. Display current date in mm-dd-yy and dd-mm-yy formats.
   - II. Use ls command to list only directories along with other attributes including inode number
   - III. Write commands for the following queries:
     list of user names who have currently logged in
     list of logins for a given user name
   - IV. Perform the following operations.
     Create myproj directory in the login directory (home directory).
     Create src/include directory within myproj using a single Command.
   - V. List the directory entries (in long format) as per the following criteria in ascending order of file size
2. a) Write a shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions and otherwise output each file name followed by its permissions
   b)Write a non-recursive shell script which accepts any number of arguments and prints them in the reverse order (For example, if the script is named rags, then executing rags A B C should produce C B A on the standard output).
3. a) Write a shell script that accepts a path name and creates all the components in that path name as directories. For example, if the script is named mpc, then the command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d.
   b) Write a shell script that takes a valid directory name as an argument and recursively descend all the subdirectories, finds the maximum length of any file in that hierarchy and writes this maximum value to the standard output.
4. a) Write a shell script which accepts valid log- in names as arguments and prints their corresponding home directories, if no arguments are specified, print a suitable error message
   b) Write a shell script that accept one or more filenames as argument and convert all of them to uppercase, provided they exist in current directory.
5. a) Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which the search is to begin. If this second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at all levels must be searched. The script need not include any error checking.
   b) Write a shell script that accepts as filename as argument and display its creation time if file exist and if it does not send output error message
6. a) Write a shell script to display the calendar for current month with current date replaced by * or ** depending on whether the date has one digit or two digits.
   b) Write a shell script to find smallest of three numbers that are read from keyboard

7. a) Write a shell script that compute gross salary of an employee, accordingly to rule given below : If basic salary is < Rs15000 then HRA=10% of basic & DA=90% of basic.
   If basic salary is >=Rs15000 then HRA=Rs500 & DA=98% of basic.
   b) Write a shell script that delete all lines containing a specific word in one or more file supplied as argument to it.
8. a) Write a shell script that accept a list of filenames as its argument, counts and report occurrence of each word that is present in the first argument file on other argument files
   b) Write a shell script that accept the file name, starting and ending line number as an argument and display all the lines between the given line number
9. a) Write a shell script to find the factorial of a given number
   b) Write a shell script that determine the period for which a specified user is working on system
10. a) Create a program called words that will continue to prompt the user to input a single word until the user enters quit. Save each word that is entered. After the user types quit echo back all of the words that have been entered. (Optional: display all of the words entered in alphabetical order.)
    b) Create an awk program which prints the alternate lines like $2^{nd}$, $4^{th}$, $6^{th}$ etc…from the file /etc/group.

**WEB LINKS:**

1. https://www.youtube.com/watch?v=1hf_0EeOYBY (NPTEL IIT Madras)
2. https://www.youtube.com/watch?v=48zApVSX97s (NPTEL IIT Madras)

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Design command structure and execute Basic commands
CO2. Demonstrate shell script using simple filters and grep
CO3. Develop and execute shell scripts using advance filter sed and report generation language AWK

# Problem Solving Using Programming Techniques

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3L +2 T | Credits | : | 0.0 |
| Total Lecture Hours | : 1 | CIE Marks | : | 50 |
| Total Tutorial Hours | : 2 | SEE Marks | : | 50 |
| Course Code | : 1TMC01 | | | |

## Course Objectives:

This Course will enable students to:

1. Obtain complete knowledge on programming languages
2. Gain in depth knowledge on functions, pointers and other programming objects.
3. Know object oriented programming concepts.
4. Understand OOP concepts such as polymorphism, inheritance
5. Obtain knowledge on standard C++ I/O classes and exception handling

**UNIT** – I 7 Hours

**C Programming: decision making, control structures and arrays in C:** Decision control and iteration control constructs in C. Programming examples on decision control and iteration control structures. Preliminaries on Arrays ( one dimensional & two dimensional) , problems related to arrays

**UNIT** – II 7 Hours

**Structures, Unions and Pointers in C :**Primitives on structures & unions, programming examples on structures. & unions. Concept of pointers, programming examples on pointers.

**UNIT** – III 8 Hours

**Functions in C**: Types of Functions, programs on functions, structure as parameter, array as a parameter, passing by reference, passing by value. Functions returning structures, Recursive functions. Programming examples

**UNIT** – IV 9 Hours

**Classes & Objects:** Introduction, Class Specification, Class Objects, access members, defining member functions, data hiding, constructors, destructors, parameterized constructors, static data members, static member functions, scope resolution operator, Passing Objects to Functions, Returning Objects, Object Assignment. Illustrative Programs.

**Operator overloading:** Operator overloading as member functions and using friend functions. Overloading of binary operators like +, -, *.Creating Prefix and Postfix forms of ++, -- Operators, Operator Overloading Restrictions, Operator Overloading Using a Friend Function to Overload ++ or – –, Overloading ( ). Illustrative programs.

**Inheritance:** Base Class, Inheritance & protected members, protected base class inheritance, inheriting multiple base classes, Constructors, Destructors & Inheritance. Passing parameters to base Class Constructors, Granting access, Virtual base classes. Illustrative programs

**UNIT** – V 8 Hours

**Standard C++ I/O Classes:** Old vs. Modern C++ I/O, C++ Streams, The C++ Stream Classes, C++'s Predefined Streams, Formatted I/O, Formatting Using the ios Members, Setting the Format Flags, Clearing Format Flags, Overloading << and >>, manipulators.

**Exception Handling:** Exception Handling, Fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived- Class Exceptions, Exception Handling Options, Catching All Exceptions, Restricting Exceptions, Rethrowing an Exception, Understanding terminate( ) and unexpected( ), uncaught_exception( ) Function, The exception and bad_exception Classes, Applying Exception Handling

**TEXT BOOK:**

1. Programming in ANSI C, E.Balagurusamy, 3rd Edition, Tata McGraw Hill, 2003
2. Object oriented programming with C++, E Balagurusamy, 4th edition, TMH

**REFERENCE BOOKS:**

1. Behrouz A Forouzan and Richard F Gilberg, Structured Programming Approach in C, 2nd Edition, Thomson, 2001.
2. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH

**WEB LINKS:**

1. https://www.toptal.com/c/the-ultimate-list-of-resources-to-learn-c-and-c-plus-plus
2. https://www.learn-c.org/
3. https://www.studytonight.com/c/
4. https://nptel.ac.in/courses/106/105/106105151/
5. https://www.tutorialspoint.com/cplusplus/index.htm
6. https://www.onlinegdb.com/online_c++_compiler

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Implement the control structures and arrays in C
CO2. Design and develop the programs using Structures, Unions and Pointers in C
CO3. Apply the object oriented concepts to the given problem.
CO4. Analyze the working of I/O operations with C++ files and exception handling

# Data Structures and Algorithms

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+2(L+T) | Credits | : | 4.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : 26 | SEE Marks | : | 50 |
| Course Code | : 2TMCA01 | | | |

## Course Objectives:

This Course will enable students to:

1. Master the fundamental concepts of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms
2. Apply the knowledge of computing and mathematics appropriate to the discipline including computer science theory and recursive processing
3. Construct and analyze various data structures and abstract data types such as lists, stacks, Queues and binary trees and implementing their various operations.
4. Master the efficiency of algorithms in terms of asymptotic notations; Design algorithm using Brute force method and Divide & conquer method.
5. Implement various sorting, searching algorithms and using Kruskal's technique, Prim's technique and Dynamic programming approach.

**UNIT** – I 8 Hours

Introduction to Data Structures: Binary and decimal integers, Real numbers, Character Strings, concept of implementation, Abstract Data Types, ADT for varying length character
Strings, Data types in C, Pointers in C, Data structures and C. Arrays in C: The array as an ADT, Using one-dimensional arrays, Implementing one dimensional arrays, Arrays as parameters, Character strings in C, Character string operations,Two dimensional arrays.Structures in C: Implementing Structures, Unions, Implementation of Unions, Structure parameters, Rational numbers.

**UNIT** – II 7 Hours

The Stack: Definition and examples, primitive operations, The stack as an Abstract Data Type(ADT), Representing stacks in C, Implementing the pop operation, Testing for exceptional conditions, Implementing the push operations, Infix, Postfix and Prefix, Basic definitions and examples, Evaluating a postfix expression and programs and limitations, converting an expression from infix to postfix, stacks in C++ using templates. Recursion: Recursive definition and processes: Factorial function, Fibonacci series, Properties of recursive definitions or algorithms.

**UNIT** – III 8 Hours

Queues and Lists: The Queue and its sequential representation, Queue as an ADT, C implementation of Queue, insert operations, Priority Queue, Array implementation of priority Queue, Lists in C: Array implementation of Lists, Limitations of the Array implementation, Allocation and freezing dynamic variables, Linked list using dynamic variables. Trees: Binary trees, Operations in Binary trees, Applications of Binary trees, Binary tree Representations: Node representation of binary trees, internal and external nodes, Implicit Array representation of Binary trees, Binary tree traversals in C.

**UNIT** – IV 8 Hours

The Role of Algorithms in Computing: Algorithms, algorithm is a technology, insertion sort, Analyzing algorithms: Random Access Machine model, analysis of insertion sort, Designing algorithms: The divide and conquer approach: Merge sort, analyzing divide and conquer algorithms, analysis of merge sort, Finding the closest pair of points: Brute force approach, Growth of functions: asymptotic notations and its properties.

**UNIT** – V 7 Hours

Breadth First Search algorithm, Deapth First Search algorithm, Minimum Spanning Trees, Kruskal's algorithm and Prim's algorithm, Growing a minimum spanning tree, Dijkstra's algorithm.

**TEXT BOOK:**

1. Data Structures Using C and C++ by YedidyahLangsam and Moshe J. Augenstein and Aaron M Tenanbanum, 2nd Edition, Pearson Education Asia, 2002.

2. Introduction to Algorithms. AnanyLevitin, 2nd Edition, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press,McGraw-Hill Book Company.

**REFERENCE BOOKS:**

1. E.Balaguruswamy Data structures using C 2013, Mc Graw Hill Education Pvt Ltd

**WEB LINKS:**

1. https://www.geeksforgeeks.org/
2. https://www.freecodecamp.org
3. https://nptel.ac.in/courses/106/102/106102064/
4. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
5. https://www.programiz.com/dsa

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Design and implement basic data structures using Abstract Data Type elements

CO2. Design and implement different operations on Stack using static memory allocation and as well as dynamic memory allocation

CO3. Design and Implement data structures: Queues and Binary Tree structures by employing dynamic memory Allocation technique for efficient utilization of memory.

CO4. Compute the efficiency of algorithms in terms of asymptotic notations; Design algorithm using Brute force method and Divide & conquer method.

CO5 Design algorithms using Greedy Technique and Dynamic programming approach.

# Database Management Systems

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+2(L+T) | Credits | : | 4.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : 26 | SEE Marks | : | 50 |
| Course Code | : 2TMCA02 | | | |

## Course Objectives:

This Course will enable students to:

1. Learn the fundamentals of DBMS with an emphasis on how to organize, maintain and retrieve data from the database.
2. Learn the basic principles of database design in the form of Entity – Relationship diagrams to handle the needs of any user oriented projects
3. Learn the programming fundamentals involved in using Structured Query Language and formation its programming lines in the form of queries.
4. Gain the knowledge on how to design the database by using Normalization process and its normal forms.
5. Know the different aspects of transactions with the given database.

**UNIT** – I 8 Hours

**Introduction :** Introduction, An example, Characteristics of Database approach, Actors on the scene, Workers behind the scene, Advantages of using DBMS approach, A brief history of database applications, when not to use a DBMS. Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, The database system environment, Centralized and client-server architectures, Classification of Database Management systems.

**UNIT** – II 8 Hours

**Data Modeling using the Entity-Relationship (ER) Model** :Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship types of degree higher than two.

**Relational Model and Relational Algebra:** Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and dealing with constraint violations, Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations, JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, Relational Database Design Using ER- to-Relational Mapping.

**UNIT** – III 10 Hours

**SQL :**SQL : Data Definition and Data Types, Specifying constraints in SQL, Schema change statements in SQL, Basic queries in SQL, More complex SQL Queries, Insert, Delete and Update statements in SQL, Specifying general constraints as Assertions and Triggers, Views (Virtual Tables) in SQL, Additional features of SQL

**UNIT** – IV 6 Hours

**Database Design**: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form. Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Multi valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies, Other Dependencies and Normal Forms.

**UNIT** – V 7 Hours

**Transaction Management:** The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock- Based Concurrency Control, Performance of locking, Transaction support in SQL.

Introduction to crash recovery, 2PL serializability and recoverability.

Introduction to lock management, Lock conversions, Dealing with Deadlocks, specialized locking techniques, Concurrency control without locking to ARIES, The log, Other recovery – related data structures, The write –ahead Log protocol, Check pointing, recovering from a system crash, Media recovery, Other algorithms and Interaction with concurrency control.

**TEXT BOOK:**

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Addison-Wesley, 2007(Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 10,11)
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003. (Chapters 16, 17.1, 17.2, 18)

**REFERENCE BOOKS:**

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, 5th Edition, Mc-GrawHill, 2006.
2. C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, 8th Edition, Pearson education, 2006.

**WEB LINKS:**

1. https://nptel.ac.in/courses/106/106/106106095/
2. https://www.coursera.org/learn/database-management?
3. https://www.youtube.com/watch?v=T7AxM7Vqvaw
4. https://www.youtube.com/watch?v=zbMHLJ0dY4w

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Identify the fundamentals of database technologies and its different architectures.

CO2. Analyze the relational model concepts and Design relational algebraic expressions for SQL queries.

CO3. Illustrate the various concepts of SQL and Design SQL Queries to perform CRUD (Create, Retrieve, Update and Delete) operations on database.

CO4. Apply the database design with Normalization concepts, Functional Dependencies, Normal Forms and Relational decomposition.

CO5 Analyze the various criteria's of transaction management techniques, concurrency control algorithms and Compare various locking mechanisms, Crash and recovery methods.

# Web Technologies

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+2(L+T) | Credits | : | 4.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : 26 | SEE Marks | : | 50 |
| Course Code | : 2TMCA03 | | | |

## Course Objectives:

This Course will enable students to:

1. Gain knowledge about HTML & HTML5 elements to create a static web page.
2. Apply the HTML5 graphics basic styles while creating the webpage
3. Use the fundamentals of CSS3 and JavaScript to create and validate a web page.
4. Write JavaScript programs using different JS objects like Number, Date, and String
5. Apply events, DOM elements and regular expressions while creating dynamic webpage using JavaScript.

**UNIT** – I 8 Hours

**HTML & HTML 5:** Getting Started, The browser wars, Feature Detection, Browser Detection, HTML Basics, Links, Images, Tables, Lists, Blocks, IFrames, Forms, Form Elements, Input Types, Input Attributes, The HTML5 New Elements – Form Input Types, Form Elements, Form Attributes, Programming Examples

**UNIT** – II 8 Hours

HTML5 Semantics, HTML5 Graphics – Canvas, SVG, HTML5 Media – Video, Audio, HTML5 Web Storage, Programming Examples

**CSS Basic** – Introduction, Syntax, Id & Class, CSS Selectors(Simple selectors, Combinator selectors , Pseudo-class selectors, Pseudo-elements selectors, Attribute selectors ) , CSS Styling – Styling Backgrounds, Styling Text, Styling Fonts, Styling Links, Styling Lists, Styling Tables, Programming Examples.

**UNIT** – III 7 Hours

CSS Box Model – Border, Margin, Padding, Outline

**CSS3:** Introduction, Borders, Backgrounds, Text Effects, 2D Transforms, 3D Transforms, Transitions, Programming Examples

**JavaScript:** JS Introduction, JS Statements, JS Comments, JS Variables, JS Operators, JS Data Types, JS Functions, JS Objects, JS Comparisons, Programming Examples

**UNIT** – IV 8 Hours

JS Conditions, JS Switch, JS Looping Statements – For, While, JS Breaks, JS Objects –Number, Number Methods, String, String Methods, Date, Date Formats, Set and Get Methods, Array, Array Methods, Boolean, Math, Math Methods, Programming Examples

**UNIT** – V 7 Hours

JS DOM – DOM Introduction, DOM Elements, DOM HTML, JS Events, JS Popup Boxes, **Dynamic Document with JavaScript:** Positioning Elements, Moving Elements, Element Visibility, Changing colors and fonts, Pattern Matching using Regular Expressions, Programming Examples

**TEXT BOOK:**

1. Head First HTML5 Programming: Building Web Apps with JavaScript By Eric Freeman and Elisabeth Robson
2. Head First HTML with CSS & XHTML by Eric T Freeman, Elisabeth Freeman and Elisabeth Robson

**REFERENCE BOOKS:**

1. Mastering Html, Css & Javascript, by Laura Lemay, Rafe Colburn, Jennifer Kyrnin
2. HTML and CSS: Design and Build Websites by Jon Duckett, ISBN: 978-1118008188, Wiley Publications, 1st Edition

**WEB LINKS:**

1. https://www.w3schools.com/html/html5_intro.asp
2. https://www.w3schools.com/css/default.asp
3. https://www.w3schools.com/js/default.asp

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Develop a static web page using html and html5 elements
CO2. Apply the basic styles to design the webpage
CO3. Apply the style and validation for the elements of the webpage using CSS3 and JavaScript
CO4. Write the JavaScript programs using built–in objects like String, Array, Date etc
CO5. Apply different events to validate the inputs for development of web application.

# Software Engineering

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCA04 | | | |

## Course Objectives:

This Course will enable students to:

1. To define software engineering and explain its importance
2. To discuss the concepts of software products and software processes
3. To explain the importance of process visibility
4. To introduce the notion of professional responsibility

**UNIT** – I 10 Hours

**Introduction**: Professional software development; Software engineering ethics.
**Software Processes**: Software process models; Process activities; Coping with change; The Rational Unified Process

**UNIT** – II 10 Hours

**Requirements** Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; the software requirements document.
**Requirements Engineering Processes**: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

**UNIT** – III 7 Hours

**System modeling:** Context models; Interaction models; Structural models; Behavioral models; Model driven engineering.
**Agile Software Development**: Agile methods; Plan- driven and agile development; Extreme programming; Agile project management; Scaling agile methods.

**UNIT** – IV 6 Hours

**Software testing**: Development testing; Test driven development; Release testing; User testing.
**Project Management**: Risk management; Managing people; Teamwork; Project scheduling;

**UNIT** – V 6 Hours

**Project planning:** Software Pricing; Plan Driven Development; Project Scheduling; Agile Planning; Estimation Techniques; Algorithmic Cost Modeling; Cocomo II Model; Project Duration And Staffing.

**TEXT BOOK:**

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education Ltd., 2017. (Chapters-: 1, 2, 3, 4, 5, 8, 20, 21 )

**REFERENCE BOOKS:**

1. Guide to the Software Engineering Body Of Knowledge (SWEBOK Version 3) Library of Congress Online Catalog
2. Roger.S.Pressman: Software Engineering-A Practitioners approach
3. Shari Lawrence Pfleeger
4. Waman S Jawadekar: Software Engineering Principles and Practice

**WEB LINKS:**

1. https://www.computer.org/education/bodies-of-knowledge/software-engineering
2. The NATO Software Engineering Conferences (interesting historic material)
3. *Software Engineering Code of Ethics and Professional Practice* established in a joint effort by IEEE-CS and ACM [ copy at ACM ]
4. https://nptel.ac.in/courses/106/105/106105087/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Practice fundamental knowledge in software engineering
CO2. Analyze the functional and non functional requirements
CO3. Practice the design and methods for application development
CO4. Identify the project management and testing activities
CO5 Manage and motivate the people

# Operation Research

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE21 | | | |

## Course Objectives:

This Course will enable students to:

1. This course deals with the details of various aspects associated with optimization. These include description of optimization techniques, namely, Linear Programming and Non-Linear Programming and their applications to various science and engineering disciplines.
2. This course is to discuss the basic Operation Research concepts and techniques for solving particular problem and identification of appropriate solution.
3. This course is to introduce the student to the world of decision making, both qualitative and in particular quantitative.
4. This course will introduce you to the analytical method and to some of the common real world decision making problems.
5. To develop a research proposal using the general approach for Operation research.
6. This course is to build more productive systems based on:

**UNIT** – I 8 Hours

**Introduction and Overview of the Operation Research:** What is OR? - The origin of OR - the nature of OR – Different phases of OR solutions - Gathering of data and formulation of mathematical model - Validation and implementation

**Introduction to Linear Programming:** Two variable LP model - Construction of the LP Model. Graphical LP solution – OR – models of some practical situations.

**UNIT** – II 7 Hours

**The Simplex Method:** Standard LP form and its basic solutions - Computational procedure of the simplex method - Artificial variable method, Big-M method, Two-Phase method - Special cases in the simplex method

**UNIT** – III 9 Hours

**Transportation Model:** Definition of the Transportation Model - Different methods of finding the starting solution - Iterative computation of the solution – Traveling Salesman Problem **Assignment Model:** The Assignment Model - Mathematical formulation - Solution by Hungarian Method - Transshipment model

**UNIT** – IV 7 Hours

**Introduction to Game Theory**: Formulation of game, pure and mixed strategies – Dominance principle, modified Dominance principle - Two persons Zero sum games – Saddle point -, graphical solution of 2 X n and m X 2 games

**UNIT** – V 8 Hours

**Historical development of PERT/CPM Techniques** – Network construction – Fulkerson's rule – Determination of Critical path and duration – Slacks/Floats – Estimation of project duration – Crashing – Least cost project scheduling

**TEXT BOOK:**

1. Operations Research: An Introduction, Hamdy A. Taha, 8th Edition, Prentice Hall India, 2009. Chapters: 1, 2(2.1, 2.2, 2.3), 3, 4, 5 and 13(13.4).

**REFERENCE BOOKS:**

1. S. D. Sharma, Operations Research, 15th Edition – Kedarnath – Ramnath, Meerut – Delhi (2008).
2. Introduction to Operations Research, Frederick S. Hillier and Gerald J. Lieberman, 8th Edition, Tata McGraw Hill, 2007.

**WEB LINKS:**

1. https://www.youtube.com/watch?v=WIWhQpR-CjY
2. https://www.youtube.com/watch?v=66aKgySf9vo&list=PLLy_2iUCG87Bq8RGMTdeFZiB-87V4i9p1
3. https://www.youtube.com/watch?v=xrGVe6gMRyk
4. https://www.youtube.com/watch?v=YgqC8_WOZyY
5. https://www.coursera.org/search?query=Operations%20Research&

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Apply different OR models used in decision making, formulate Linear programming problem and solve using graphical method.
CO2. Identify, formulate and solve linear programming problems using Simplex method and Big M method
CO3. Formulate and solve given management problems such as transportation problem and assignment problem
CO4. Apply game theory concepts for decision making.
CO5 Schedule events and activities of a project using CPM & PERT

# Enterprise Resource Planning

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE22 | | | |

## Course Objectives:

This Course will enable students to:

1. Identify the factors that led to the development of ERP system
2. ERP implementation using different Techniques
3. Learn the of business development modules
4. Analyze the ERP Market, E-Commerce and Internet

**UNIT** – I 8 Hours

**Introduction To ERP** Overview, Benefits of ERP, ERP and Related Technologies, Business Data Mining, On–line Analytical Processing, Supply Chain Management

**UNIT** – II 8 Hours

**ERP Implementation :** Implementation of Life Cycle, Implementation Methodology, Hidden Costs, Organizing Implementation, Vendors, Consultants and Users, Contracts

**UNIT** – III 8 Hours

**Business Modules :** Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution

**UNIT** – IV 8 Hours

**ERP Market :** ERP Market Place, SAP AG, People Soft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD

**UNIT** – V 7 Hours

**ERP–Present And Future :** Turbo Charge the ERP System, EIA, ERP and E–Commerce, ERP and Internet, Future Directions in ERP.

**TEXT BOOK:**

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 1999.
2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, “Concepts in Enterprise Resource Planning”, Thomson Learning, 2001.

**REFERENCE BOOKS:**

1. Vinod Kumar Garg and N.K .Venkata Krishnan, “Enterprise Resource Planning concepts and Planning”, Prentice Hall, 1998.
2. Jose Antonio Fernandz, “ The SAP R /3 Hand book”, Tata McGraw Hill

**WEB LINKS:**

1. https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm
2. http://www.academictutorials.com/erp/
3. https://www.javatpoint.com/erp-full-form
4. http://www.openlearningworld.com/innerpages/Business%20Needs%20and%20ERP.htm

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Acquire Benefits of ERP, Process Re-engineering Project management and Monitoring
CO2. Analyze the performance of Project Quality management
CO3. Know how ERP evolved in market place, develop the ERP system.

# Optimization Techniques

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE23 | | | |

## Course Objectives:

This Course will enable students to:

1. To understand constrained, unconstrained optimization problems.
2. To explore the algorithms available
3. To understand integer programming
4. To get an insight into nature inspired algorithms

**UNIT** – I 8 Hours

**Introduction** , optimization Unconstrained Optimization ,Univariate Functions , Multivariate Functions ,Gradient-Based Methods ,Newton's Method Convergence Analysis , Steepest Descent Method Line Search Conjugate Gradient Method , Stochastic Gradient Descent, Sub gradient Method , problems.

**UNIT** – II 8 Hours

Constrained optimization, Mathematical Formulation, Lagrange Multipliers, SlackVariables Generalized Reduced Gradient Method , KKT Conditions , Penalty Method , Problems.

**UNIT** – III 8 Hours

Integer Programming , Integer Linear Programming, Integer LP, LP Relaxation , Branch and Bound How to Branch, Mixed Integer Programming, Applications of LP, IP, and MIP.

**UNIT** – IV 8 Hours

Regression and Regularization , Sample Mean and Variance, Regression Analysis ,Maximum Likelihood Regression , Linearization , Generalized Linear Regression , Goodness of Fit ,Nonlinear Least Squares Gauss–Newton Algorithm, Levenberg–Marquardt Algorithm

**UNIT** – V 7 Hours

Nature-Inspired Algorithms, Introduction to Ant and Bee Algorithms, Particle Swarm Optimization Firefly Algorithm, Cuckoo Search.

**TEXT BOOK:**

1. Xin-SheYang, Optimization Techniques and Applications with Examples, John Wiley & Sons Publications, 2018
2. Kalyanmoy Deb, Optimization For Engineering Design: Algorithms and Examples, Prentice hall of India, 2nd Edition, 2013.

**REFERENCE BOOKS:**

1. Optimization Techniques Hardcover – Import, 30 April 2009, by Chander Mohan (Author), Kusum Deep (Author),
2. Optimization Techniques Paperback – 30 December 2013, by A. K. Malik (Author), S. K. Yadav (Author), S. R. Yadav (Author)
3. Optimization Techniques Paperback – 1 January 2013, by Neeshu Sharma (Author),
4. Engineering Optimization: Theory And Practice Paperback – 1 January 2013, by Singiresu S. Rao (Author)

**WEB LINKS:**

1. https://www.coursera.org/search?query=Optimization%20Techniques
2. https://www.youtube.com/watch?v=_awAywLKuEQ
3. https://www.youtube.com/watch?v=Q2dewZweAtU
4. https://www.youtube.com/watch?v=Zq7g1nc2MJ8

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Elucidate elaborately on constrained, unconstrained optimization and general principles involved in optimization.

CO2. Develop objective function and constraints and be able to apply interger programming technique.

CO3. Explore the regression and regularization techniques and be able to fine best fit for the given problem.

CO4. Explain the principles of nature inspired algorithms in general and honey Bee, ant colony , particle swarm and firefly algorithms in particular.

# Computer Oriented Numerical and Statistical Methods

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE24 | | | |

## Course Objectives:

This Course will enable students to:

1. Understand the representation of floating point numbers in normalized form, to solve nonlinear equations by using various iterative methods and to write algorithms for the same.
2. Understand the application of direct and iterative methods for simultaneous algebraic equations along with algorithms.
3. Understand the type of differentiation problem with the corresponding formula and to write the algorithms for them.
4. Solve numerical integration problems with algorithms and the foundations of Statistics.
5. Understand Measures of Central Tendency and Dispersion with problems and algorithms

**UNIT** – I 9 Hours

**Iterative Methods**

Introduction, Floating point representation of numbers, introduction, beginning an iterative method, the method of successive bisection, the method of false position, Newton-Raphson iterative method. The Secant method, the method of successive approximations, Comparison of iterative methods.

**UNIT** – II 7 Hours

**Solution of Simultaneous Algebraic Equations**

Introduction, The Gauss elimination method, pivoting, Ill conditioned equations, Refinement of the solution obtained by Gaussian elimination, The Gauss-Seidel iterative method, An algorithm to implement the Gauss-Seidel method, Comparison of direct and iterative methods.

**UNIT** – III 7 Hours

**Numerical Differentiation**

Introduction, Formulae for numerical differentiation- First derivative using forward difference formula, backward difference formula, Lagrange's interpolation formula, Newton's divided difference formula.

**UNIT** – IV 8 Hours

**Numerical Integration**

Numerical integration, Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Algorithms for integration of tabulated function, Gaussian quadrature formulae, Comparison of integration formulae.

**Introduction to Statistics**

Introduction, Meaning & Scope of Statistics, Data, Types of Data and Chart, Frequency, Class Boundaries, Frequency Chart.

**UNIT** – V 8 Hours

**Measures of Central Tendency and Dispersion**

Introduction, Mean for Frequency Less Data, Arithmetic Mean for Discrete & Continuous Frequency Distributions, Weighted Mean, Median for Raw Data, Mode for Raw Data, Dispersion, Skewness & Kurtosis.

**TEXT BOOK:**

1. V Rajaraman, Computer Oriented Numerical Methods, Prentice Hall of India, 3rd Edition. (Chapters: 2.1, 2.2, 3.1 to 3.8, 4.1 to 4.8, 8.1, 8.2, 8.3, 8.4, 8.6, 8.8, 8.9, 9.1, 9.2, 9.4, 9.5, 9.6, 9.7, 9.8)
2. Sant Sharan Mishra, Computer Oriented Numerical and Statistical Methods, PHI, 2013 (Chapters: 9.1 to 9.7, 10.1 to 10.9)

**REFERENCE BOOKS:**

1. Steven C Chapra, Raymond P Canale, Numerical Methods for Engineers, Tata McGraw-Hill, Fourth Edition.
2. M K Jain, S R K Iyengar, R K Jain, Numerical Methods for scientific & Engineering computation, NEW AGE, Sixth edition.
3. Dr. B S Grewal, Numerical Methods in Engineering & Science, Khanna Publishers, 9th edition 2013.
4. Richard A Johnson, Irwin Miller, John Freund, Probability and Statistics for Engineers, Pearson Education India; 8 edition (2015)
5. George Argyrous, Statistics for Research: With a Guide to SPSS, SAGE South Asia, Third edition, 2012.

**WEB LINKS:**

1. https://nptel.ac.in/courses/111/107/111107105/#
2. https://byjus.com/maths/
3. https://www.studypug.com/algebra-help/
4. https://www.geeksforgeeks.org/program-for-bisection-method/
5. https://statistics.laerd.com/statistical-guides/measures-central-tendency-mean-mode-median.php
6. https://byjus.com/maths/central-tendency/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. ***Represent*** numbers in normalized floating-point format and ***apply*** a suitable iterative method to find the solution of transcendental equation with the given accuracy.

CO2. ***Solve*** problems on simultaneous algebraic equations using the direct and iterative methods.

CO3. ***Solve*** problems on numerical differentiation of data and functions.

CO4. ***Solve*** problems on numerical integration of data, functions and the fundamentals of statistics.

CO5 ***Solve*** problems on Measures of Central Tendency and Dispersion in Statistics.

# Management Information Systems and E-Commerce

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE25 | | | |

## Course Objectives:

This Course will enable students to:

1. Distinction between Data, Information and its classification.
2. Understand and use decision making concepts, behavioral concepts and models, and identify problem alternatives for approaches to resolve them.
3. Analyze and use how the problems of managing data resources in a traditional file environment are solved by a ERP system
4. Become familiar with all phases of E-business in the realm of modern business
5. Mastering the different aspects of E-Commerce and the security features involved in E-commerce

**UNIT** – I 8 Hours

**Information concepts:**

Information concepts, Information: A quality product, Classification of Information Methods of Data and Information collection, Value of the Information, General model of a Human as Information processor.

**Management Information System:**

Introduction of MIS:MIS Concept, Definition, Role of the MIS, Impact of MIS, MIS and the user, Management as a control system, MIS support to the management, Management effectiveness and MIS.

**UNIT** – II 8 Hours

**Decision Making:**

Decision Making and DSS: Decision making concepts, Decision making process, Decision-making by analytical modeling, Behavioral concepts in Decision making, Organizational Decision-making, MIS and Decision Making.

**Decision Support System**

Decision Support System(DSS): Concept and philosophy, DSS Models: Behavioral, Management Science and Operations Research Models, Group Decision Support System(GDSS)

**UNIT** – III 8 Hours

**Management of Global Enterprise**

**E**nterprise Management System (EMS), Enterprise Resource Planning (ERP), ERP Model and modules, Benefits of ERP, ERP Product evaluation, ERP implementation, Supply Chain Management(SCM), Information system in SCM, Customer Relationship Management (CRM), Management of Global Enterprise, EMS and MIS.

**UNIT** – IV 8 Hours

**E-business Technology**

Introduction to E-business, Models of E-business, Internet and World Wide Web(WWW), Intranet/Extranet, Security in E-business, Electronic Payment Systems, Impact of web on Strategic Management, Web enabled Business Management, WEB 2.0, MIS in Web Environment.

**UNIT** – V 7 Hours

**Electronic commerce(E-commerce)**

Introduction: Electronic commerce and physical commerce, The DIGITAL phenomenon, Looking at e-commerce from different perspectives, Different types of e-commerce, Examples of the types of e-commerce, Amazon*: B2C e-commerce, eBay: C2C e-commerce

Trading process network: B2B e-commerce, Priceline : C2B e-commerce, Some e-commerce scenarios: Retailing, Servicing, Publishing, Changes brought by e-commerce, Advantages of e-commerce.

**Basic cryptography for enabling e-commerce**

Security concerns, Security requirements, Encryption, Two basic principles for private key encryption,Data encryption standard, symmetric key encryption algorithm, The key distribution problem, Public key encryption

**TEXT BOOK:**

1. Waman S Jhawadekar: Management Information Systems, 5th Edition, McGraw Hill.
2. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang: E-Commerce Fundamentals and Applications, Wile India Edition

**REFERENCE BOOKS:**

1. James A O'Brein, George M Marakas, Management Information Systems, 7th Edition, TMH publication, 2007.
2. Ravi Kalakota Andrew Winston, Frontiers of Electronic Commerce
3. H. M. Deitel, P. J. Deitel, E-Business and E-Commerce: How to Programe.

**WEB LINKS:**

1. http://www.openlearningworld.com
2. https://www.investopedia.com/terms/e/erp.asp
3. https://www.tutorialspoint.com/
4. https://www.tutorialspoint.com/listtutorial/introduction-to-e-business/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Recognize and demonstrate the value, quality and the role of various types of information and its usage in the business systems.

CO2. Interpret, translate and demonstrate the roles, impact and effectiveness of Management information systems in organizations,

CO3. Relate, translate, analyse and implement the process of decision making with the support of decision support technology in the business organizations at all levels.

CO4. Interpret, contrast, translate and demonstrate different roles of Enterprise Resource Planning in improving the performance of the business systems.

CO5 Recognize, interpret and apply the contemporary e-commerce concepts and terminology

# Design and Analysis of Algorithms

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE26 | | | |

## Course Objectives:

This Course will enable students to:

1. Study paradigms and approaches used to analyze and design algorithms and to appreciate the impact of algorithm design in practice.
2. Understand how the worst-case time complexity of an algorithm is defined, how asymptotic notation is used to provide a rough classification of algorithms.
3. Assess how a number of algorithms for fundamental problems in computer science and engineering work and compare with one another.
4. Understand how there are still some problems for which it is unknown whether there exist efficient algorithms, and how to design efficient algorithms.
5. To create analytical skills, to enable the students to design algorithms for various real-time problems.
6. To provide basic idea of machine learning algorithms

**UNIT** – I 8 Hours

Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Basics of data Structures. Analysis Framework, Asymptotic Notations and Basic efficiency classes. Mathematical analysis of Recursive and Non-recursive algorithms, Examples. Algorithm visualization.

**UNIT** – II 8 Hours

Divide-and-Conquer: Divide and conquer recurrence relation, Master's theorem, Merge sort, Quicksort, Multiplication of large integers.

Decrease-and-Conquer: Insertion Sort, Depth First and Breadth First Search, Topological sorting.

**UNIT** – III 8 Hours

Transform-and-Conquer: Presorting, Generating Balanced Search Trees.

Space and Time Tradeoffs: Sorting by Counting, Input Enhancement in String Matching, Hashing techniques

**UNIT** – IV 8 Hours

Dynamic Programming: Computing a binomial coefficient, Warshall's and Floyd's Algorithms

Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm

**UNIT** – V 7 Hours

Algorithmic power P, NP and NP complete problems. Introduction to Machine learning algorithms, supervised and unsupervised learning, and reinforcement learning.

**TEXT BOOK:**

1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education.
2. **Ethem Alphydin**, Introduction to Machine Learning, III edition, MIT Press.

**REFERENCE BOOKS:**

1. Horowitz E., Sahani S., Rajasekharan S.: Fundamentals of Computer Algorithms, 2nd Edition, Universities Press, 2007.
2. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, 2nd Edition, PHI, 2001.

**WEB LINKS:**

1. https://nptel.ac.in/courses/106/105/106105164/ (IIT Kharagpur)
2. https://nptel.ac.in/courses/106/106/106106131/ (IIT Madras)
3. https://www.youtube.com/watch?v=7CrHsqMOeyI
4. https://www.youtube.com/watch?v=Qe6PUzVu2pk

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Apply an appropriate method for analyzing algorithm complexity, including asymptotic notation, and determine worst case complexity.

CO2. Apply brute force, divide and conquer and decrease and conquer strategies to design the algorithms for solving sorting and graph problems.

CO3. Apply transform and conquer and space trade off strategies to design algorithms for solving problems related to trees, string matching and hashing.

CO4. Identify the limitation of the algorithm in solving complex problems and able to demonstrate the knowledge of machine learning algorithms.

# Artificial Intelligence

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE31 | | | |

## Course Objectives:

This Course will enable students to:

1. Know the representations and algorithms used to build artificial intelligence systems
2. Understand the role of the knowledge representation and reasoning.
3. Achieve the knowledge in building the simple knowledge-based systems.
4. Overviews to build the ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems.

**UNIT** – I 7 Hours

**Introduction:** What is AI? Intelligent Agents: Agents and environment ; Rationality ; The nature of environment ; the structure of agents . Problem solving: Problem-solving agents ; Example problems ; Searching for solution; Uninformed search strategies.

**UNIT** – II 8 Hours

**Informed Search:** Informed search strategies ; Heuristic functions ; Adversial search: Games ; Optimal decisions in games; Alpha-Beta pruning Constraint satisfaction problems: Defining Constraint satisfaction problems.

**UNIT** – III 8 Hours

**Logical Agents:** Knowledge-based agents; The wumpus world ; Logic; propositional logic: A very simple logic; First-Order Logic: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic.

**UNIT** – IV 8 Hours

**Inference In First-Order Logic:** Propositional versus first-order inference; Unification and lifting; Forward chaining; Backward chaining. Classical Planning: Definition of Classical planning;

**UNIT** – V 8 Hours

**Quantifying Uncertainty:** Acting under certainty, Probabilistic Reasoning: Representing knowledge in an uncertain domain; Learning: Forms of learning ; Supervised learning; AI: The Present and Future: Agent components; Agent architectures; Are we going in the right direction? What if AI does succeed?

**TEXT BOOK:**

1. Stuart Russel and Peter Norvig : Artificial Intelligence A Modern Approach, 3rd Edition, Pearson India Education limited, 2015, (1.1,2.1to2.4,3.1 to 3.6,5.1 to 5.3, 6.1, 7.1 to 7.4, 8.1 to 8.3, 9.1 to 9.4.2, 10.1, 13.1, 14.1, 18.1,18.2 and 27th full chapter)

**REFERENCE BOOKS:**

1. Elaine Rich, Kevin Knight: Artificial Intelligence, 2nd Edition, Tata McGraw Hill, 1991.
2. Nils J. Nilsson: Principles of Artificial Intelligence, Elsevier, 1980.

**WEB LINKS:**

1. https://www.javatpoint.com/agents-in-ai
2. https://www.javatpoint.com/ai-informed-search-algorithms
3. https://www.cs.jhu.edu/~phi/ai/slides/lecture-logical-agents.pdf
4. https://www.youtube.com/watch?v=-Rf2hOyjZB8
5. https://www.youtube.com/watch?v=sdx6E2w9Td0
6. https://www.youtube.com/watch?v=RFdZMGJHrTc
7. https://www.youtube.com/watch?v=1BRIjhX4JdU

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Apply basic principles of AI in problem solving agents.
CO2. Analyze and apply searching techniques to solve real world problems
CO3. Represent the real world problems by using first order and propositional logic.
CO4. Demonstrate the working knowledge of reasoning in the presence of planning, incomplete and /or uncertain information.

**Assignment (Self-study) component:**

1. Integrate artificial intelligence techniques into any of the app development.

# Cyber Security

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE32 | | | |

## Course Objectives:

This Course will enable students to:

1. Understand about cybercrimes and the various attacks
2. Learn about the tools and methodologies of detecting crimes
3. Explore the various kinds of phishing and identity theft
4. Understand the Unix operating system
5. Explore the firewalls and related tools

**UNIT** – I 8 Hours

### Introduction to Cybercrime and Laws

Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and information Security, Who are Cybercriminals? Classifications of Cybercrimes. How Criminals Plan Them – Introduction, How Criminals Plan the Attacks, Cybercafé and Cybercrimes, Botnets, Attack Vector, The Indian IT ACT 2000 and amendments.

**UNIT** – II 7 Hours

### Tools and Methods used in Cybercrime

Introduction, Proxy Server and Anonymizers, Password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow.

**UNIT** – III 8 Hours

### Phishing and Identity Theft

Introduction, Phishing – Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle.

**UNIT** – IV 8 Hours

Unix Command Lines, Backtrack Linux, Mac Ports, Cygwin, Windows Power Shell, Net Cat Commands, Net Cat Uses, SSH, Data Pipe, Fpipe

**UNIT** – V 7 Hours

### Network Defense tools and block chain technology

Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Intrusion Detection System, introduction to block chain technology (definition, tools used for implementation ) and its applications.

**TEXT BOOK:**

1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill. (Chapters: 2, 7, 8, 11)

**REFERENCE BOOKS:**

1. Marjie T. Britz - Computer Forensics and Cyber Crime: An Introduction - Pearson
2. Chwan-Hwa (John) Wu,J. David Irwin - Introduction to Computer Networks and Cyber security – CRC Press
3. Bill Nelson, Amelia Phillips, Christopher Steuart - Guide to Computer Forensics and Investigations - Cengage Learning

**WEB LINKS:**

1. https://www.tutorialspoint.com/fundamentals_of_science_and_technology/cyber_crime_and_cyber_security.htm
2. https://www.w3schools.in/category/cyber-security/
3. https://tutorialspoint.dev/computer-science/computer-network-tutorials/network-security-cia-triad
4. https://www.simplilearn.com/tutorials/cyber-security-tutorial

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Define and illustrate cyber security concepts and applications
CO2. Analyze the working of cyber security principles to system design
CO3. Illustrate appropriate techniques to solve cyber security threats
CO4. Evaluate and implement cyber security through network security protocols
CO5 Define and illustrate cyber security concepts and applications
CO6 Analyze the working of cyber security principles to system design

# Distributed Operating Systems

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE33 | | | |

## Course Objectives:

This Course will enable students to:

1. To learn the fundamentals of DBMS with an emphasis on how to organize, maintain and retrieve data from the database.
2. To learn the basic principles of database design in the form of Entity – Relationship diagrams to handle the needs of any user oriented projects
3. To learn the programming fundamentals involved in using Structured Query Language and formation its programming lines in the form of queries.
4. To gain the knowledge on how to design the database by using Normalization process and its normal forms.
5. To know the different aspects of transactions with the given database.

**UNIT** – I 8 Hours

Fundamentals: What is Distributed Computing Systems? Evolution of Distributed Computing System; Distributed Computing System Models; What is Distributed Operating System? Issues in Designing a Distributed Operating System; Introduction to Distributed Computing Environment (DCE).Message Passing: Introduction, Desirable features of a Good Message Passing System, Issues in PC by Message Passing, Synchronization, Buffering, Multi-datagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication, Case Study: 4.3 BSD UNIX IPC Mechanism.

**UNIT** – II 7 Hours

Remote Procedure Calls: Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, RPC in Heterogeneous Environments, Lightweight RPC, Optimization for Better Performance, Case Studies: Sun RPC.

**UNIT** – III 8 Hours

Distributed Shared Memory: Introduction, General Architecture of DSM systems, Design and Implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM, Advantages of DSM. Synchronization: Introduction, Clock Synchronization, Event Ordering, Mutual Exclusion, Dead Lock, Election Algorithms

**UNIT** – IV 8 Hours

Resource Management: Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load – Sharing Approach Process Management: Introduction, Process Migration, Threads.

**UNIT** – V 8 Hours

Distributed File Systems: Introduction, Desirable Features of a Good Distributed File System, File models, File–Accessing Models, File – Sharing Semantics, File – Caching Schemes, File Replication, Fault Tolerance, Atomic Transactions and Design Principles.

**TEXT BOOK:**

1. Pradeep. K. Sinha: Distributed Operating Systems: Concepts and Design, PHI, 2007.

**REFERENCE BOOKS:**

1. Andrew S. Tanenbaum: Distributed Operating Systems, Pearson Education, 2013.

**WEB LINKS:**

1. https://www.youtube.com/watch?v=NYBKXzl5bWU
2. https://www.youtube.com/watch?v=BU0OEEgzUNY
3. https://www.youtube.com/watch?v=dX2PSA0si5g
4. https://www.udemy.com/course/distributed-systems-cloud-computing-with-java/
5. https://www.coursera.org/learn/distributed-programming-in-java

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Analyse design issues and different message passing techniques in DOS, distributed systems

CO2. Analyse RPC implementation and its performance in DOS

CO3. Analyse the major security issues associated with distributed systems and evaluate techniques available for increasing system security

CO4. Apply the concepts of distributed shared memory and resource management for the given problem/ case study.

CO5 Analyse distributed file systems and evaluate the performance in terms of fault tolerance, file replication as major factors Apply modification to the existing algorithms to improve the performance of DOS.

# Digital Marketing

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE34 | | | |

## Course Objectives:

This Course will enable students to:

1. To gain knowledge of Digital marketing vs traditional marketing
2. To gain knowledge of Display Advertising, Search engine advertising
3. To gain knowledge various social media marketing
4. To gain knowledge of Search engine optimization and Web Analtyics
5. To gain knowledge of Social media strategy

**UNIT** – I 8 Hours

Introduction to Digital Marketing Evolution of Digital Marketing from traditional to modern era, Role of Internet; Current trends, Info-graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment; Digital marketing strategy; P.O.E.M. framework, Digital landscape, Digital marketing plan, Digital marketing models.

**UNIT** – II 7 Hours

Internet Marketing and Digital Marketing Mix – Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on IMC; Search Engine Advertising: - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing: - Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing.

**UNIT** – III 9 Hours

Social Media Marketing – Role of Influencer Marketing, Tools & Plan– Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: - Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools Linkedin Marketing: - Introduction and Importance of Linkedin Marketing, Framing Linkedin Strategy, Lead Generation through Linkedin, Content Strategy, Analytics and Targeting Twitter Marketing: - Introduction to Twitter Marketing, how twitter Marketing is different than other forms of digital marketing, framing content strategy, Twitter Advertising Campaigns Instagram and Snapchat: - Digital Marketing Strategies through Instagram and Snapchat Mobile Marketing: - Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics Introduction to social media metrics

**UNIT** – IV 7 Hours

Introduction to SEO, SEM, Web Analytics, Mobile Marketing, Trends in Digital Advertising– - Introduction and need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics - Introduction to SEM Web Analytics: - Google Analytics & Google AdWords; data collection for web analytics, multichannel attribution, Universal analytics, Tracking code Trends in digital advertising

**UNIT** – V 8 Hours

Social Media Channels: Introduction, Key terms and concepts, Traditional media vs Social media. Social media channels: Social networking. Content creation, Bookmarking & aggregating and Location & social media. Tracking social media campaigns. Social media marketing: Rules of engagement. Advantages and challenges.

Social Media Strategy: Introduction, Key terms and concepts. Using social media to solve business challenges. Step-by-step guide to creating a social media strategy. Documents and processes. Dealing with opportunities and threats. Step-by-step guide for recovering from an online brand attack. Social media risks and challenges

**TEXT BOOK:**

1. Seema Gupta “Digital Marketing” Mc-Graw Hill 1st Edition – 2017

**REFERENCE BOOKS:**

1. Ian Dodson “The Art of Digital Marketing” Wiley Latest Edition.
2. Puneet Singh Bhatia “Fundamentals of Digital Marketing” Pearson 1st Edition – 2017
3. Prof. Nitin C. Kamat, Mr.Chinmay Nitin Kamat Digital Social Media Marketing Himalaya Publishing House Pvt. Ltd. Latest Edition

**WEB LINKS:**

1. https://www.youtube.com/watch?v=nU-IIXBWlS4
2. https://www.digitalmarketer.com/digital-marketing/assets/pdf/ultimate-guide-to-digital-marketing.pdf
3. https://www.tutorialspoint.com/digital_marketing_tutorials.htm
4. https://www.youtube.com/watch?v=j_SsD1_9ARU

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Comprehend the significance of digital marketing over traditional marketing
CO2. Analyze the working of Display Advertising and working of Search engine advertising
CO3. Analyze the role of various social media for digital marketing, its pros and cons; social media strategies
CO4. Analyze the working of SEO and Web Analytics

# Programming with C# using .Net

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE35 | | | |

## Course Objectives:

This Course will enable students to:

1. Familiarize .NET framework and OOPS concepts in C#.
2. Analyze the concepts of Inheritance, Exception Handling and Interfaces.
3. Illustrate the concepts of Delegates and Lambda expressions.
4. Illustrate the concepts of some advanced C# language features such as custom conversion routines etc.

**UNIT** – I 7 Hours

**The philosophy of .NET**

Introducing the Building Blocks of the .NET Platform (the CLR, CTS, and CLS), Additional .NET-Aware Programming Languages, An Overview of .NET Assemblies, Understanding the Common Type System, Understanding the Common Language Specification, Understanding the Common Language Runtime, The Assembly/Namespace/Type Distinction, Exploring an Assembly Using ildasm.exe, Exploring an Assembly Using Reflector, Deploying the .NET Runtime, The Platform-Independent Nature of .NET

**Building C# Applications**

The Role of the .NET Framework 4.0 SDK, Building C# Applications using csc.exe

**UNIT** – II 9 Hours

**Core C# Programming Constructs**

The Anatomy of a simple C# Program, An Interesting Aside: Some Additional Members of the System. Environment Class, The System. Console class, System Data Types & C# shorthand Notation, Working with String Data, Narrowing & widening data type conversions, Understanding implicitly typed local variables, C# iteration constructs, Decision constructs & the relational/Equality operators, Methods & parameter modifiers, Understanding C# arrays, Understanding the Structure type, Understanding Value types & reference types, Understanding C# Nullable types

**UNIT** – III 9 Hours

**Defining encapsulated class types**

Introducing the C# class type, understanding constructors, the role of the this keyword, understanding the static keyword, Defining the pillars of OOP, C# access modifiers, The first pillar: C#'s encapsulation services, understanding automatic properties, understanding object initializer syntax, working with constant field data, understanding partial types.

**Inheritance**

Inheritance Basics, Member Access and Inheritance, Using Protected Access, Constructors and Inheritance, Calling Base Class Constructors, Inheritance and Name Hiding, Using base to Access a Hidden Name, Creating a Multilevel Hierarchy, When Are Constructors Called? Base Class References and Derived Objects, Virtual Methods and Overriding, Why Overridden Methods? Applying Virtual Methods, Using Abstract Classes, Using sealed to Prevent Inheritance, The object Class, Boxing and Unboxing, Is object a Universal Data Type?

**UNIT** – IV 8 Hours

**Exception Handling**

The System.Exception Class, Exception-Handling Fundamentals, Using try and catch, A Simple Exception Example, A Second Exception Example, The Consequences of an Uncaught Exception, Exceptions Let You Handle Errors Gracefully, Using Multiple catch Clauses, Catching All Exceptions,

Nesting try Blocks, Throwing an Exception, Rethrowing an Exception, Using finally.

**Interfaces**

Interfaces, Implementing Interfaces, Using Interface References, Interface Properties, Interfaces Can Be Inherited, Name Hiding with Interface Inheritance, Explicit Implementations, Choosing Between an Interface and an Abstract Class.

**UNIT** – V 7 Hours

**Delegates & Lambda Expressions**

Delegates, Delegate Method Group Conversion, Using Instance Methods as Delegates, Multicasting, Covariance and Contra variance, System. Delegate, Why Delegates? Anonymous Functions, Anonymous Methods, Pass Arguments to an Anonymous Method, Return a Value from an Anonymous Method, Use Outer Variables with Anonymous Methods, Lambda Expressions, The Lambda Operator, Expression Lambdas, Statement Lambdas.

**Advanced C# Language Features**

Understanding Operator overloading, Understanding Custom type conversions (up to the internal representation of custom conversion routines)

**TEXT BOOK:**

1. Andrew Troelsen: Pro C# 2010 and the .NET 4 Platform, Fifth Edition, Apress, India, 2010. Chapters: 1 to 5, 12.
2. Herbert Schildt: The Complete Reference C# 4.0, TMH Edition 2010. Chapters: 11, 12, 13, 15.

**REFERENCE BOOKS:**

1. Ian Griffiths, Matthew Adams, and Jesse Liberty: Programming C# 4.0, Sixth Edition, O'REILLY, 2010.
2. Andrew Stellman, Jennifer Greene: Head First C#, 2nd Edition, O'REILLY 2010.

**WEB LINKS:**

1. https://www.w3schools.com/cs/index.php
2. https://docs.microsoft.com/en-us/dotnet/csharp/tour-of-csharp/
3. https://www.javatpoint.com/c-sharp-tutorial
4. https://www.tutorialspoint.com/csharp/index.htm
5. https://www.geeksforgeeks.org/csharp-programming-language/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Interpret .NET framework and the details of various ways of building C# applications.
CO2. Develop the programs in C# by using the core C# programming constructs.
CO3. Design the programs in C# by using the pillars of OOP (Encapsulation, Inheritance, and Polymorphism) and inheritance.
CO4. Develop the programs in C# by using the interfaces and handle runtime anomalies using exception handling.
CO5 Design the programs in C# by using Delegates, Lambdas and several advanced C# language features.

# User Interface Design

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAE36 | | | |

## Course Objectives:

This Course will enable students to:

1. ***Explain*** the concepts of how to use Interactive systems like electronic mails, object action interface model, human-computer interaction.
2. ***Designing*** the user-interface is intended primarily for designers, managers and evaluators of interactive systems
3. ***Apply*** the .concepts of task related menu organization like single menus, combinations of multiple menus, form filling, dialogue boxes, audio menus and window designing.
4. ***Outlines*** procedures and guidelines to maintain high degree of interaction required by the system to the user.
5. ***Achieve*** the goal of universal access

**UNIT** – I 8 Hours

**Introduction :** Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivation, Universal Usability, Goals for our profession. Guideline, principles, and theories: Introduction, Guidelines, principles, Theories.

**UNIT** – II 7 Hours

**Development Processes :** Managing Design Processes: Introduction, Organizational Design to support Usability, The Four Pillars of Design, Development methodologies: Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues. Evaluating Interface Design Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments

**UNIT** – III 8 Hours

**Direct Manipulation and Virtual Environments:** Introduction, Examples of Direct Manipulation, Discussion of direct manipulation, 3D Interfaces, Tele-operation, Virtual and Augmented Reality Menu Selection, Form Filling and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combination of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry With Menus, Form Filling, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays

**UNIT** – IV 8 Hours

**Command and Natural Languages**: Introduction, Command-organization functionality strategies and structure, Naming and Abbreviations, Natural Language in computing. Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory interfaces, Displays-Small and Large Design Issues Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display design, web page design, Window Design, Color

**UNIT** – V 7 Hours

**User Documentation and Online Help :** Introduction, Online versus paper documentation, Reading from paper versus Displays, Shaping the content of the Manuals, Accessing the Documentation, Online Tutorials and animated demonstrations, Online Communities for User Assistance, The Development Process. Information Search and Visualization
Introduction, Search in Textual Documents and Database Querying, Multimedia

document searches, Advanced filtering and Search Interfaces, Information Visualization: Introduction, Data tyoe by task taxonomy, Challenges for information visualization

**TEXT BOOK:**

1. Ben Shneiderman, Plaisant, Cohen, Jacobs: Designing the User Interface, 5th Edition, Pearson ,Education, 2010.

**REFERENCE BOOKS:**

1. Alan Dix, Janet Finalay, Gregory D AbiwdmRusselBealel: Human-Computer Interaction, III Edition, Pearson , Education, 2008.
2. Eberts: User Interface Design, Prentice Hall, 1994
3. Wilber O Galitz: The Essential Guide to User Interface Design- An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt Ltd, 2011

**WEB LINKS:**

1. https://www.youtube.com/watch?v=_P3CrgFlXhg
2. https://www.youtube.com/watch?v=EBCn1btfX68

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Recognize the new technologies that provide interactive devices and interfaces.
CO2. Apply the guidelines to develop the UID and evaluate for the given problem.
CO3. Apply the development methodologies with an analysis of the social impact and legal issues
CO4. Apply command, natural languages and issues for designing and maintaining QoS
CO5 Analyse the techniques used for information search and visualization

# DBMS Lab with Mini Project

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3 | Credits | : | 1.5 |
| Total Lecture Hours | : - | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAL1 | | | |

## Course Objectives:

This Course will enable students to:

1. Create SQL queries for the small projects
2. Create database objects that include tables, constraints, indexes, and sequences

**Practical – 1 :**

Consider the Insurance database given below. The primary keys are underlined and the data types are specified.

DRIVER (driver-id#:String, driver_name : string, address: string)
CAR (Regno: String, car_model:string, yearofpurchase:int)
ACCIDENT (Report-Number: int, dateofaccident:date, location: string)
CAR_OWNER (driver-id#:string, Regno: String)
PARTICIPATED (driver-id#:string, report-number: int, damage_amount:int)

1. Create the above tables by properly specifying the primary keys and the foreign keys.
2. Enter at least five tuples (i.e. records ) for each relation (i.e. table).

Execute SQL queries for the following requirements:
Query-1 : List out driver name, address, model of the car, year of purchase for a particular owner
Query-2 : List out driver name, model of the car, year of purchase, place of accident and date of accident occurred at a particular place.
Query-3 : List the number of accidents done by a particular driver :
Query-4 : List out the accident details (i.e. driver name, model of the car, date of accident, place of accident, damage amount ) where the damage amount exceeds Rs. 25,000
Query-5 : Find out the place of accident where the number of accidents occurred are more than one.
Query-6 : Find the total number of people who owned car that were involved in an accident in the year 2009
Query-7 : Find the number of accidents in which car belongs to specific model were involved

**Practical – 2 :**

Consider the following relations for an order processing database application in a company.
CUSTOMER (cust#: int, cname: String, City: String)
ITEM (item#: int, ItemName: string, unitprice: int)
WAREHOUSE (warehouse#: int, warehouse_name: string, city: String)
CORDER (order#: int, odate: date, cust#: int, ord-Amt:int)
ORDER-ITEM (order#: int, Item#: Int, Qty: int)
SHIPMENT (order# int, warehouse#: int, ship-date: date)
Create the above tables by properly specifying the primary keys and the foreign keys.
Enter at least 5 to 10 tuples for each relation.
Execute SQL queries for the following requirements:
Query-1: List out the details of orders, i.e. orderno, warehouse name, shipdate for a particular city :
Query-2: List out customer name, number of orders they made, their total ordered amount and their average ordered amount for all the customers:
Query-3: Find out the warehouse and number of orders they obtained from different customers.
Query-4: Find out the warehouse, which has got number of orders more than 2.
Query-5: Find out the customer who has ordered the number of items more than 3.

**Practical – 3.**

Consider the following database of student enrollment in courses and books adopted for each course.

STUDENT (regno#: string, name: string, major: string, bdate: date)
COURSE (course#: int, cname: string, dept: String)
TEXT (book_ISBN#: int, book_title: string, publisher: string, author: string)
ENROLL (regno#: string, course#: int, sem: int, marks: int)
BOOK_ADOPTION (course#: int, sem: int, book_ISBN: int)

- Create the above tables by properly specifying the primary keys and the foreign keys
- Enter at least 7 to 10 records to each table.

0Execute SQL queries for the following requirements:

1) List out the student details, and their course details. The records should be ordered in a semester wise manner.
2) List out the student details under a particular department whose name is ordered in a semester wise
3) List out all the book details under a particular course
4) Find out the Courses in which number of students studying will be more than 2.
5) Find out the Publisher who has published more than 2 books.
6) Find out the authors who have written book for I semester, computer science course.
7) List out the student details whose total number of months starting from their date of birth is more than 225
8) Find out the course name to which maximum number of students have joined

**Practical – 4 :**

For the same previous database tables (i.e. Practical – 3)
STUDENT (regno#: string, name: string, major: string, bdate: date)
COURSE (course#: int, cname: string, dept: String)
TEXT (book_ISBN#: int, book_title: string, publisher: string, author: string)
ENROLL (regno#: string, course#: int, sem: int, marks: int)
BOOK_ADOPTION (course#: int, sem: int, book_ISBN: int)

Execute SQL queries for the following requirements :

1) List out the students those who have born in the month of April
2) List out all the students whose age lies between 17 and 19
3) List out all the student details whose marks greater than 750
4) Increase the marks by 10 % to students belongs to Computer Science Department and I semester Students.
5) Find out the department in which no books are available :
6) Find out the department to which no Students have joined :
7) Remove all the details related to the Electronics department

**Practical – 5.**

Consider the following Employee database of working in a department and getting salary grade.
Employee (empno: number, empname: string, job: string, manager: number (self reference key), hiredate: date, salary: number, commision: number, deptno number(foreign key) )
Department (deptno: number, deptname: string, location: string )
SalaryGrade ( grade: number, LowSalary: number, highSalary: number)

i. Create the above tables by properly specifying the primary keys and the foreign keys
ii. Enter atleast ten tuples for each relation.

**Execute SQL queries for the following requirements :**

1. List details of employees who have joined before 30 Sep 81.
2. List employee names those who have joined between the months June to December of the year 1981.
3. List the name and designation of the employee who does not report to anybody.
   (i.e. doesn't have any managers)
4. List the names of employees whose names should have 'A' as the third character.
5. List the employees whose name should not start with letter 'A' and should not end with the letter 'A' but it should be there in the name other than First and Last character.
6. List the names of employees who have finished their 35 years of experience in the company.
7. List the employee name, salary, PF, HRA, DA and gross; order the results in the ascending order of gross. (PF is 10%, HRA is 50%, DA is 30% of the salary and

gross is sum of salary, PF, HRA & DA)
8. List the department name, number of employees, total_salary, average salary, maximum salary and minimum salary in each of the department.
9. List the total salary, maximum salary, minimum salary and average salary of the employees according to job wise.

**Practical – 6**

For the same previous database tables (i.e. Practical – 5)
Employee (empno: number, empname: string, job: string, manager: number (self reference key), hiredate: date, salary: number, commision: number, deptno number(foreign key) )
Department (deptno: number, deptname: string, location: string )
SalaryGrade ( grade: number, LowSalary: number, highSalary: number)

**Execute SQL queries for the following requirements :**
1. List details of the employees who have joined in the month of February.
2. List the employees having experience greater than 300 months.
3. List empno, empname, job, salary, deptname, and grade of the salary of all the employees except clerks.
4. List empno, empname, job, salary, deptname and grade of the salary with annual remuneration greater than 36000
5. Find the job that was filled in first half of 1981 and the same job that was filled during second half of 1981
6. Find all the employees who have joined the company before their managers
7. List departments for which no employees exist.
8. In which year did most people join the company. Display the year and no of employees
9. List the department in which highest number of employees is working

**WEB LINKS:**

1. https://itsourcecode.com/free-projects/database-design-projects/dbms-mini-project-topics-2019/
2. https://postgres.ai/docs
3. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php
4. https://projectabstracts.com/sql-database-projects-free-downloads-with-source-code-and-project-report
5. https://www.kashipara.com/project/full-list/download_project-source-code
6. https://www.freeprojectz.com/project-source-code-database-download/dbms-project

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Apply DDL commands to create database objects.
CO2. Apply DML commands in SQL and formulate SQL queries with varied criteria's.
CO3. Develop mini projects based on database related skills

# Web Technologies Lab

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3 | Credits | : | 1.5 |
| Total Lecture Hours | : - | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAL1 | | | |

## Course Objectives:

This Course will enable students to:

1. Analyze a web page and identify its elements and attributes.
2. Create web pages using XHTML and Cascading Style Sheets.
3. Apply the style for the web page using CSS3.
4. Build dynamic web pages using JavaScript (Client side programming).

1 Create an XHTML page that provides information about your department. Your XHTML page must use the following tags:
   a) Text Formatting tags
   b) Horizontal rule
   c) Links
   d) Images
   e) Tables (Use of additional tags encouraged).

2 Develop and demonstrate a HTML5 page which contains
   a) Canvas and SVG elements used to display rectangle, line and text
   b) Display Video File using HTML5 video tag.

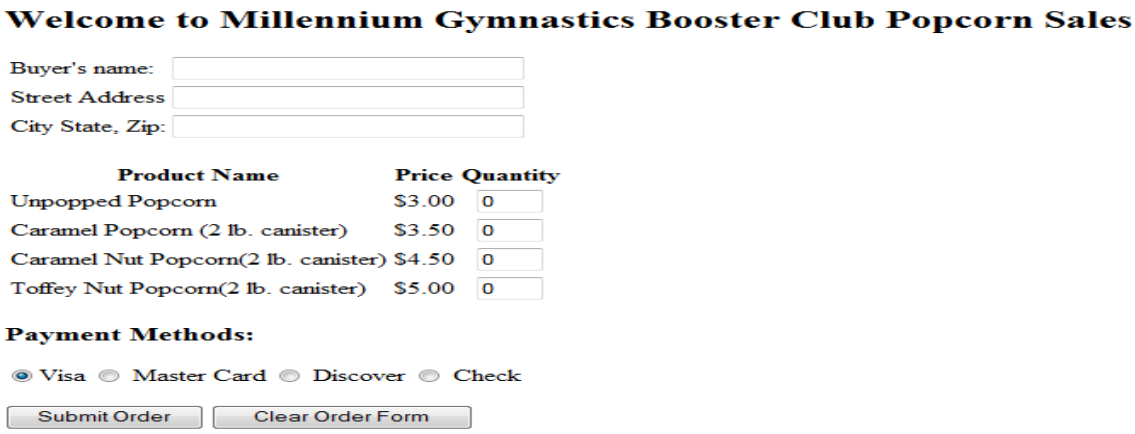
3 Develop an XHTML document to demonstrate the web storage object.
   a) Local Storage
   b) Session Storage

4 Develop and demonstrate the usage of inline, internal and external style sheet using CSS. Use XHTML page that contains at least three paragraphs of text, listed elements and a table with four rows and four columns.

5 Develop and demonstrate a XHTML file that includes Javascript script for the following problems:
   a) Input : A number n obtained using prompt Output : The first n Fibonacci numbers
   b) Input : A number n obtained using prompt Output : A table of numbers from 1 to n and their squares using alert

6 Write a JavaScript program to generate n number of random numbers and store them in an array. Sort the generated numbers in ascending order using array sort method. Develop separate functions to find mean and median of numbers that are in the array. Display the results with appropriate messages.

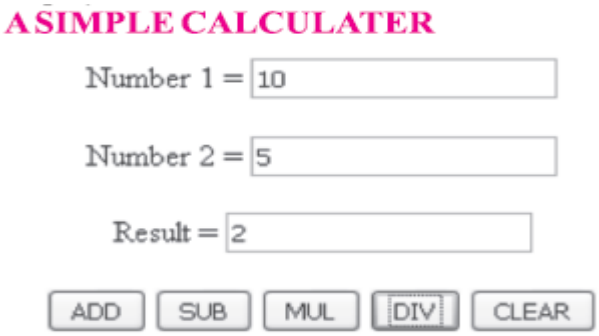
7 Create a XHTML document that describes the form for taking orders for popcorn. Text boxes are used at the top of the form to collect the buyer's name and address. These are placed in a borderless table to force the text box align vertically. A second table to collect actual order. Each row of this table names a product, displays the price, and uses text box with size 2 to collect the quantity ordered using tag. The payment method is input by the user through one of four radio buttons. Provide provision for submission of order and clear the order form. Sample form is as below




8 a)Develop and demonstrate, a HTML document that collects the USN(the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; (no embedded spaces are allowed) from the user. Use JavaScript that validate the content of the document. Suitable messages should be display in the alert if errors are detected in the input data. Use CSS and event handlers to make your document good looking and effective.

b) Modify the above program to get the current semester also(restricted to be a number from 1 to 4)

9 Develop a simple calculator to perform arithmetic (addition, subtraction, multiplication and division) operations on given two numbers. Use an html tag that allows the user to input two numbers and to display the result of arithmetic operation. Write suitable HTML, JavaScript and CSS to your simple calculator. The following figure show sample document display.




10 Develop and demonstrate a HTML file which includes JavaScript that uses functions for the following problems:

a. Parameter: A string Output: The position of the left-most vowel in the given string.
b. Parameter: A number Output: The number with its digits in the reverse order.

11 Develop and demonstrate using JavaScript, an XHTML document that uses an

a) onload event

b) onfocus event

**WEB LINKS:**

1. https://www.w3schools.com/html/html_examples.asp
2. https://www.geeksforgeeks.org/css-examples/
3. https://www.w3schools.com/js/js_examples.asp

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Apply the concept and usages web based programming techniques.

CO2. Develop XHTML documents using JavaScript and CSS.

CO3. Design and implement user interactive dynamic web based applications.

# Data Structures and Algorithm Lab

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 4 | Credits | : | 2.0 |
| Total Lecture Hours | : - | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMCAL3 | | | |

## Course Objectives:

This Course will enable students to:

1. Master the applications of Stack, its operations, and Queues using both static memory allocation and dynamic memory allocation
2. Design and develop Stack, types of Queues, types of linked list using memory allocation
3. Implement different nonlinear data structures : binary search tree using dynamic memory allocation
4. Implement Graph traversal methods such as Breadth First Search and Depth First Search
5. Design and implement various algorithms such as Prims' algorithm and Kruskal's algorithm and for minimum spanning tree.

Sl.no Questions

1. Develop C program to simulate basic operation of Stack using Array.
2. Develop C program for converting an Infix Expression to Postfix Expression.
3. Develop C program for evaluating Postfix Expression.
4. Develop C program to simulate basic operations of linear queue using Array
5. Write a program to simulate the working of a singly linked list providing the following operations:
   a. Insert at first position
   b. Delete first node
   c. Search a key
   d. Display
6. Write program in C to simulate working of ascending priority queue using
7. Write a C program to implement the following sorting algorithms using user defined functions: a. Bubble sort (Ascending order) b. Insertion sort (Descending order).
8. Write C program for implementing the operations in Binary tree.
9. Write C program to check whether a given graph is connected or not using DFS method
10. Write C program to check whether a given graph is connected or not using BFS method
11. Write C program to implement Prim's algorithm.
12. Write a c program to implement Kruskal's algorithm to find minimum spanning tree

**WEB LINKS:**

1. https://www.geeksforgeeks.org/
2. https://www.freecodecamp.org
3. https://nptel.ac.in/courses/106/102/106102064/
4. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
5. https://www.programiz.com/dsa

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Design and develop Linear data structures like Linked List, Stack, Queue using static and dynamic memory allocation technique and explore their applications.

CO2. Design and develop Non linear data structures like Trees and graphs using dynamic memory allocation technique.

CO2. Apply the knowledge of algorithms and data structures in various graph operations such as traversing, searching and finding minimum spanning trees for connected, weighted and non weighted graphs.

# Aptitude Related Analytical Skills

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : - | Credits | : | 1.0 |
| Total Lecture Hours | : 36 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 2TMC02 | | | |

## Course Objectives:

This Course will enable students to:

1. Understand various aptitude related concepts
2. Understand the verbal, puzzle and general aptitude related problems
3. Able to provide logic regaining and face Psychometric test

**Part- I**

| Sl. No. | Module covered | Duration (in hrs.) |
|---|---|---|
| 1 | General Aptitude & Puzzle | 10 |
| 2 | Verbal Reasoning | 3 |
| 3 | Logical Reasoning | 6 |
| 4 | Psychometric Tests | 2 |
| 5 | Company Specific Special Tests | 2 |
| 6 | Pre-training Assessments | 3 |
| 7 | Sample Test | 4 |
| 8 | Solving Model Test Papers – (Major Corporate Questions) | 5 |
| 9 | Tips to clear Aptitudes within time limits | 1 |
| **Total Course Duration** | | **36** |

**Modules Snap Shot**:

**1. General Aptitude:**

a) Number based problems
b) Algebra based
c) Time and work related
d) Questions based on train, boat, streams….
e) Interest calculations
f) Clocks and time calculations
g) Area and volume based (measurements)
h) Age calculation based
i) Profit, Loss and other formulae based
j) Percentage, mean, median, mode S.D.

**2. Puzzles**

**3. Verbal Reasoning:**

a) Grammar and words usage
b) Sentence completion and comprehension
c) Synonyms and antonyms

**4. Logical Reasoning:**

a) Odd man series

b) Data interpretation type
c) Problems based on relationship
d) Picture based logical questions
e) Complete the series kind
f) Other logical type

**5. Psychometric Test:**

a) Intelligence testing
b) Loyalty testing
c) Behavioral testing
d) Stress level test

**6. Company Specific Special Test:**

{Infosys – Puzzles, TCS – Critical reasoning, Google – Situational tests….
Major fresher recruiting company's special type of question will be discussed}

**7. Course Design:**

**REFERENCE**


| | |
|---|---|
| 1. | George Summers - Puzzles |
| 2. | R.S. Agarwal - Quantitative Aptitude |
| 3. | Baron's GRE 12th Edition |
| 4. | Shakuntala Devi – Puzzles |
| 5. | Quantitative Aptitude by Alok Chakraborty |
| 6. | Quantitative Aptitude by Abhijit Guha |


## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Demonstrate procedural fluency with real number arithmetic operations
CO2. Solve time and work related
CO3. Take charge of their own learning through good classroom habits
CO4. Demonstrate competence in the selection

# Machine Learning

| | | | |
|---|---|---|---|
| Contact Hours/Week | : 3+2(L+T) | Credits | : 04 |
| Total Lecture Hours | : 39 | CIE Marks | : 50 |
| Total Tutorial Hours | : 26 | SEE Marks | : 50 |
| Course Code | : 3TMCA01 | | |

## Course Objectives:

This Course will enable students to:

1. Introduce to the basic concepts of machine learning and Concept Learning.
2. Learn the elements of decision trees &Model Evaluation.
3. Understand the concept of artificial neural networks and instance based learning.
4. Understand the Bayesian classifiers.
5. Familiarize the concept of Evaluating Hypothesis, unsupervised learning.

**UNIT** – I 7 Hours

**Introduction:** Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

**Concept Learning:** A Concept learning task, Concept learning as search, Find-S: Finding a maximally specific hypothesis, Version spaces and the Candidate Elimination algorithm, Inductive Bias.

**UNIT** – II 8 Hours

**Decision Tree Learning:** Decision tree representation, Appropriate problems for decision tree learning, The Basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

**Model Evaluation:**Metrics for evaluating Classifier Performance, Holdout method & Random Subsampling, Cross-Validation, Bootstrap.

**UNIT** – III 8 Hours

**Instance based Learning**: Introduction, k-nearest neighbor learning, case-based reasoning.

**Artificial Neural Networks:** Introduction, Neural Network representations, Appropriate problems for Neural network Learning, Perceptrons, Multilayer Networks and the backpropogation algorithm.

**UNIT** – IV 8 Hours

**Bayesian Learning:** Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypotheses, ML hypotheses for predicting probabilities, MDL principle, Naïve Bayes classier, Bayesian belief networks, The EM algorithm

**UNIT** – V 8 Hours

**Evaluating Hypothesis:** Motivation, Estimating hypothesis accuracy, Basics of sampling theory, A General approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

**Unsupervised Learning:** Cluster analysis: What is Cluster analysis?, Requirements for Cluster analysis, Partitioning Methods: k-Means, Hierarchical Methods: Agglomerative vs Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods

**TEXT BOOK:**

1. Tom M Mitchell , Machine Learning, McGraw Hill Education (India) Edition 2013. (Sections: 1.1 to 1.3, 2.2 to 2.5, 2.7, 3.2 to 3.7, 4.1 to 4.5, 6.1 to 6.6, 6.9,6.11,6.12, 5.1 to 5.6, 8.1 to 8.5)
2. Jiawei Han, MK, JP, Data mining, Concepts & Techniques, 3rd Edition, MK. (Sections: 8.5, 8.5.1,8.5.2,8.5.3,8.5.4,10.1, 10.1.1, 10.1.2, 10.2, 10.2.1, 10.3, 10.3.1, 10.3.2)

**REFERENCE BOOKS:**

1. EthemAlpaydin, Introduction to Machine Learning, 3rdEdition, EEE, MIT Press, 2018.
2. Trevor Hastie, Robert Tibshiran, J. H. Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition (Springer Series in Statistics), 19 April 2017.
3. V.Susheela Devi, M.Narasimha Murthy, Pattern Recognition: An Introduction, Universities Press.

**WEB LINKS:**

1. https://www.kaggle.com/
2. https://machinelearningmastery.com/
3. https://www.tensorflow.org/
4. https://www.youtube.com/?gl=IN&tab=w1
5. https://ai.google/
6. http://ndl.iitkgp.ac.in/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. ***Interpret*** basics of machine learning and apply concept learning algorithm for real world problems.

CO2. ***Perform*** classification/labeling of data objects using concepts of decision tree learning and ***investigate*** instant based learning.

CO3. ***Interpret*** and ***apply*** the concept of neural networks for learning linear and non-linear functions.

CO4. ***Apply*** Bayesian techniques and derive effectively learning rules for real world problems.

CO5. ***Evaluate*** hypothesis and ***investigate*** unsupervised learning to apply it for real world applications.

# MOBILE APPLICATIONS

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+2(L+T) | Credits | : | 4.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : 26 | SEE Marks | : | 50 |
| Course Code | : 3TMCA02 | | | |

## Course Objectives:

This Course will enable students to:

1. Learn to setup Android application development environment
2. Illustrate user interfaces for interacting with apps and triggering actions
3. Interpret tasks used in handling multiple activities.
4. Identify options to save persistent application data
5. Appraise the role of security and performance in Android applications

**UNIT** – I 8 Hours

**Introduction**

Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in the Business World – Effective use of Screen Real Estate

**Understanding Mobile Applications**

Understanding Mobile Applications Users – Understanding Mobile Information Design – Understanding Mobile Platforms – Using the Tools of Mobile Interface Design.

**UNIT** – II 8 Hours

**Getting Started with Android Programming**

What is Android – Obtaining the required tools– Anatomy of an Android Application – Components of Android Applications – Activities – Fragments – Utilizing the Action Bar

**UNIT** – III 8 Hours

**Android UI Design and Location Based Services**

Views and View Groups – Basic Views – Fragments – Displaying Maps – Getting Location Data – Publishing for Publishing – Deploying APK Files

**UNIT** – IV 8 Hours

**Android Messaging and Networking**

SMS Messaging – Sending Email – Networking – Downloading Binary Data, Text files – Accessing Web Services – Performing Asynchronous Call – Creating your own services – Communicating between a service and an activity – Binding activities to services

**UNIT** – V 8 Hours

**Feedback and Oscillator Circuits**

iOS – Obtaining the tools and SDK – Components of XCODE – Architecture of iOS Building Derby App in iOS – Other useful iOS things – Windows Phone: Getting the tools you need – Windows Phone 7 Project – Building Derby App in Windows Phone 7 – Distribution – Other useful Windows Phone Thing

**TEXT BOOK:**

1. Jeff McWherter and Scott Gowell, “Professional Mobile Application Development”, 1st Edition, 2012, *ISBN*: 978-1-118-20390-3
2. Wei-Meng Lee, “Beginning Android Application Development”, Wiley 2011

**REFERENCE BOOKS:**

1. Reto Meier “Professional Android 4 Application Development”, Wrox Publications2012

**WEB LINKS:**

1. https://www.youtube.com/watch?v=giVfVQlKBVM
2. https://www.youtube.com/watch?v=aS__9RbCyHg
3. https://www.tutorialspoint.com/android/index.htm
4. https://developer.android.com/codelabs/build-your-first-android-app#0
5. https://www.geeksforgeeks.org/android-tutorial/
6. https://www.tutlane.com/tutorial/android
7. https://www.w3schools.in/category/android-tutorial/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Illustrate effective user interfaces that leverage evolving mobile device capabilities

CO2. Develop applications using software development kits (SDKs), frameworks and toolkits.

CO3. Establish various views methods involved to design app, API in getting map, its location and presenting the apps to the users.

CO4. Design and develop an application with synchronizing the real time applications like SMS, Email, etc and services

CO5. Build and deploy competent mobile application development solutions on various cross platforms.

# Professional Web Development

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+2(L+T) | Credits | : | 4.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : 26 | SEE Marks | : | 50 |
| Course Code | : 3TMCA03 | | | |

## Course Objectives:

This Course will enable students to:

1. Interpretation of the elements and its usage with Java Collection Framework elements .
2. Implement and deploy web WSDL and SOAP services across clients and servers.
3. Development of user interface applications using dynamic and interactive AngularJs
4. Implementation of RESTful API to protect systems from online frauds using Spring Boot Framework.
5. Build, configure and develop flexible web based Java enterprise applications using Spring Framework.

**UNIT** – I 8 Hours

**Java Collection Framework**:

The Collections Framework: Collections overview, Recent changes to Collections, The Collection Interfaces, Java Collection API and framework, Collection Interface, List interface, Set interface, Queue interface, The Collection classes: ArrayList class, List, ArrayList, Queue, LinkedList class ,HashSet class, TreeSet class, Accessing a Collection via an Iterator,Using an iterator,The For-Each alternative to iterators, User defined classes

**UNIT** – II 7 Hours

**WSDL** :Web Services Description Languages Inside WSDL, The WSDL document Type Element, Message Element, Port Type Element, Binding Element, Port Element, Service element.

**Simple Object Access Protocol(SOAP)**: SOAP one-way transmission primitive, SOAP request-response transmission primitive, SOAP binding element, SOAP operation element, SOAP body element, SOAP fault element, SOAP header element, SOAP address element, WSDL and HTTP binding

**UNIT** – III 8 Hours

**AngularJS Framework** : Evolution, Building blocks, Dependency injection, Setting up The AngularJS development environment, Writing first application, Angular Basics: Components, code listing for to-do list application, interpolation, Templating and styling, Property binding, Event binding, Wire frames

**UNIT** – IV 8 Hours

**REST API:** Introduction to RESTful web services, , RESTful key elements, RESTful methods, RESTful Architecture, RESTful principles and constraints, creating a first RESTful web service, Running and testing first RESTful web service, Exposing a REST API: RESTful, Spring Data within Spring Application

**UNIT** – V 8 Hours

**Spring Framework**: Basics of Spring architecture, environment setup, Inversion Of Control containers, First Spring Application, Spring Dependency Injection, Applying different configurations: Using XML configuration

**Spring Boot:** Pre requirements, Spring Boot, Running Spring Boot application, working with classes and dependencies, Spring Boot-Tomcat Deployment. Spring Boot servlet initializer, Update packaging JAR into WAR.

**TEXT BOOK:**


1. Jim Keogh,The Complete Reference JAVA, 7th Edition, Tata McGraw Hill. ISBN: 978-0-07-163177-8 ( Unit-1 : PageNos: 440-446, 448-456, 458-463)
2. Herbert Schildt The Complete Reference J2EE,Tata McgrawHill, ISBN: 978-0-07-052912-0 for Unit-5: Page Nos: 684-700 )
3. Web Development with go, Building scalable web Apps and RESTful ServicesShiju Varghese, Apress. ISBN-13 (pbk): 978-1-4842-1053-6
4. Felipe Gutierrez: Spring Framework , Apress Edition, ISBN:9781430265337, 2014
5. SridharRao : Web Development with Angular and Bootstrap, 3rd Edition, Packt, ISBN: 978-1-78883-810-8


**REFERENCE BOOKS:**


1. RESTful API Design, Matthias Biehl,API University Press,
2. Spring in Action, ISBN-13: 978-1617294945
3. ANGULAR , Lakshmi Kamala Thota, ISBN: 9789389932072, 9789389932072


**WEB LINKS:**

1. https://www.geeksforgeeks.org/collections-in-java-2/
2. https://www.soapui.org/
3. https://angular.io and https://angularjs.org
4. https://restfulapi.net
5. https://spring.io and https://getbootstrap.com
6. https://www.geeksforgeeks.org/collections-in-java-2/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Interpret the elements and its usage with Java Collection Framework elements.

CO2. Implement and deploy web WSDL and SOAP services across clients and servers.

CO3. Develop user interface applications using dynamic and interactive AngularJs.

CO4. Implement RESTful API to protect systems from online frauds using Spring Boot Framework.

CO5. Design and develop flexible web based Java enterprise applications using Spring Framework.

# Big Data

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+2(L+T) | Credits | : | 4.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : 26 | SEE Marks | : | 50 |
| Course Code | : 3TMCA04 | | | |

## Course Objectives:

This Course will enable students to:

1. Understand basics of Big Data, its elements, its analytics , its usage in business context, computing in big data etc
2. Understand modern tools of Hadoop Ecosystem to the solution of various problems in storage , processing , accessing , managing and analyzing the big data
3. Understand the different layers of Big Data Stack architecture in effective analysis of big data and analyze the merits of using modern Data Warehouses against the limitations of traditional Databases
4. Understand Map Reduce programs and requirement of Yarn Architecture.
5. Understand the requirements of NO SQL and need of Hive tools.

**UNIT** – I 8 Hours

Getting an Overview of Big Data: What is Big Data? History of Data, Management – Evolution of Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Volume, Velocity, Variety, Veracity, Careers in Big data, Future of Big Data.

Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, How data models and computing models are different, Introducing Hadoop, HDFS and MapReduce, How does Hadoop Function? Cloud Computing and Big Data, Cloud Services for Big Data, In-Memory Computing Technology for Big Data

**UNIT** – II 7 Hours

Understanding Hadoop Ecosystem: Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, Concepts of Blocks in HDFS Architecture, Name Nodes and Data Nodes, Features of HDFS, MapReduce, Hadoop Yarn, Introducing HBase, HBase Architecture, Regions, Storing Bigdata with HBase, Interacting with the Hadoop Ecosystem, HBase in Operation – Programming with HBase, Combining HBase and HDFS, REST and Thrift, Data Integrity in HDFS, Features of HBase ,hive, Pig and Pig Latin, Sqoop, Zookeeper, Flume, Oozie

Understanding Big Data Technology Foundations:

Exploring the Big Data Stack, Data Sources Layer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer, Security Layer, Monitoring Layer, Analytics Engine, Visualization Layer, Big Data Applications, Virtualization and Big Data, Virtualization Approaches, Server virtualization, Application Virtualization, Network Virtualization, Processor and Memory Virtualization, Data and Storage Virtualization, Managing Virtualization with Hypervisor.

**UNIT** – III 8 Hours

Understanding MapReduce Fundamentals and HBase: The MapReduce Framework. Exploring the Features of MapReduce. Working of MapReduce. Exploring Map and Reduce Functions. Techniques to Optimize MapReduce Jobs. Hardware/Network Topology, Synchronization, File System. Uses of MapReduce. Role of HBase in Big Data Processing. Characteristics of HBase. Understand Hadoop YARN Architecture: Limitations of MapReduce, Advantages of YARN, YARN architecture : Resource manager, application manager , Integration of Resource Manager and Application Manager. Working of YARN. YARN schedulers: Capacity and Fail Scheduler. Backward compatibility with YARN

**UNIT** – IV 9 Hours

**Exploring Hive:** Introducing Hive, Getting Started with Hive, Hive services, Variables, Properties, Queries, Data Types in Hive, Built-In Functions in Hive, Hive DDL, Creating, Viewing, Dropping, Altering Databases, Creating Tables using the existing Schema, Dropping, Altering tables, Using DDL Statements, Data Manipulation Loading Files into Tables, Inserting Data into Tables, Update, Delete, Using Hive DML Statements, Data Retrieval Queries using the SELECT Command, WHERE Clause, GROUP BY Clause, HAVING Clause, LIMIT Clause, Executing HiveQL Queries, Using JOINS, Inner Joins, Outer Joins, Cartesian Product Joins, Map-Side Joins, Joining Tables

**UNIT** – V 7 Hours

**NoSQL:** Introduction to NoSQL, why NoSQL, Characteristics of NoSQL. Types of NoSQL models: key value Data model, Column-oriented data model, document data model, graph databases. Schema less database, materialized views, Distributed models: CAP theorem. Sharding.

**TEXT BOOK:**

1. BIG DATA Black Book ,D T Editorial Services, Dreamtech press 2016 Edition
2. "Hadoop – The Definitive Guide; Storage and Analysis at Internet scale", Tom White, 4th Edition, 2015, O'Reilly, Shroff Publishers & Distributers Pvt. Ltd., ISBN – 978-93-5213-067-2

**REFERENCE BOOKS:**

1. Big Data, Anil Maheswari, Mc Graw Hill
2. NoSQL For Mere Mortals, Dan Sullivan, Addison Wisley Pearson
3. ShashankTiwari, "Professional NOSQL", John Wiley India Pvt. Ltd., 2011

**WEB LINKS:**

1. https://nptel.ac.in/courses/106/104/106104189/
2. https://www.coursera.org/learn/Big data

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. **Apply** the basic knowledge related to Big Data, its elements, its usage in business context, computing in big data etc. to the solution of complex real-world engineering problems.

CO2. **Select and apply** appropriate modern tools of Hadoop Ecosystem to the solution of various problems in storage, processing, accessing, managing and analyzing the big data

CO3. Identify the importance of the different layers of Big Data Stack architecture in effective analysis of big data and analyze the merits of using modern Data Warehouses against the limitations of traditional Databases

CO4. Design and develop MapReduce programs to the solution of various Real world application problems; identify the requirement of Yarn Architecture.

CO5. I**dentify** the requirements of NO SQL; need of Hive tools for Big Data access and monitoring.

# Software Testing

| | | | | | |
|---|---|---|---|---|---|
| Contact Hours/Week | : | 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : | 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : | - | SEE Marks | : | 50 |
| Course Code | : | 3TMCAE41 | | | |

## Course Objectives:

This Course will enable students to:

1. Understand the principles of testing.
2. Identify the need for testing.
3. Identify testing process.
4. Describe various types of test and their objectives.
5. Identify the types of tests to be conducted on applications.

**UNIT** – I 8 Hours

Introduction to testing as an engineering activity, The evolving profession of software engineering, the role of process in software quality, testing as a process.
Testing fundamentals: Initiating a study of testing, basic definitions, why testing is necessary? What is testing? The psychology of testing? Software quality assurance group, software-testing principles, The Tester's Role in a Software Development Organization.

**UNIT** – II 10 Hours

The Test Development Life Cycle (TDLC), when should testing stop?; Verification strategies; review, walkthrough, inspectionTesting types and techniques; white box testing: basis path testing, flow graph notation, cyclomatic complexity, graph matrices, loop testing Black box testing: boundary value analysis, equivalence partitioning, graph based testing methods, error guessing.

**UNIT** – III 10 Hours

Levels of testing; The Need for Levels of Testing, Unit Test, Unit Test Planning, Designing the Unit Tests. The Class as a Testable Unit, Running the Unit tests and Recording results, Integration tests, Designing Integration Tests, Integration Test Planning, System Test – The Different Types, Regression Testing, Alpha, Beta and Acceptance Tests, Web testing: Introduction to web testing, web testing process and techniques, cross browser testing, web browser error messages, Performance testing

**UNIT** – IV 7 Hours

Test planning: what is test plan; why to plan test? Template for test plan; guidelines for creating the test plan; risk analysis Test design: importance; test design essentials; good test case; test case mistakes; test case template; test design stages; Software Testing Metrics: Why Test Metrics are Important?: Types of Test Metrics Manual Test Metrics; Test Metrics Life Cycle;How to calculate Test Metric;Test Strategy;Test Plan Vs Test Strategy

**UNIT** – V 6 Hours

Test execution: Objectives; execution considerations; execution activities
Defect management: what is defect; defect life cycle; defect management process

**TEXT BOOK:**

1. Ilene Burnstein, "Practical Software Testing", Springer international edition.(Unit-I)
2. Foundations of Software Testing ISTQB certification (Level I) by Dorothy graham, Erik van veenendaal, Rex black.

**REFERENCE BOOKS:**

1. Boris Beizer, "Software System Testing And Quality Assurance", vannostrandreinhold , newyork
2. Gordon schulmeyer , "Zero Defect Software" , McGraw –hill book co
3. Watts Humphrey, "Managing the Software Process", Addison weselypub.co.inc.

**WEB LINKS:**

1. https://www.coursera.org/specializations/software-testing-automation
2. https://www.udemy.com/course/everything-for-software-tester/
3. https://www.udacity.com/course/software-testing--cs258
4. https://www.greatlearning.in/academy/learn-for-free/courses/software-testing-fundamentals1
5. https://www.guru99.com/software-testing.html
6. https://testinginstitute.com/Free-Software-Testing-Training.php
7. https://onlinecourses.nptel.ac.in/noc19_cs71/preview

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Identify the need and the importance of software testing as an engineering activity
CO2. Interpret the concept of testing using different types of testing and testing techniques.
CO3. Identify the different levels of testing.
CO4. Exemplify how to write the test plan and test cases.
CO5. Interpret the defect management process

**Assignment Component:**

Students should submit a test plan document for the mini project will be awarded with 4 marks.

# Software Project Management

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAE42 | | | |

## Course Objectives:

This Course will enable students to:

1. Deliver successful software projects that support organization's strategic goals.
2. Match organizational needs to the most effective software development model
3. Plan and manage projects at each stage of the software development life cycle (SDLC)
4. Create project plans that address real-world management challenges
5. Develop the skills for tracking and controlling software deliverables

**UNIT** – I 8 Hours

**Introduction to Project Management**

Importance of software project management: What is a project? Problems with Software Projects What are Project Management? Stages of Project. The Feasibility Study Planning. Project Execution. The Stakeholder of Project. All parties of project. The Role of Project Manager. Project Management Framework.

Project Planning

**Integration Management**. what is Integration Management. Project Plan Development. Plan Execution. Scope Management. what is Scope Management?. Methods for Selecting Projects. Project Charter. Scope Statement. Work Breakdown Structure. Stepwise Project Planning Overview. Main Steps in Project Planning.

**UNIT** – II 9 Hours

**Project Scheduling**

Time Management. Importance of Project Schedules. Schedules and Activities. Sequencing and Scheduling Activity. Project Network Diagrams. Network Planning Models. Duration Estimating and Schedule Development. Critical Path Analysis. Program Evaluation and Review Technique (PERT).

**Project Cost Management**

Importance and Principles of Project Cost Management. Resource Planning. Cost Estimating. Types of Cost Estimates. Expert Judgment. Estimating by Analogy. COCOMO Model. Cost Budgeting. Cost Control.

**UNIT** – III 8 Hours

**Project Quality Management**

Quality of Information Technology Projects. Stages of Software Quality Management Quality Planning. Quality Assurance. Quality Control. Quality Standards. Tools and Techniques For Quality Control.

**Project Human Resources Management**

What is Project Human Resources Management?. Keys to Managing People.
Organizational Planning. Issues in Project Staff Acquisition and Team Development.

**UNIT** – IV 7 Hours

**Project Communication Management**

Communications Planning. Information Distribution. Performance Reporting. Administrative Closure. Suggestions for Improving Project Communications.

**UNIT** – V 8 Hours

**Project Procurement Management** Importance of Project Procurement Management. Procurement Planning. Solicitation. Source Selection. Contract Administration. Contract Close-out.

**TEXT BOOK:**

1. Kathy Schwalbe, “Information Technology Project Management”,International Student Edition, THOMSON Course Technology, 2003

2. Bob Hughes and Mike Cotterell, “Software Project Management”, Third Edition, Tata McGraw-Hill.

**REFERENCE BOOKS:**

1. Basics of Software Project Management, NIIT, Prentice-Hall India, 2004.
2. PankajJalote, Software Project Management in Practice, Pearson Ed., 2002.
3. S.A. Kelkar, Software Project Management, a Concise Study, Revised Edition, Prentice-Hall India, 2003

**WEB LINKS:**

1. https://www.youtube.com/watch?v=yztebYOfsHo
2. https://www.pmi.org/learning/library/software-project-management-method-a3-8982
3. https://www.smartzworld.com/notes/software-project-management-pdf-notes-spm-pdf-notes/
4. https://www.manage.gov.in/studymaterial/PM.pdf
5. https://www.youtube.com/watch?v=yztebYOfsHo

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Recognize the practices and methods for successful software project management
CO2. Apply the evaluation techniques for estimating cost, benefits, schedule and risk
CO3. Identify techniques for requirements, policies and decision making for effective resource management and project quality
CO4. Devise a framework to manage project communication and project reporting
CO5. Develop strategies for software project management plan for activities, risk, monitoring, control and procurement management

# System Simulation and Modeling

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAE43 | | | |

## Course Objectives:

This Course will enable students to:

1. Judge whether simulation can be a useful both an analysis tool for predicting the effects of Changes to existing systems.
2. Identify the major capabilities and limitations of discrete-event simulation for modeling types of systems.
3. Define a simulation model for a practical business scenario.
4. Describe the generation of random number, input modeling, output analysis and comparison of alternative system

**UNIT** – I 7 Hours

When Simulation is the appropriate and not appropriate tool, 4 phases and 12-Steps in a simulation study. Advantages & Disadvantages of Simulation. Areas of application of simulation, Systems and System Environment, Components of a System, Discrete and Continuous Systems, Model of a System, Types of Models, Discrete – Event System Simulation, Steps in a Simulation Study, Queuing Models: Characteristics of Queuing systems, Queuing notations; Examples.

**UNIT** – II 8 Hours

Simulation Examples, Simulation of Queuing Systems, Simulation of Inventory Systems, The Event – Scheduling / Time – Advance Algorithm, World Views , Manual simulation using Event Scheduling, List processing

**UNIT** – III 8 Hours

Properties of Random numbers, Generation of Pseudo-random Numbers, Techniques for generating random Numbers, Tests for random Numbers Frequency Test , Runs Test, Tests for Autocorrelation, Gap Test , Poker Test, Random Variate Generation: Inverse Transform Technique, Exponential Distribution, Uniform Distribution, Acceptance-Rejection technique, Poisson Distribution

**UNIT** – IV 9 Hours

Data Collection, Identifying the distribution with data Histograms, Parameter Estimation Preliminary Statistics, Examples: sample Mean and Sample Variance, Goodness of Fit test : Chi-Square Test, Kolmogorov-Smirnov Goodness-of-Fit Test : Examples, Selecting Input Models without data, Multivariate and Time-Series Input Models

**UNIT** – V 7 Hours

Introduction Model Building, Verification and validation, Verification of simulation Models, Calibration and validation of models, Face validity and validation of model assumptions, Input – output validation: using historical input data and turning test, Output Analysis for a single model : Types of Simulations with respect to Output Analysis, Stochastic Nature of Output data, measure of performance and Estimation, Examples for performance estimation, Output analysis for Terminating Simulation, Output analysis for Steady-state simulations

**TEXT BOOK:**

1. Jerry Banks , John S Carson , Barry L Nelson , David M Nicol " Discreate-Event System Simulation", 4th Edition, Prentice-Hall India

**REFERENCE BOOKS:**

1. Lawrence M. Leemis , Stephen K. park : Dscreate – Event Simulation : A First Cource , Pearson Prentice-Hall, 2006
2. Averill M Law, W David Kelton , “Simulation Modeling and Analysis”, 4th Edition, McGraw - Hill. 2007

**WEB LINKS:**

1. https://www.youtube.com/playlist?list=PLPTjP-gx7TM8n9SUdp0tt1m788LfOpo9u
2. https://www.youtube.com/watch?v=Wp3jyLkfBQs
3. https://nptel.ac.in/courses/112/107/112107220/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Interpret the basic concepts in modeling and simulation.
CO2. Classify various simulation models and give practical examples for each category.
CO3. Explore the effects of randomness on system behaviour and performance.
CO4. Generate and test random numbers and variants and apply them to develop simulation Models
CO5. Analyse the knowledge input modeling, verification, validation, calibration and performance estimation of existing simulation models.

# Soft Computing Techniques

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAE44 | | | |

## Course Objectives:

This Course will enable students to:

1. Develop the skills to gain a basic understanding of neural network theory
2. Develop the skills to gain basic understanding of fuzzy logic theory
3. Develop the skills to gain basic understanding of Evolutionary computing using genetic algorithm.

**UNIT** – I 8 Hours

**Artificial Neural Network**

Fundamental Concept – Artificial Neural Network, Biological Neural Network, Brain Vs Computer; Important Terminologies of ANNs – Weights, Bias, Threshold, learning rate, Momentum Factor, Vigilance Parameter, Notations; Back Propagation Network- Theory, Architecture, Flow chart for Training Process, Training Algorithm, Learning Factors of Back Propagation Network, Testing Algorithm of Back Propagation Network

**UNIT** – II 8 Hours

**Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets**

Introduction to Fuzzy Logic, Classical Sets – Operators on classical sets, Fuzzy Sets- Fuzzy Set Operations, properties of Fuzzy Sets

**Classical Relations and Fuzzy Relations**

Introduction, Cartesian product of Relation, Classical Relation – Cardinality of Classical Relation, Operations on Classical Relations, Properties of Crisp Relations, Composition of Classical Relations; Fuzzy Relations - Cardinality of Fuzzy Relation, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Composition

**UNIT** – III 8 Hours

**Member Functions**

Introduction, Features of the Membership Functions, Fuzzification, Methods of Membership Value Assignments – Intuition, Inference, Rank Ordering, Angular Fuzzy Sets, Neural Networks, Genetic Algorithms, Induction Reasoning

**UNIT** – IV 7 Hours

**Defuzzification**

Lambda-Cuts for Fuzzy Sets, Lambda-Cuts for Fuzzy Relations, Defuzzification Methods – Max-Membership Principle, Centroid Method, Weighted Average Method, Mean-Max Membership, Centre of Sums, Centre of Largest Area, First of maxima

**UNIT** – V 8 Hours

**Genetic Algorithms**

Traditional Optimization and Search Techniques, Genetic Algorithm and Search Space, Basic Terminologies in Genetic Algorithm – Individuals, Genes, Fitness, Populations; Operators : Crossover, Mutation, Reproduction in Genetic Algorithm , Convergence of Genetic Algorithm Flow

**TEXT BOOK:**

1. Soft Computing, S. N. Sivanandam, S. N. Deepa, 2nd Edition, 2015, Wiley Publishers, ISBN –978-81-265-2741-0

**REFERENCE BOOKS:**

1. Neural Networks, Fuzzy Logic and Genetic alrithmsSyntesis and Applciations, S Rajashekaran, GA VijayalakshmiPai, PHI Publications,, ISBN: 978-81-203-2186-1
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, III edition, John Wiley &amp Sons, 2015.
3. Soft Computing Advances and Applications, B. K. Tripathi, J. Anuradha, 2015, Cengage Learning India Pvt Ltd, ISBN-13: 978-81-315-2619-4, ISBN-10: 81-315-2619-4
4. Pattern Recognition and Image Analysis, Earl Gose, Richard JohnsonBaugh, Steve Jost, Pearson, ISBN: 978-93-325-4979-1

**WEB LINKS:**

1. https://nptel.ac.in/courses/106/105/106105173/#
2. https://nptel.ac.in/courses/127/105/127105006/
3. https://www.tutorialspoint.com/fuzzy_logic/index.htm
4. https://www.tutorialspoint.com/artificial_neural_network/index.htm
5. https://www.tutorialspoint.com/genetic_algorithms/index.htm

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Design and Analyze the fundamental theory and concepts of neural networks, Identify different neural network architectures, appropriate learning rules for each of the architectures

CO2. Analyze concepts of fuzziness involved in various systems , fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic

CO3. Analyze working of evolutionary computing using genetic algorithms

# Entrepreneurship and IPR

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAE45 | | | |

## Course Objectives:

This Course will enable students to:

1. Describe the role of Entrepreneur and Entrepreneurship.
2. Discuss the Women Entrepreneurship & various Start-ups: Micro and Small Enterprises.
3. Illustrate the Opportunity Identification, Selection and Forms of Business Ownership.
4. Discuss the support of Institutional Finance to Entrepreneurs and Institutional Support to Entrepreneurs.
5. Understand the Intellectual Property (IP) Acts, Copy Right Act/ Patent Act/ Cyber Law/Trademark.

**UNIT** – I 7 Hours

**Entrepreneur:** Introduction, Evolution of the Concept of Entrepreneur, Characteristics of successful Entrepreneurs, The charm of becoming an Entrepreneur, TheEntrepreneurial Decision Process, Functions of Entrepreneur, Need for an Entrepreneur, Types of Entrepreneurs.

**Entrepreneurship:** Concept of Entrepreneurship, Growth of Entrepreneurship in India,Role of Entrepreneurship in Economic Development

**UNIT** – II 8 Hours

**Women Entrepreneurship:** Concept of Women Entrepreneur, Functions of Women Entrepreneurs, Problems of Women Entrepreneurs, Developing Women Entrepreneurship, Limitations of Women Entrepreneurship.

**START-UP: Micro and Small Enterprises:** Small Enterprises: Meaning and Definition, Micro and Macro units, Essentials, features and characteristics, relationship between Micro and Macro Enterprises, Role of Micro Enterprises in Economic Development, Package for Promotion of Micro and Small – Scale Enterprises, Problems of Micro and Small Enterprises.

**UNIT** – III 8 Hours

**Opportunity Identification and Selection**: Need for opportunity Identification and Selection, Environmental Dynamics and Change, Business Opportunities in Various Sectors, Identification of Business Opportunity: Idea Generation, Opportunity/Product Identification, Opportunity Selection, Steps in setting up of a small Business Enterprise.

**Forms of Business Ownership**: Sole Proprietorship, Partnership, Company, Cooperative, Selection of an Appropriate form of Ownership Structure, Ownership Pattern in Micro – Scale Enterprises in India: The Empirial Evidence.

**UNIT** – IV 8 Hours

**SUPPORT: Institutional Finance to Entrepreneurs:** Need for Institutional Finance, Institutional Finance: Commercial Banks, Other Financial Institutions.

**Institutional Support to Entrepreneurs:** Need for Institutional Support, Institutional Support to small Entrepreneurs: National Small Industries Corporation Ltd (NSIC),Small Industries Development Organization (SIDO), Small Scale Industries Board(SSIB). State Small Industries Development Corporations (SSID), District Industries Centers (DICs), Industrial Estates, Specialized Institutions, Technical Consultancy Organizations (TCOs).

**UNIT** – V 8 Hours

**Intellectual Property (IP) Acts:** Introduction to IP: Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Introduction to Cyber law – Innovations & Inventions Trade related Intellectual Property Right. Patent Acts: Indian patent acts 1970. Design Act: Industrial design act 2000. Introduction to Copyrights-Principles of Copyright principles. The subjects Matter of Copy right – The Rights Afforded by Copyright law-Copyright Ownership. Copy right acts: Copyright Act 1957. Introduction to Trade secret – Maintaining Trade secret, Trade mark Act, 1999.

**TEXT BOOK:**

1. Dr. S. S. Khanka: Entrepreneurial Development, Revised Edition, S Chand & Co.
2. Debirag E Bouchoux: "Intellectual Property". Cengage learning, New Delhi
3. M Ashok Kumar and Mohd.Iqbal Ali: "Intellectual Property Right" Serials Pub.

**REFERENCE BOOKS:**

1. Charantimath P M, Entrepreneurship Development and Small Business Management, Pearson Education.
2. Cyber Law, Texts & Cases, South-Western's Special Topics Collections.

**WEB LINKS:**

1. https://byjus.com/commerce/what-is-entrepreneurship/
2. https://harappa.education/harappa-diaries/meaning-examples-and-role-of-entrepreneurship/
3. https://www.econlib.org/library/Enc/Entrepreneurship.html
4. https://www.itu.int/en/ITU-T/ipr/Pages/default.aspx
5. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/intellectual-property-rights

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Identify how to become a successful Entrepreneur by considering the growth of Entrepreneurship in India.
CO2. Recognize the concept of Women Entrepreneurship and Micro/Small Enterprise.
CO3. Recognize the steps in setting up of a small Business Enterprise and the Forms of Business Ownership.
CO4. Exemplify how to get Finance to Entrepreneurs and the Institutional Support to Entrepreneurs.
CO5. Apply some concepts/sections of Copy Right Act/ Patent Act/ Cyber Law/Trademark to the given case & develop conclusions.

# Augmented Virtual Reality

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAE51 | | | |

## Course Objectives:

This Course will enable students to:

1. Gain the knowledge of Virtual Reality concepts and its implication
2. Understand the Input-Output interactions in Virtual Reality
3. Understand role of Computer Graphics in Virtual reality
4. Gain the knowledge of Architecture of Augmented Reality

**UNIT** – I 8 Hours

Introduction to Virtual Reality Fundamental Concept and Components of Virtual Reality, Primary Features and Present Development on Virtual Reality, Multiple Modals of Input and Output Interface in Virtual Reality

**UNIT** – II 8 Hours

Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based 3D Menus & 3D Scanner etc; Output -- Visual /Auditory / Haptic Devices.

**UNIT** – III 8 Hours

Visual Computation in Virtual Reality (1) Fundamentals of Computer Graphics; Real time rendering technology; Principles of Stereoscopic Display; Software and Hardware Technology on Stereoscopic Display

**UNIT** – IV 7 Hours

Environment Modeling in Virtual Reality Geometric Modeling; behavior Simulation; Principles of touch feedback and force feedback;

**UNIT** – V 8 Hours

Augmented Reality System Structure of Augmented Reality; Key Technology in AR; General solution for calculating geometric & illumination consistency in the augmented environment

**TEXT BOOK:**

1. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
2. Donald Hearn and Pauline Baker, “Computer Graphics C Version”, Pearson Education, 2002.
3. Edward Angel, “Interactive Computer Graphics: A Top-Down Approach Using OpenGL”, Addison-Wesley, 2009.

**REFERENCE BOOKS:**

1. Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann, 2002.
2. Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
3. Guangran LIU. Virtual Reality Technology, Tsinghua Press, Jan. 2011.

**WEB LINKS:**

1. https://www.youtube.com/watch?v=HRzobEK03mY
2. https://www.youtube.com/watch?v=h3rKvsFTfPA
3. https://www.youtube.com/watch?v=zLMgdYI82IE
4. https://www.youtube.com/watch?v=Nq3mPFgpREE
5. https://freevideolectures.com/course/3693/virtual-reality

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Describe Virtual Reality concepts and its implication.
CO2. Illustrate the Input-Output interactions in Virtual Reality
CO3. Interpret the need of Visual Computation and role of Computer Graphics in Virtual reality
CO4. Illustrate the role of modeling in Virtual Reality
CO5. Describe the Architecture of Augmented Reality

# Object Oriented Modeling Design

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAE52 | | | |

## Course Objectives:

This Course will enable students to:

1. Become familiar with all phases of Object-Oriented Modeling and Design
2. Master the main features of the Unified Modeling Language (UML) and its usage.
3. Master the main concepts of object technologies and how to apply them at work
4. Develop the ability to analyze and solve challenging problem domains using UML models.
5. Understand and design the reusable design pattern principles and apply them towards the implementation of software solutions.

**UNIT** – I 8 Hours

OOMD Introduction: What is Object Orientation? What is OO development? Object Oriented themes; Evidencefor usefulness of OO Development; Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts, Link and associations concepts,Generalization and inheritance; A sample class model, Practical tips, Advanced Class Modeling: Advanced object and class concepts; Association ends;N-ary associations; Aggregation, Abstract classes; Multiple inheritance; Metadata; Reification Constraints;

**UNIT** – II 7 Hours

State Modeling: Events, States, Transitions and Conditions, State diagrams; State diagram behavior, Practical tips, Advanced State Modeling: Nested state diagrams , Nested states,Signal generalization; Concurrency ,A sample state model; Relation of class and state models; Practical tips, Interaction Modeling: Use case models; Sequence models, Activity models,Advanced Interaction Modeling, Use case relationships; Procedural sequence models Special constructs for activity models , summary, Process Overview: Development stages; Development life cycle.

**UNIT** – III 8 Hours

Domain Analysis: Overview of analysis, Domain class model; Domain state model, Domain interaction model; Iterating the analysis, Application Analysis: Application interaction model; Application class model, Application state model; Adding operations System Design :Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems, Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources, Choosing a software control strategy; Handling boundary conditions, Setting the trade-off priorities;

**UNIT** – IV 8 Hours

Class Design: Overview of class design; Bridging the gap; Realizing use cases, Designing algorithms; Recurring downwards, Refactoring; Design optimization, Reification of behavior; Adjustment of inheritance, Organizing a class design; ATM example Implementation Modeling: Overview of implementation; Fine-tuning classes, Fine-tuning generalizations; Realizing associations; Testing, Legacy Systems: Reverse engineering; Building the class models; Building the interaction model

**UNIT** – V 8 Hours

Design Patterns : What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns , Pattern description; Communication Patterns , Forwarder-Receiver , Design Patterns: Client-Dispatcher-Server, Publisher-Subscriber ,Management Patterns: Command

processor, View Handler Communication : Forwader – Receiver,Client-Dispatcher-Server

**TEXT BOOK:**

1. Michael Blaha, James Rumbaugh:Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005.(Chapters 1 to 17, 23)
2. Frank Buschmann, RegineMeunier, Michael StalPattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006. (Chapters 1, 3.5, 3.6, 4)

**REFERENCE BOOKS:**

1. Grady Booch Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson, 2007.
2. Mark Priestley Practical Object-Oriented Design with UML, 2nd Edition, Tata McGraw-Hill, 2003.
3. Booch, and Jacobson.The Unified Modeling Language User Guide, 2nd Edition, Pearson, 2005.

**WEB LINKS:**

1. https://www.javatpoint.com/uml
2. https://www.visual-paradigm.com
3. https://www.geeksforgeeks.org/unified-modeling-language-uml-state-diagrams/
4. https://www.tutorialspoint.com/uml/uml_interaction_diagram.htm
5. https://sourcemaking.com/design_patterns

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Design simple UML models and structure programs using object-oriented methodologies.
CO2. Implement object-oriented methods which includes principles bstraction, inheritance and polymorphism in the basic UML diagrams.
CO3. Design and develop different models to navigate to the solution of programming problems in UML convention..
CO4. Apply standard ethics and effective communication for developing UML models.
CO5. Design and develop real time interactive systems in UML convention using various design patterns on a builder tool.

# Internet of Things

| | | | | | |
|---|---|---|---|---|---|
| Contact Hours/Week | : | 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : | 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : | 0 | SEE Marks | : | 50 |
| Course Code | : | 3TMCAE53 | | | |

## Course Objectives:

This Course will enable students to:

1. Realize the evolution of IOT in Mobile Devices, Cloud & Sensor Networks.
2. Study the building blocks of IOT, its characteristics and application areas of IOT.
3. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.
4. Explore the architecture, its components and working of IOT components.
5. Realize the evolution of IOT in Mobile Devices, Cloud & Sensor Networks.

**UNIT** – I 9 Hours

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack

**UNIT** – II 8 Hours

Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, ConnectingSmart Objects, Communications Criteria, IoT Access Technologies.

**UNIT** – III 8 Hours

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.

**UNIT** – IV 7 Hours

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment

**UNIT** – V 6 Hours

IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoTArchitecture,Smart City Security Architecture, Smart City Use-Case Examples.

**TEXT BOOK:**

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the 2. Internet of Things”, 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 9789386873743)
2. Srinivasa K G, “Internet of Things”,CENGAGE Leaning India, 2017

**REFERENCE BOOKS:**

1. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1stEdition, VPT, 2014. (ISBN: 978-8173719547)
2. Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

**WEB LINKS:**

1. https://www.javatpoint.com/iot-internet-of-things
2. https://hkrtrainings.com/iot-tutorial
3. https://www.edureka.co/blog/iot-tutorial/
4. https://www.guru99.com/iot-tutorial.html#primary
5. https://www.tutorialspoint.com/internet_of_things/index.htm

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Interpret IoT Architectures, the Core IoT Functional Stack, IoT Data Management and Compute Stack
CO2. Indentify the role of Sensors, Actuators, and Smart Objects, Sensor Networks, ConnectingSmart Objects, Communications Criteria
CO3. Analyse the application protocol, transport layer methods for the given business case.
CO4. Analyse the application of data analytics and security for IOT.
CO5. Apply the knowledge of python in Raspberry PI and Arduino

# Cloud Computing

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAE54 | | | |

## Course Objectives:

This Course will enable students to:

1. Examine the use of Cloud Computing to solve given engineering problem
2. Use of the public cloud computing platforms
3. Illustrate through the technical talk and project demonstrations

**UNIT** – I 8 Hours

**Defining Cloud Computing:** Cloud Types, The NIST model, The Cloud Cube Model, Deployment models, Service models, Examining the Characteristics of Cloud Computing, Paradigm shift, Benefits of cloud computing, Disadvantages of cloud computing; Assessing the value proposition: Early adopters and new applications, the laws of cloudonomics, cloud computing obstacles, behavioral factors relating to cloud adoption, measuring cloud computing costs, specifying SLAs with examples.

**UNIT** – II 8 Hours

**Understanding Cloud Architecture:** Exploring the Cloud Computing Stack, Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols; Understanding Services and Applications by Type: Defining IaaS, Defining PaaS, Defining SaaS, Defining IDaaS.

**UNIT** – III 8 Hours

**Understanding Abstraction and Virtualization:** Using Virtualization Technologies, Load balancing and Virtualization, Understanding Hypervisors; Capacity Planning: Defining Baseline and Metrics, Baseline measurements, System metrics, Load testing, Resource ceilings, Server and instance types, Network Capacity, Scaling

**UNIT** – IV 8 Hours

**Using Platforms:** Defining Services, Salesforce.com versus Force.com: SaaS versus PaaS, Application development , Exploring Google Applications, Surveying the Google Application Portfolio, Understanding Amazon Web Services, Amazon Web Service Components and Services, Exploring Microsoft Cloud Services, Defining the Windows Azure Platform

**UNIT** – V 7 Hours

**Moving Applications to the Cloud** : Applications in the Clouds , Functionality mapping, Application attributes, Cloud service attributes, System abstraction, Cloud bursting, Applications and Cloud APIs

**TEXT BOOK:**

1. Barrie Sosinsky, “Cloud Computing Bible”, Wiley Publishing Inc. 2011 (free e-book available).

**REFERENCE BOOKS:**

1. David S. Linthicum, Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide (free e-book available)
2. Kai Hwang, Geoffrey C. Fox, and Jack J. Dongarra, “Distributed and Cloud Computing – From Parallel Processing to the Internet of Things”, Morgan Kaufman Publishers, 2012.
3. GautamShroff, Enterprise Cloud Computing Technology Architecture Applications (free e-book available)
4. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach (free e-book available)

**WEB LINKS:**

1. Barrie Sosinsky, “Cloud Computing Bible”, Wiley Publishing Inc. 2011 https://arpitapatel.files.wordpress.com/2014/10/cloud-computing-bible1.pdf
2. https://docs.microsoft.com/en-gb/learn/modules/intro-to-azure-fundamentals/what-is-cloud-computing
3. Getting start with GCP, Azure, AWS https://cloud.google.com/compute/docs, https://docs.microsoft.com/en-gb/learn/azure, https://aws.amazon.com/getting-started/hands-on/
4. Getting start with Docker & Kubernates https://docs.docker.com/get-started/ https://kubernetes.io/docs/tutorials/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Analyse the trade-offs in cloud modules, services and cloud characteristics.
CO2. Explore the cloud architecture, protocols and the services.
CO3. Conceptualise the virtualization and its role in enabling cloud computing applications.
CO4. Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine.

**Assignment Component:**

Demonstration of various cloud services to host static and dynamic web pages will be Considered to award assignment marks.

# User Interface and User Experience

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 3+0(L+T) | Credits | : | 3.0 |
| Total Lecture Hours | : 39 | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAE55 | | | |

## Course Objectives:

This Course will enable students to:

1. Explain the concepts of how to use Interactive systems like electronic mails, object action interface model, human-computer interaction
2. Designing the user-interface is intended primarily for designers, managers and evaluators of interactive systems
3. Apply the .concepts of task related menu organization like single menus, combinations of multiple menus, form filling, dialogue boxes, audio menus and window designing.
4. Achieve the goal of universal access.
5. Overviews procedures and guidelines to maintain high degree of interaction required by the system to the user

**UNIT** – I 7 Hours

**Introduction**

**Usability of Interactive Systems:** Introduction, Usability Requirements, Usability measures, Usability Motivations, Universal Usability, Goals for our profession

**Guideline, principles, and Theories**: Introduction, Guidelines, principles, Theories

**UNIT** – II 8 Hours

**Development Processes Evaluating Interfaces**

**Managing Design Processes:** Introduction, Organizational Design to support Usability, The Four pillars of design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues.

**Evaluating Interface Designs**

Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation during Active Use

**UNIT** – III 8 Hours

**Interaction Styles**

**Direct Manipulation and Virtual Environments:** Introduction, Examples of Direct Manipulation, 3D Interfaces, Teleoperation, Virtual and Augmented Reality.

**Menu Selection, Form Filling**, and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry with Menus: Form Fillin, Dialog Boxes, and Alternatives, Audio Menus and Menus for small Displays.

**UNIT** – IV 8 Hours

**Command and Natural Languages, Design issues**

Introduction, Command-Organization functionality Strategies and structure, Naming and Abbreviations, Natural Language in Computing.

**Interaction Devices:** Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory interfaces, Displays-Small and Large.

**Balancing Function and Fashion:** Introduction, Error Messages, Nonanthropomorphic Design, Display Design, Window Design, Color

**UNIT** – V 8 Hours

**User Manuals, Online Help, and Tutorials**

Introduction, online versus paper documentation, Reading from Paper Verses Displays, Shaping the Content of the Manuals, Online Manuals and Help, Online Tutorials, Demonstrations, and Guides, Online Communities for User Assistance, The Development Process.

**Information Search and Visualization:**

Introduction, Search in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Search Interfaces, Information Visualization

**TEXT BOOK:**

1. Ben Shneidermanplaisant Cohen, Jocobs : Designing the User Interface, 5th Edition, Pearson Education, 2010.

**REFERENCE BOOKS:**

1. Alan J Dix et. al.: Human-Computer Interaction, II Edition, Prentice-Hall India, 1998.
2. Eberts: User Interface Design, Prentice-Hall, 1994.
3. Wilber O Galitz: The Essential Guide to User Interface Design - An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt. Ltd, 1998.

**WEB LINKS:**

1. https://www.youtube.com/playlist?list=PLPTjP-gx7TM8n9SUdp0tt1m788LfOpo9u
2. https://www.youtube.com/watch?v=Wp3jyLkfBQs
3. https://nptel.ac.in/courses/112/107/112107220/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Interpret the fundamental concepts of Interactive systems
CO2. Implement Development processes and evaluate Interface design
CO3. Demonstrate different interaction styles
CO4. Apply the command and natural languages for different designs for UI
CO5. Implement User manuals, online help, Tutorials

# Machine Learning Lab

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 2 | Credits | : | 1 |
| Total Lecture Hours | : - | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAL1 | | | |

## Course Objectives:

This Course will enable students to:

1. Implement and evaluate machine learning algorithms in Python

**Implementation of the following techniques of machine learning:**

| Sl. No | Implementations |
|---|---|
| 1. | Concept Learning: FIND-S algorithm |
| 2. | Concept Learning: Candidate-Elimination algorithm |
| 3. | Bayesian classifiers: naïve Bayesian classifier |
| 4. | Instance based Learning: k-Nearest Neighbour algorithm |
| 5. | Artificial Neural Networks: Back propagation algorithm |
| 6. | Decision trees: ID3 algorithm |
| 7. | Unsupervised Learning: k-Means algorithm, Hierarchical clustering. |

**WEB LINKS:**

1. https://www.w3schools.com/python/python_ml_getting_started.asp
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.freecodecamp.org/learn/machine-learning-with-python/
4. https://www.youtube.com/watch?v=fKUfFgiSJx0
5. https://www.youtube.com/watch?v=nJKxWbQ1jaw
6. https://www.youtube.com/watch?v=v9jXnT7tvbs
7. https://www.youtube.com/watch?v=rLOyrWV8gmA
8. http://ndl.iitkgp.ac.in

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Design Python programs for various Machine Learning algorithms.
CO2. Apply appropriate data sets to the Machine Learning algorithms.

# Mobile Application Development Lab

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 2 | Credits | : | 1 |
| Total Lecture Hours | : - | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAL2 | | | |

## Course Objectives:

This Course will enable students to:

1. To understand the installation of android studio tools and processes
2. Identify the concepts and techniques used in creating applications.
3. Learn how to use databases to store data from android applications
4. Deploy self-developed applications on android devices.

| Sl. No | Implementations |
|---|---|
| 1. | Design an application that contains Phone Contacts in vertical linear manner. Selected contact appears at the top of the list with a large italicized font and a blue background. |
| 2. | Create an application that uses Layout Managers and Event Listeners. |
| 3. | Develop a standard calculator application to perform basic calculations like addition, subtraction, multiplication and division |
| 4. | Devise an application that draws basic graphical primitives (rectangle, circle) on the screen. |
| 5. | Build a mobile application that create, save, update and delete data in a database. |
| 6. | Devise an application that implements Multi-threading. |
| 7. | Develop a mobile application that displays different menu layout. |
| 8. | Create an application that writes data to the SD card. |
| 9 | Implement an application for the following<br>i. Creates an alert upon receiving a message.**or**<br>ii. Login form, if success display the login form else display the in valid user |
| 10 | Devise a mobile application that creates alarm clock. |

**WEB LINKS:**

1. https://www.youtube.com/watch?v=giVfVQlKBVM
2. https://www.youtube.com/watch?v=aS__9RbCyHg
3. https://www.tutorialspoint.com/android/index.htm
4. https://developer.android.com/codelabs/build-your-first-android-app#0
5. https://www.geeksforgeeks.org/android-tutorial/
6. https://www.tutlane.com/tutorial/android
7. https://www.w3schools.in/category/android-tutorial/

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Develop applications using software development kits (SDKs), frameworks and toolkits

CO2. Establish various views methods involved to design app, API in getting map, its location and presenting the apps to the users.

CO3. Design and develop an application with synchronizing the real time applications like SMS, Email, etc and services

# Professional Web Development Lab

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 2 | Credits | : | 1 |
| Total Lecture Hours | : - | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAL3 | | | |

## Course Objectives:

This Course will enable students to:

1. Design and develop applications with Collection Framework API.
2. Design and develop applications for user interfaces using AngularJs and CSS. and RESTful services.
3. Build, configure and develop flexible web based Java applications using Spring Framework, Spring Boot.

**Sl.no Implementations**

1. Write a Java Collection program to demonstrate TreeSet by adding books to a Set and display all the books and ensure that TreeSet must be Comparable typeand TreeSet objects must be user defined objects and implement comparable interface.
2. Write a Java Collection program to find the union, intersection and the difference between two sets in both ways using HashSet
3. Implement the service of Web Services Description Language (WSDL) Create and use your own function and execute it using WSDL.
4. Implement the service of Simple Object Access Protocol (SOAP) Create and use your own function and execute it using SOAP.
5. Create a new project using AngularJs and implement the User Interface operations.
6. Design and build a web application and demonstrate the implementation of building RESTful web Service.
7. Design and build a web application using Spring Framework and its services
8. Design and build a MVC Application using Spring Boot Framework and add some useful services.

**WEB LINKS:**

1. https://www.geeksforgeeks.org/collections-in-java-2/
2. https://www.soapui.org/
3. https://angular.io and https://angularjs.org
4. https://restfulapi.net
5. https://spring.io and
6. https://getbootstrap.com

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Implement usage of various Java Collection Framework elements

CO2. Implement and deploy web services using WSDL and SOAP services across clients and servers.

CO3. Implement client user interface applications using dynamic and interactive AngularJs, RESTful API on Spring Framework and Spring Boot.

# Mini Project

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : 2 | Credits | : | 1 |
| Total Lecture Hours | : - | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 3TMCAL4 | | | |

## Course Objectives:

This Course will enable students to:

1. Be able to develop problem statement
2. Understand requirement analysis and identify design methodologies
3. Use computing tools and appropriate programming language

Mini projects can be developed in groups by selecting any topics such as DBMS, Image processing, Wireless sensor network, Data mining, Data analytics or any other topics using latest technologies. Each groups consisting of a maximum of two students.

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Identify and formulate problem statement by doing literature surveying variety of allied areas related to computer applications and information technology.

CO2. Perform requirement analysis and identify design methodologies, apply ethical principles and lifelong learning.

CO3. Apply advanced programming techniques, computational knowledge to develop solution to real world problems.

CO4. Apply modern computing tools, programming language that is relevant and appropriate to the project.

CO5. Work effectively in team and also individually, apply ethical principles and indulge in lifelong learning.

CO6. Present technical report as a document with clear explanation and effective presentation.

# Major Project

| | | | | |
|---|---|---|---|---|
| Contact Hours/Week | : - | Credits | : | 20 |
| Total Lecture Hours | : - | CIE Marks | : | 50 |
| Total Tutorial Hours | : - | SEE Marks | : | 50 |
| Course Code | : 4TMCA41 | | | |

## Course Objectives:

This Course will enable students to:

1. Be able to define an open problem for developing a computational system
2. Understand various steps of system/ software development
3. Know about the ethics of organization in general and project development in particular

## Major project Regulations

1 Major project is for the entire semester and evaluated at the end of the semester for the assigned credits.

2 The project may be based on;

- Design of a system.
- Theoretical/Analytical modeling.
- Computer simulation.
- Developing working software
- Interdisciplinary computer application/modeling.

3 The project could be part of the research activity carried out in the department.

4 The literature survey should be one of the components of the project.

5 The project can be carried outside the institute in a recognized industry/research lab.

6 All the project works should be approved by DAAC.

7 HOD and DAAC assign guides for the major project.

8 The project is to be carried out by individual student.

### CIE for the major project

Major project comprises of three seminars. Departmental Project Evaluation Committee (DPEC) shall evaluate seminars along with the respective guides

1. In the *first seminar,* students have to present about the area of the project, literature survey and preliminary requirements of the project and what they propose to do.
2. In the *second seminar*, the students have to present about the project development issues like, specifications, flow chart, design steps, data flow diagrams, data structures, entity relationship diagrams pertaining to the chosen project.
3. In the *third seminar*, the students have to demonstrate the project.
4. CIE is done for a total of 100 marks, ***which shall be reduced to 50***.

**Table 1. Break up of CIE marks for major project**

| | |
|---|---|
| Seminar-1 | 20 marks |
| * Seminar-2 | 40 marks |
| Seminar-3 | 40 marks |
| **Total** | **100 marks** |

*Conducted in presence of external examiner

### *SEE for the major project*

SEE is conducted by one external examiner and the respective guide. The breakup of marks is given in Table 2.

SEE is done for a total of 100 marks, ***which shall be reduced to 50.***

**Table 2. Break up of SEE marks for major project**

| | |
|---|---|
| Evaluation of the project report by external examiner and the guide (average of independent evaluations) | 50 marks |
| Presentation, Demonstration and Quality of work, viva-voce | 50 marks |
| **Total** | **100 marks** |

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Identify the relevant topic that is in synchrony with recent trends in information technology by performing the literature survey through standard journal referrals or industry professionals.
CO2. Identify the problem statement befitting the domain of interest.
CO3. Interpret the problem, analyze the requirements, develop algorithms, and propose innovative ideas to solve the problem.
CO4. Implement the project individually and in a team by applying the appropriate software engineering practices and principles.
CO5. Create, identify, and apply appropriate techniques, resources, and modern computing tools.
CO6. Commit to professional ethics, and to the norms of computing practice.
CO7. Apply appropriate testing techniques and develop test cases.
CO8. Effectively communicate individually and in a team and be able to comprehend and write effective project report including design documentation with high clarity.
CO9. Practice ethical values and lifelong learning.
CO10. Provide innovative solutions to societal and environmental issues.

# Technical Seminar

| | | | | | |
|---|---|---|---|---|---|
| Contact Hours/Week | : | - | Credits | : | 02 |
| Total Lecture Hours | : | - | CIE Marks | : | 50 |
| Total Tutorial Hours | : | - | SEE Marks | : | - |
| Course Code | : | 4TMCAS1 | | | |

## Course Objectives:

This Course will enable students to:

1. Identify the topic of the seminar appropriate to the domain
2. Perform literature survey
3. Understand the ppt and report preparation techniques

## Instructions to Students:

1. Students have to present the seminar on a chosen topic.
2. There should be no repetition/duplication of topics among the students
3. Students have to submit the reports of their seminar well before the presentation of seminar.
4. Departmental seminar Evaluation Committee (DSEC) shall evaluate the seminar.
5. No SEE for this subject

## Course Outcomes:

**After the completion of this course, students will be able to:**

CO1. Perform the literature survey through standard referrals and select the relevant topic that is in synchrony with recent trends in information technology and appropriate to computing specialization.

CO2. Gain an understanding of advanced methodologies in the chosen field, including theory, and interdisciplinary approaches and relate the topic to the principles of mathematics, computing sciences, and relevant domain principles and to substantiate the conclusions.

CO3. Relate the topic to complex computing problems, systems, components or processes that may meet the needs of public health, safety, cultural, societal and environmental considerations.

CO4. Prepare a visual presentation of the seminar topic depicting the synthesis of the topic with required illustrations, interpretations and clear elaboration of the information gathered and to provide valid conclusions.

CO5. Make an oral presentation effectively among the peers and computing community. Demonstrate through short seminar report writing ability to comprehend and summarize.