Dr. Mahalingam College of Engineering and Technology
(An Autonomous Institution)
Pollachi - 642 003

Curriculum and Syllabi

Department of Computer Applications

Semesters I to IV

Regulations 2019

DR MAHALINGAM
MCET
COLLEGE OF ENGINEERING AND TECHNOLOGY
Enlightening Technical Minds

Dr. Mahalingam College of Engineering and Technology, Pollachi – 642003.
(An autonomous institution approved by AICTE and affiliated to Anna University)

Department of Computer Applications

Vision

To Make MCA Department, a well-known center of excellence in Research & Development and achieve a State of Honor

Mission

- To provide an environment that promotes the innovation and dissemination of knowledge
- To develop individuals who are leaders, innovators, entrepreneurs and independent learners, well prepared to contribute to their local, regional and global community

Programme: Master of Computer Applications (MCA)

Programme Educational Objectives (PEOs) - Regulations 2019

After 2 to 3 years of completion of the programme the graduates will be able to:

PEO1. Domain Expertise: Possess technical expertise, excel in communication skills and leadership to manage diverse audience in their career

PEO2. Computing Skills and Ethics: Employ technical skills to solve societal and environmental issues in an ethical manner

PEO3. Lifelong Learning and Research: Involve in learning the recent technologies to meet the global demands –To be updated

Programme Outcomes (POs) - Regulations 2019

On successful completion of the programme the graduates will be able to:

PO1. Domain Expertise: Apply the knowledge of mathematical fundamentals in the field of Computer Applications.

PO2. Computing Skills and Ethics: Identify, formulate, and solve the computational problems.

PO3. Lifelong Learning and Research: Design and develop algorithms, implement programs and evaluate the performance.

PO4. Complex problem Investigation: Investigate complex problems by employing research methods to arrive at valid conclusions.

PO5. Modern Tool Usage: Evaluate and use appropriate tools and techniques in developing application activities.

PO6. Societal contribution: Follow professional engineering practice by applying contextual knowledge to assess societal and legal issues.

PO7. Environment and Sustainability: Provide scientific solutions with due consideration of environmental and economic sustainability.

PO8. Ethics: Follow ethical principles and norm in developing applications.

PO9. Individual and Team work: Function effectively as an individual, team member or leader in diversified environments.

PO10. Communication: Communicate effectively through various modes for all application development activities

PO11. Project Management and Finance: Apply development knowledge and management principles for effective project management in multi-disciplinary environments.

PO12. Life-long Learning: Recognize the need for and have the ability to engage in independent and lifelong learning in the context of technological change.
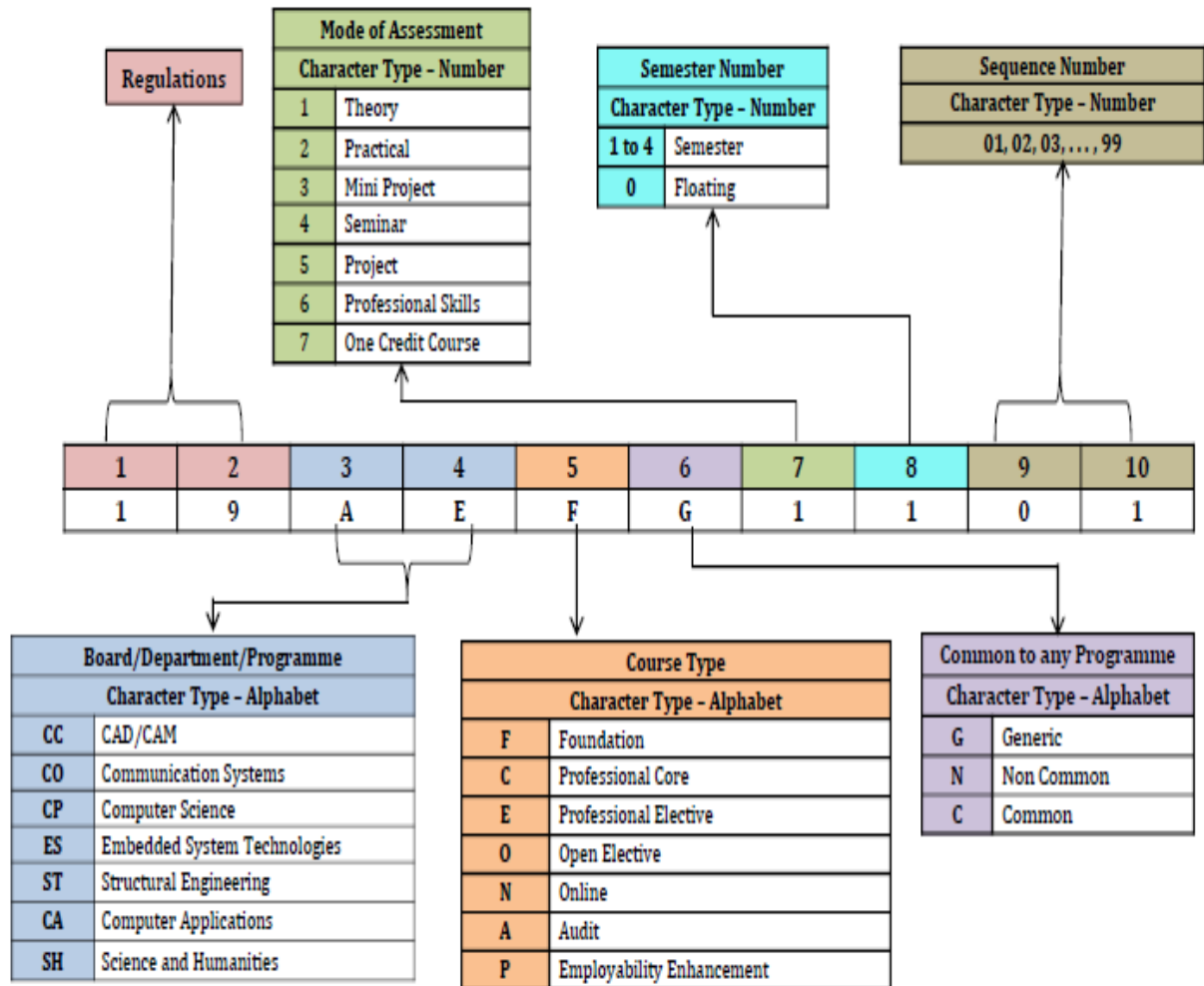
Programme Specific Outcomes (PSOs) - Regulations 2019

On successful completion of the programme the graduates will be able to:

PSO1. Application Development: Apply software engineering principles in the design and development of web and mobile applications.

PSO2. Data management: Manage and analyze huge volume of data in real world problems.

Dr. Mahalingam College of Technology, Pollachi
2019 Regulations - Course Code Generation Procedure for PG Courses(v1)

Regulations

Mode of Assessment

Character Type – Number	
1	Theory
2	Practical
3	Mini Project
4	Seminar
5	Project
6	Professional Skills
7	One Credit Course

Semester Number

Character Type – Number	
1 to 4	Semester
0	Floating

Sequence Number

Character Type – Number
01, 02, 03, . . . , 99

1	2	3	4	5	6	7	8	9	10
1	9	A	E	F	G	1	1	0	1

Board/Department/Programme

Character Type – Alphabet	
CC	CAD/CAM
CO	Communication Systems
CP	Computer Science
ES	Embedded System Technologies
ST	Structural Engineering
CA	Computer Applications
SH	Science and Humanities

Course Type

Character Type – Alphabet	
F	Foundation
C	Professional Core
E	Professional Elective
O	Open Elective
N	Online
A	Audit
P	Employability Enhancement

Common to any Programme

Character Type – Alphabet	
G	Generic
N	Non Common
C	Common

Dr. MAHALINGAM
COLLEGE OF ENGINEERING AND TECHNOLOGY
Affiliated to Anna University, Chennai; Approved by AICTE ; Accredited by NAAC with Grade 'A++'
Accredited by NBA - Tier1 (Mech, Auto, Civil, EEE, ECE, E&I and CSE)
Udumalai Road, Pollachi - 642 003. Tel: 04259-236030/40/50 Fax: 04259-236070 www.mcet.in

Programme: Department of Computer Applications (MCA)
2019 Regulations
(Amended with effect from 2020 - 2021 Academic Year Onwards)
Curriculum for Semesters I to IV

Semester I

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19CAFN1101	Probability and Statistics	3	1	0	4	100	
19CACN1101	Web Technology	3	0	0	3	100	
19CACN1102	Programming in C	3	0	0	3	100	
19CACN1103	Data Structures and Algorithms	3	0	0	3	100	
19CACN1104	Database Management Systems	3	0	0	3	100	
19CACN2101	Programming in C Laboratory	0	0	4	2	100	
19CACN2102	Data Structures and Database Management Systems Laboratory	0	0	4	2	100	
19CACN3101	Mini Project–I	0	0	6	3	100	
XXXXXXXXX	One credit Course	0	0	2	1	100	
	TOTAL	**15**	**1**	**16**	**24**	**900**	

Semester II

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19CACN1201	Computer Networks	3	0	0	3	100	
19CACN1202	Software Engineering	3	1	0	4	100	
19CACN1203	Python programming	3	0	0	3	100	
19CACN1204	Java Programming	3	0	0	3	100	
XXXXXXXXX	Professional Elective– I	3	0	0	3	100	
19CACN2201	Python programming Laboratory	0	0	4	2	100	
19CACN2202	Java Programming Laboratory	0	0	4	2	100	
19CACN3201	Mini Project –II	0	0	6	3	100	
XXXXXXXXX	One Credit Course	0	0	2	1	100	
TOTAL		**15**	**1**	**16**	**24**	**900**	

Semester III

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19CACN1301	Machine Learning	3	1	0	4	100	
19CACN1302	Cloud Computing	3	0	0	3	100	
19CACN1303	Big Data Analytics	3	0	0	3	100	
XXXXXXXXX	Professional Elective– II	3	0	0	3	100	
XXXXXXXXX	Professional Elective–III	3	0	0	3	100	
19CACN2301	Software Testing Laboratory	0	0	4	2	100	
19CACN2302	Cloud Computing Laboratory	0	0	4	2	100	
19CACN2303	Big Data Analytics Laboratory	0	0	4	2	100	
TOTAL		**15**	**1**	**12**	**22**	**800**	

Semester IV

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19CACN5401	Project Work	-	-	24	12	100	-

Total Credits: 82

Professional Electives

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
Networking						
19CAEN1001	Security in Computing	3	0	0	3	100
19CAEN1002	Block Chain Management	3	0	0	3	100
19CAEN1022	Wireless Networking	3	0	0	3	100
Database Technology						
19CAEN1003	Database Architecture and Administration	3	0	0	3	100
19CAEN1004	Data Mining and Data Warehousing	3	0	0	3	100
19CAEN1005	Information storage and Management	3	0	0	3	100
19CAEN1006	Information Retrieval Techniques	3	0	0	3	100
Software and Management						
19CAEN1007	Software Project Management	3	0	0	3	100
19CAEN1008	Resource Management Techniques	3	0	0	3	100
19CAEN1009	Human Values and Professional ethics	3	0	0	3	100
19CAEN1010	Agile Software Development	3	0	0	3	100
19CAEN1023	Software Quality and Testing	3	0	0	3	100
Latest Technologies						
19CAEN1011	Evolutionary computing	3	0	0	3	100
19CAEN1012	Semantic Web Technologies	3	0	0	3	100
19CAEN1013	Business Intelligence	3	0	0	3	100
19CAEN1014	Internet of Things	3	0	0	3	100
19CAEN1015	Web Mining and Social Networking	3	0	0	3	100
19CAEN1016	Artificial Intelligence	3	0	0	3	100
19CAEN1021	Mobile Programming with Swift	3	0	0	3	100
19CAEN1024	Deep Learning	3	0	0	3	100

| 19CAEN1025 | Cyber Security | 3 | 0 | 0 | 3 | 100 |
| 19CAEN1026 | Virtual Reality | 3 | 0 | 0 | 3 | 100 |

User Interface Design						
19CAEN1017	Human Computer Interface	3	0	0	3	100
19CAEN1018	Visualization Techniques	3	0	0	3	100
Operating Systems						
19CAEN1019	Advanced Operating systems	3	0	0	3	100
19CAEN1020	Unix and Networking Programming	3	0	0	3	100

Research Methodology						
19CAEN1027	Research Methodology and Intellectual Property Rights	3	0	0	3	100

Course Code: 19CAFN1101	Course Title: Probability and Statistics		
Course Category: Foundation Course	Course Level: Introductory		
L:T:P(Hours/Week) 3:1:0	Credits:4	Total Contact Hours:60	Marks:100

Pre-requisites

➢ NIL

Course Objectives

The course is intended to:
1. Infer the basic probabilistic random variables and illustrate their related applications
2. Infer the probability distributions
3. Apply the statistical method for classification of data and statistical measures
4. Apply the hypothesis for small and large samples
5. Analyze the analysis of variances for design of experiments

Unit I   Random Variables   12 Hours

Sample spaces – events – probability definition – conditional probability – total probability – Bayes' theorem - Random variable - Distribution function – discrete, continuous random variables – Probability mass function – Probability density function.

Unit II   Probability Distributions   12 Hours

Expectation–moments-moment generating functions–Discrete Distributions: Bernoulli trials – Binomial distribution – Poisson distribution – Continuous distributions: Exponential distribution - Normal distribution.

Unit III   Classification of Data and Statistical Measures   12 Hours

Classification-Tabulation-Graphical representation – Simple bar chart – Pie chart measures of central tendency: Arithmetic Mean, Median and Mode – Measures of variation: Range, Quartile deviation - Standard deviation and Coefficient of variation.

Unit IV   Tests of Hypothesis   12 Hours

Statistical hypothesis – Type I and Type II errors – Testing of hypothesis: One-tailed and two tailed Tests –t test for single mean and difference of mean – F-Test - Chi-square test for independence of attributes.

Unit V   Analysis of Variance   12 Hours

Analysis of Variance (ANOVA) – Completely Randomized Design (CRD) – Randomized Block Design (RBD) – Latin Square Design (LSD)

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Infer the concepts of random variables in probability	Understand
CO2: Infer the problems under probability distributions	Understand
CO3: Apply the measures of central tendency and dispersion for analysis of data	Apply
CO4: Apply various tests in hypothesis testing for small samples	Apply
CO5: Analyze experiments based on one-way, two-way and Latin square classifications	Analyze

Reference Book(s):

R1. Ravichandran. J, "Probability and Statistics for Engineers", 4th Edition, Wiley India Publication, 2014

R2. Veerarajen.T, "Probability, Statistics and Random Process", 1st Edition Tata McGraw Hill, 2006

R3. Ross, Sheldon. M, "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Academic Press, 2009

R4. Freund John, E and Miller, Irvin, "Probability and Statistics for Engineering", Duxbury Press; 6th edition, 2003

Web References:

1. http://nptel.ac.in/downloads/111101004

2. http://nptel.ac.in/downloads/111105041/10

3. http://nptel.ac.in/downloads/111104079

Course Code: 19CACN1101	Course Title: Web Technology		
Course Category: Professional Core	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

➢ NIL

Course Objectives

The course is intended to:

1. Infer the concept of World Wide Web
2. Design the Web Pages
3. Apply the scripting concepts to perform operations on web page
4. Apply the JavaScript concepts
5. Design the Web Pages using Document Object Model

Unit I   Introduction To World Wide Web   9 Hours

Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 –File Transfer Protocol - Overview of HTTP, HTTP request – response –– Generation of dynamic web pages.

Unit II   UI Design   9 Hours

Markup Language (HTML): Introduction to HTML - Formatting and Fonts–Commenting Code– Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – Frames - HTML Forms. Cascading Style Sheet (CSS): Introduction to CSS–Basic syntax and structure -Inline Styles – Embedding Style Sheets - Linking External Style Sheets – Backgrounds – Manipulating text - Margins and Padding - Positioning using CSS

.
Unit III   JavaScript   9 Hours

Introduction - Core features - Data types and Variables - Operators, Expressions, and Statements - Functions - Objects - Array, Date and Math related Objects - Document Object Model - Event Handling- Controlling Windows & Frames and Documents - Form handling and validations

Unit IV   Java script Response Web Design   9 Hours

Menu – Tabs – Navigations – drop downs – Image operations – Buttons

Unit V   Advanced Response Web Design   9 Hours

Forms- Filters – Tables –Tool tips – progress bars – count down timer - User ratings –Chat
messages

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the concept of WWW request & response for webpage development	Understand
CO 2: Design the Web pages using HTML & CSS for real time applications	Apply
CO 3: Apply the scripting operations on web pages for real time scenario	Apply
CO 4: Apply java script concepts for data processing	Apply
CO 5: Design the web pages for dynamic operations using Document Object Model	Apply

Reference Book(s):

R1. Harvey & Paul Deitel and Associates, Harvey Deitel and Abbey Deitel," Internet and World Wide Web - How to Program", 5th Edition, Pearson Education, 2019

R2. ThomasAPowell,FritzSchneider,   -   JavaScript:TheCompleteReference",3rdEdition, Tata McGraw Hill,2013

R3. Achyut S Godbole and AtulKahate,- Web Technologies", 2nd Edition, Tata McGraw Hill, 2012

Web References:

1.   http://nptel.ac.in/courses/106105084/

2.   http://nptel.ac.in/video.php?subjectId=106105084

Course Code: 19CACN1102	Course Title: Programming in C		
Course Category: Professional Core	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

➢ NIL

Course Objectives

The course is intended to:

1. Choose appropriate programming constructs
2. Construct programs using arrays and functions
3. Develop program using structures and unions
4. Apply the concepts of pointers
5. Develop program using file management

Unit I   Basics of C Language   9 Hours

Overview of C Language - Constants, Variables and Data Types - Operators, Expressions and Assignment statements - Managing Input/Output Operations - Formatted I/O - Decision Making- Branching - IF, Nested IF - Switch - goto - Looping- while, do, for statements.

Unit II   Arrays and Functions   9 Hours

Arrays - dynamic and multi-dimensional arrays - Character arrays and Strings - String handling Functions - User defined Functions - Categories of Functions – Recursion.

Unit III   Structures and Unions   9 Hours

Basics of Structures-Declaring a Structure - Array of Structures- passing Structures elements to Functions - Passing entire Structure to Function - Structures within Structures - Union - Union of Structures - Enumerated Data Types - typedef Statement.

Unit IV   Pointers   9 Hours

Pointers - Declaration - Accessing a variable - Dynamic memory allocation - Pointers versus Arrays- Array of pointers- Pointers to functions and structure Pointers.

Unit V   File Management   9 Hours

File Management in C - Data hierarchy- Files and Streams - Sequential access file- Random access file – Preprocessors.

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO 1: Choose appropriate data types, variables, statements for solving problems	Apply
CO 2: Construct program using arrays and functions for given problem	Apply
CO 3: Develop program using structure and union for given problem	Apply
CO 4: Apply the pointer concepts in real time application	Apply
CO 5: Develop program using file management for real time problem	Apply

Reference Book(s):

R1. Stephen G. Kochen,"Programming in C: A Complete Introduction to the C programming Language", Third Edition, Pearson Education, 2008

R2. Al Kelley, Ira Pohl,"A Book on C: Programming in C", Fourth Edition, Addison-Wesley Professional, 2010

R3. YashavantP.Kanetkar,"Understanding Pointers in C", BPB Publications,New Delhi, 2009

R4. Byron C Gottried, "Programming with C", Schuams Outline series, 2nd Edition,2006

R5. Richard Johnsonbaugh, "Applications Programming In ANSI C", 3rd edition, Pearson Education, 2003

Web References:

1. https://www.eskimo.com/~scs/cclass/notes/top.html

2. https://onlinecourses.nptel.ac.in/iitk_cs_101/preview

3. https://www.cs.cf.ac.uk/Dave/C/CE.html

Course Code: 19CACN1103	Course Title: Data Structures and Algorithms		
Course Category: Professional Core	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

➤ NIL

Course Objectives

The course is intended to:

1. Illustrate the data structures such as linked lists, Stacks
2. Apply the different choice of trees
3. Apply the Searching, Sorting and Heap algorithms
4. Apply graph computations in shortest path algorithms
5. Analyze the efficiency of algorithms

Unit I   Linear Data Structures   9 Hours

ADT - Linked Lists (Singly, Doubly and Circular) Implementation – Array, Pointer- Stack: Definition and Examples, Representing Stacks - Queues: Queue and its Representation – Applications of Stack, Queue and list.

Unit II   Nonlinear Data Structures   9 Hours

Trees – General- Binary Tree - Binary Search trees- AVL Trees, B-Trees – Implementations – Tree Traversals. Hashing – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Unit III   Sort with Heaps   9 Hours

General Background: Shell Sort-. Heap –Binary Heap – Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps.

Unit IV   Graphs and Their Applications   9 Hours

Graphs – Representation – Topological Sort - Shortest Path Algorithm -Dijkstra's algorithm - Network Flow Problem – Minimum Spanning Tree – Prim's Algorithm - Kruskal's Algorithm – Graph Traversals– Applications of Depth–First Search.

Unit V   Algorithm Design Techniques   9 Hours

Design Techniques – Greedy Algorithm- Divide and Conquer: Closest Point- The Selection Problem– Dynamic Programming: Ordering Matrix Multiplication-Optimal Binary Search Tree- Backtracking Algorithms: Turnpike reconstruction problem.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Illustrate the data structures such as linked lists, Stacks and Queues for real world applications	Understand
CO 2: Apply the different choice of trees that effectively model the information in a problem	Apply
CO 3: Apply the Sorting with Heaps for efficient management of data	Apply
CO 4: Apply graph computations in shortest path algorithms for real word problems	Apply
CO 5: Analyze the efficiency of algorithms of greedy, divide and conquer and dynamic programming for problem solving	Analyze

Reference Book(s):

R1.   M.A. Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2011

R2.   Narasimha Karumanchi, "Data Structures and Algorithms", Career Monk Publications, 5th Edition 2016.

R3.   T.H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein," Introduction to Algorithms", 3rd Edition, 2015

R4.   V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint Edition, 2006

Web References:

1.   http://nptel.ac.in/courses/106104019/

2.   https://www.coursera.org/specializations/data-structures-algorithms

3.   https://online-learning.harvard.edu/course/data-structures-and-algorithms

Course Code: 19CACN1104	Course Title: Database Management Systems			
Course Category: Professional Core		Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45		Marks:100

Pre-requisites

➢ NIL

Course Objectives

The course is intended to:
1. Illustrate the basic concepts of database systems
2. Build the SQL queries and authorization mechanism
3. Construct a relational database using ER model and normalization
4. Apply the concepts of database storage structure and access techniques
5. Develop a web application with database connection

Unit I   Introduction to Relational Databases   9 Hours

Database System Applications – Purpose of Database systems – View of Data – Database Languages– Relational Databases – Database Design – Data Storage and Querying – Transaction Management – Database Architecture – Database Users and Administration - Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations.

Unit II   SQL   9 Hours

Overview of the SQL Query Language – SQL Data Definition – Basic Structure of SQL Queries- Additional Basic Operations - Aggregate Functions – Nested Sub queries – Set Operations - Modification of the Database - Join Expressions – Views – Transactions – Integrity Constraints – SQL data types and Schemas – Authorization – Accessing SQL from a programming language – Functions and procedures – Triggers – Relational Algebra – Tuple relational calculus – Domain relational calculus.

Unit III   Database Design   9 Hours

Entity Relationship model – constraints – Entity Relationship Diagrams – Features of Good Relational Designs – Atomic Domains and First Normal Form – Decomposition using Functional Dependencies – Functional Dependency Theory – Algorithms for Decomposition – Decomposition using Mutivalued dependencies.

Unit IV   Data Storage and Querying   9 Hours

RAID – Ordered Indices – B+ Tree Index Files – B+ Tree Extensions – Multiple Key Access – Static Hashing – Dynamic Hashing – Measures of Query Cost – Selection Operations –

Sorting – Join Operations – Overview of Query Optimization – Transformation of Relational Expressions – Estimating Statistics of Expression Results – Choice of Evaluation Plans

Unit V   **Web Application with Database**   **9 Hours**

C# and the .NET Framework - The .NET Platform- The .NET Framework- Compilation and the MSIL- The C# Language- Programming Web Application with Web Forms- Creating a Web Form- Adding Controls- Data Binding- Connecting to the Database - Responding to Post back Events- ASP.NET and C#.

Course Outcomes	Cognitive
At the end of this course, students will be able to:	**Level**
CO 1: Illustrate the principles of Database systems and fundamentals of relational model	Understand
CO 2: Build the SQL queries and authorization mechanism in relational tables.	Apply
CO 3: Construct relational database using ER model and normalization for real world problems. .	Apply
CO 4: Apply the concepts of database storage structure and access techniques	Apply
CO 5: Develop a web application with database connection for real time scenario	Apply

Reference Book(s):

R1.   Abraham Silberschatz, Hentry F. Korth and S.Sudharssan, "Database System Concepts", 6th Edition, Tata McGraw Hill, 2019

R2.   Jesse Liberty,"Programming C#", Second Edition, O'Reilly Media,2012

R3.   Raghu Ramakrishna & Johannes Gerhrke, "Database Management System", McGrawHill, 3rd Edition, 2010

R4.   C. J. Date,"An Introduction to Database Systems", Eighth Edition, Addison-Wesley, 2003

R5.   RamezElmasri   and   Shamkant   B.Navathe,"Fundamental   Database Systems",3rdEdition,Pearson Education, 2010

R6.   Mario Szpuszta, Matthew MacDonald,"Pro ASP.NET 4 in C# 2010",3rd Edition, Apress, 2010

Web References:

1.   http://nptel.ac.in/courses/106106093/

2.   https://www.classcentral.com/course/swayam-database-management-system-9914

Course Code: 19CACN2101	Course Title: Programming in C Laboratory		
Course Category: Professional Core	Course Level: Practice		
L:T:P(Hours/Week) 0: 0: 4	Credits: 2	Total Contact Hours: 60	Marks:100

Pre-requisites

> ➢ NIL

Course Objectives

The course is intended to:
1. Apply the concepts of looping statements.
2. Choose decision statements and functions concepts
3. Implement applications using Arrays and Pointers.
4. Apply Structure and Files for developing applications
5. Develop applications using Functions and Files

List of Exercises:

1. Develop Programs using Input, output, assignment statements and looping statements

2. Develop Programs using Functions and decision statements

3. Implement Programs using arrays and pointers for sorting the values

4. Design application using structures and file for storing, retrieving data in the form of reports

5. Develop applications using Functions and file for text processing

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Apply the concepts of looping statements for performing string manipulations	Apply
CO 2: Choose decision statements and functions for data manipulation functions	Apply
CO 3: Implement applications using arrays and pointers	Apply
CO 4: Apply Structure and Files for generation of reports	Apply
CO 5: Develop applications using Functions and file for text processing	Apply

Reference Book(s):

R1.   Stephen G.Kochen,"Programming in C: A Complete Introduction to the C   programming Language", 3rd Edition, Pearson Education, 2008

R2.   Al Kelley, Ira Pohl, "A Book on C: Programming in C", 4th Edition, Addison - Wesley Professional, 2010

R3.   YashavantP.Kanetkar,"Understanding Pointers in C", BPB Publications, New Delhi, 2009

R4.   Byron C Gottried, "Programming with C", Schuams Outline series, Second Edition,2006

R5.   Richard Johnsonbaugh, "Applications Programming In ANSI C", Third edition, Pearson Education, 2003

Web References:

1.   https://www.eskimo.com/~scs/cclass/notes/top.html

2.   https://www.cs.cf.ac.uk/Dave/C/CE.html

3.   https://onlinecourses.nptel.ac.in/iitk_cs_101/preview

Course Code: 19CACN2102	Course Title: Data Structures and Database Management Systems Laboratory		
Course Category: Professional Core	Course Level: Practice		
L:T:P(Hours/Week) 0: 0: 4	Credits: 2	Total Contact Hours: 60	Marks:100

Pre-requisites

> ➢ NIL

Course Objectives

The course is intended to:

1. Design and implement linear and nonlinear data structures
2. Choose graph traversal for real time problems
3. Design a web based application provided with exceptions and cursors
4. Apply the concept of triggers with database connectivity

List of Exercises:

1. Develop applications using stack and Queue
2. Implement applications using various lists
3. Apply the graph to find shortest path
4. Develop a web-based database application system using the concept of exceptions
5. Design and implement a database application using the concept of cursors
6. Develop a real time application with database connectivity using triggers

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Design and implement solving problems linear and nonlinear data structures for solving problems	Apply
CO 2: Choose graph traversal to find the shortest path problems.	Apply
CO 3: Design a web based application provided with exceptions and cursors for the real time scenario	Apply
CO 4: Apply the concept of triggers with database connectivity for web based applications	Apply

Reference Book(s):

R1.   M. A. Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2011

R2.   Abraham Silberschatz, Hentry F. Korth   and   S. Sudharssan,"Database System Concepts", 6th Edition, Tata McGraw Hill, 2019

R3.   Structures using C, ISRD Group, 2nd Edition, McGraw Hill2013

R4.   Data Structures and Database Management System Laboratory – Manual.

R5.   Raghu Ramakrishna & Johannes Gerhrke, "Database Management System", McGrawHill,3rd Edition, 2010

Web References:

1.   http://nptel.ac.in/courses/106106093/

2.   https://www.coursera.org/specializations/data-structures-algorithms

Course Code: 19CACN3101	Course Title: Mini Project - I		
Course Category: Project		Course Level: Practice	
L:T:P(Hours/Week) 0: 0: 6	Credits: 3	Total Contact Hours: 60	Marks:100

Pre-requisites

> ➤ NIL

Course Objectives

The course is intended to:
1. Identify the business problems.
2. Applying the software development life cycle (SDLC) methodology to specific business problems.
3. Develop a trivial application on specific domains
4. Preparing the mini project report and examining.
5. Effectively present the project's results in both written and verbal forms.

The objective of Mini Project - I is to enable the student to develop an application software in the broad field of information technology, either fully practical work to be assigned by the department on an individual basis under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) in software development work. The assignment to normally include:

1. The progress of the mini project is evaluated based on a minimum of three reviews
2. The review committee may be constituted by the Head of the Department.
3. A mini project report is required at the end of the semester.
4. The mini project work is evaluated based on oral presentation and the mini project report evaluates by internal examiners constituted by the Head of the Department.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1:Obtain exposure in order to gather needs for a specific business problem.	Apply
CO 2:Design an application for a specific business problem with a particular domain	Apply
CO 3:Appropriately explain the project's results with implementation and functionality for the users in both written and verbal form.	Apply

Course Code: 19CACN1201	Course Title: Computer Networks		
Course Category: Professional Core	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

> ➢ NIL

Course Objectives

The course is intended to:

1. Explain the basic components of networks model
2. Utilize the error detection techniques and network architecture provided in   the data link layer
3. Apply the routing algorithm to find the best route
4. Select the suitable transport layer protocol and congestion control mechanism
5. Apply the concepts of application layer protocols and services provided in the network

Unit I   Data Communications   9 Hours

Data Communications –Components – Data flow – Physical structures   Network types – Network Models ISO/OSI model–TCP/IP Model –Line Coding- Transmission Media

Unit II   Data Link Layer   9 Hours

Error – Detection and Correction – Data Link Control-Flow control-Simple Protocol-Stop and Wait Protocol – Ethernet- IEEE 802.3- 802.11 – Connecting Devices –VLAN

Unit III   Network Layer   9 Hours

Services –Switching concepts – Circuit switching – Packet switching –IP-Datagram-Ipv4 Address– Sub netting - Network Address Translation (NAT)-Ipv6–ICMP-Routing Algorithms – Distance-Vector Routing- Link-State Routing-BGP

Unit IV   Transport Layer   9 Hours

Transport layer –services –Connection establishment – Flow control – Transmission control protocol – Congestion control and avoidance – User datagram protocol. –Transport for Real Time Applications (RTP)

Unit V   Application Layer   9 Hours

Applications – DNS – SMTP – FTP –WWW – SNMP- Security –RSA- DES –Web security –SSL – PGP-Firewall.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the basic components of networks model for data communication	Understand
CO 2: Utilize the error detection techniques and network architecture provided in the data link layer for a given scenario.	Apply
CO 3: Apply the routing algorithm suitable for a given network.	Apply
CO 4: Select the suitable transport layer protocol and congestion control mechanism for a given traffic scenario.	Apply
CO 5: Apply the concepts of application layer protocols and services provided in the network based on the requirements of an application	Apply

Reference Book(s):

R1.   Behrouz A. Forouzan ,"Data Communications and Networking", 5th Edition, McGraw Hill, 2015

R2.   William Stallings, Data and Computer Communications, 9th Edition, Prentice Hall, 2011

R3.   Larry L. Peterson & Bruce S. Davie, Computer Networks – A systems Approach", 4th Edition, Harcourt Asia / Morgan Kaufmann, 2008

R4.   James F. Kurose, Keith W. Ross, Computer Networking: A Top-down Approach, Pearson Education, Limited, 6thEdition, 2012

R5.   Andrew S. Tannenbaum David J. Wetherall, Computer Networks", 5th Edition, Pearson Education 2011

Web References:

1.   https://nptel.ac.in/courses/106/106/106106091/

2.   https://www.classcentral.com/course/fundamentals-network-communications-9267

Course Code: 19CACN1202	Course Title: Software Engineering		
Course Category: Professional Core	Course Level: Mastery		
L:T:P(Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours: 60	Marks:100

Pre-requisites

➢ NIL

Course Objectives

The course is intended to:

1. Infer the concepts of linear Generic & Prescriptive Process, Agile Process & Extreme Programming.
2. Understand the software requirements and design
3. Draw the diagrams using notations unified modeling language.
4. Analyze the various testing strategies and SCM.
5. Analyze the software quality management

Unit I   Introduction   12 Hours

Introduction to Software Engineering – Prescriptive Process Models: Waterfall, Incremental, Prototyping, and Spiral Model – Agile Development: Agile Process –Scrum.

Unit II   Software Requirements &Design   12 Hours

Requirements Modeling: Scenario–Based, Data- based, Class–Based, Flow–Oriented, Behavioral Modeling. Software Design: Design Models.

Unit III   Unified Modeling Language   12 Hours

Introduction – Use case – Class diagram - Sequence Diagram -Package Diagram - State Machine Diagram - Activity Diagram - Collaboration Diagram – Interaction Diagram.

Unit IV   Testing and Maintenance   12 Hours

Test Strategy for Conventional Software: unit testing – Integration Testing. Validation Testing: validation test criteria –Alpha and Beta Testing. System Testing- Recovery Testing – stress Testing- performance Testing. Testing Conventional Applications: White box testing – Black box testing. Software Configuration Management: SCM Repository –SCM Process.

Unit V   Quality Management   12 Hours

Review techniques: cost impact of software defects - review metrics and their use- formal technical reviews. Software quality assurance: SQA tasks, goals, and metrics - software reliability.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the concepts of linear Generic & Prescriptive Process, Agile Process & Extreme Programming for software lifecycle.	Understand
CO 2: Express the software requirements and design for real time projects.	Understand
CO 3: Draw the diagrams using notations unified modeling language for real time projects.	Apply
CO 4: Apply the various testing strategies and SCM for real time projects	Apply
CO 5: Analyze the software quality management for real time projects	Apply

Reference Book(s):

R1.   Roger Pressman S," Software Engineering: A Practitioner's Approach", Tata McGraw Hill, 8th Edition, 2019

R2.   Martin Fowler, "UML Distilled", Pearson Education, 3rd Edition,2003.(Reprint)

R3.   Ian Sommerville, "Software Engineering", Pearson Education, 9th Edition, 2010

R4.   Pfleeger and Atlee, "Software Engineering", Pearson Education, 4th Edition, 2009

Web References:

1.   http://nptel.ac.in/courses/106105087/

2.   http://nptel.ac.in/courses/106101061/

Course Code: 19CACN1203	Course Title: Python Programming		
Course Category: Professional Core	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

➢ 19CACN1102 Programming in C

Course Objectives

The course is intended to:
1. Demonstrate the basic features of the python language.
2. Apply the data structure concepts in python.
3. Apply the object oriented features and GUI designing using tkinter in python.
4. Apply the concepts of web development in python using Django framework.
5. Apply the python libraries and data visualization concepts in data analysis.

Unit I   Introduction to Python   9 Hours

Variables, Expressions and Statements – Functions - Interface Design-Conditionals and Recursion Fruitful Functions- Iteration.

Unit II   Data Structures in Python   9 Hours

Strings - Word Play – Lists – Dictionaries - Tuples- Data Structure Selection – Files.

Unit III   Oops Concepts in Python   9 Hours

Classes and Objects - Classes and Functions - Classes and Methods – Inheritance - Tkinter: GUI - Buttons and Callbacks - Canvas Widgets-Coordinate Sequences - More Widgets - Packing Widgets - Menus and Callable – Binding.

Unit IV   Web Development in Python   9 Hours

Django on web-creating a Django project-Hello world with Django-Working with templates -Working with models-working with Django forms.

Unit V   Data Analysis in Python   9 Hours

Data analysis and processing – Overview of libraries in data analysis-Python libraries in data analysis numpy arrays and vectorized computation-Data analysis with Pandas-Data visualization.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Demonstrate the basic features of the python language using variables, expressions and functions.	Apply
CO 2: Apply the data structure concepts in python for an application using list, tuples and dictionaries.	Apply
CO 3: Apply the object oriented features using tkinter in python for GUI based application.	Apply
CO 4: Apply the concepts of web development in python using Django framework for website development.	Apply
CO 5: Apply the python libraries and data visualization concepts in data analysis for real time scenario.	Apply

Reference Book(s):

R1.   Allen Downey, "Think Python", Second Edition, Green Tea Press, 2018

R2.   Samuel Dauzon, Aidas Bendoraitis, Arun Ravindran, "Django: Web Development with python", Packt Publisher, 2016

R3.   Phuong Vo.T.H, Martin Czygan,"Getting started with python Data Analysis", Packt Publisher, 2015

R4.   Laura Cassell, Alan Gauld, "Python Projects", Wrox Publication, 2015

R5.   Jeffrey Elkner, Chris Meyers Allen Downey, "Learning with Python", Fourth Edition, Dream Tech Press Publication, 2015

R6.   Adrian Holovaty, Jacob Kaplan-Moss, et al, "The Django Book" Release 2.0, 2013

R7.   Wes McKinney,"Python for Data Analysis", First Edition, O'Reilly Publication, 2013

Web References:

1.   https://www.coursera.org/learn/python

2.   https://pythonprogramming.net/design-bootstrap-django-python-tutorial/

3.   https://pythonprogramming.net/data-analysis-python-pandas-tutorial-introduction/

Course Code: 19CACN1204	Course Title: Java Programming		
Course Category: Professional Core	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0:0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

> ➢ 19CACN1102 Programming in C

Course Objectives

The course is intended to:

1. Apply the operators, control structures, classes and objects
2. Apply the exception handling and multithreading
3. Apply the various collections.
4. Apply the various string manipulation functions.
5. Apply the AWT concepts.

Unit I   Java Fundamentals & Classes   9 Hours

Java Fundamentals: Introduction – Overview of Java virtual machine- Data types, variable, arrays, expressions, operators, and control structures. Classes and Objects: Classes – Objects – Abstract classes- Static classes- Inner classes- Method Overloading- Inheritance, Constructors and Method Overriding.

Unit II Packages and Multithreading   9 Hours

Packages - Packages and Access Protection Exception Handling: try and catch block - Multiple catch block -Nested try - finally block - throw keyword - Exception Propagation - throws keyword - Custom Exception. Multithreading: Life Cycle of a Thread - Creating Thread- Thread Scheduler - Sleeping a thread - Thread priorities and synchronization – inter - thread communication–Multi-threading.

Unit III   Java Utilities   9 Hours

Collections overview - classes and interfaces - Iterator and User-defined classes - comparators and collection algorithms- Arrays, generic collections, legacy classes and interfaces - String tokenizer.

Unit IV   Input Output Streams   9 Hours

Java I/O classes and Interfaces - File Concepts - Stream class: byte stream and character stream – Serialization - String handling: String operations - String comparison: Searching, Modifying and Conversion.

Unit V   AWT and Event Handling   9 Hours

Applet class: Basics and Architecture - HTML tags - Event handling - Event listener interfaces - AWT classes and Window fundamentals – AWT controls.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Apply the operators, control structures, classes and objects in the given problem	Apply
CO 2: Apply the exception handling and multithreading in given problem	Apply
CO 3: Apply the collection classes and interfaces in given applications.	Apply
CO 4: Apply the string and string buffer classes in the given problem.	Apply
CO 5: Develop an application using AWT controls	Apply

Reference Book(s):

R1.   H. M. Deitel, P. J. Deitel, "Java How to Program", 9th Edition, Prentice Hall, 2014

R2.   H. M.Deitel, P. J. Deitel, S. E. Santry," Advanced Java 2 Platform How to program", Prentice Hall, 2012

R3.   Antonio Goncalves, "Beginning Java EE 7", Apress publication, 2013

R4.   Herbert Schildt,"The Complete Reference JAVA2", 9th edition, Tata McGraw-Hill, 2014

Web References:

1.   http://www.tutorialspoint.com/java

Course Code: 19CACN2201	Course Title: Python Programming Laboratory			
Course Category: Professional Core		Course Level: Practice		
L:T:P(Hours/Week) 0: 0:4	Credits:2	Total Contact Hours: 60		Marks:100

Pre-requisites

> ➢ 19CACN1102 Programming in C

Course Objectives

The course is intended to:

1. Apply the tkinter package in python
2. Implement the packages using Django framework
3. Develop a project using django with database connection
4. Build the numpy packages in python
5. Apply the pandas library in python

List of Experiments:

1. Develop a simple GUI database application using tkinter package.
2. Install and configure the packages required to develop a website using Django.
3. Develop a Django project working with database connection.
4. Implement the numpy packages for arrays in python.
5. Experiment with Pandas library to perform data analysis in python.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	**Cognitive Level**
CO 1: Apply the tkinter package in python for GUI application	Apply
CO 2: Implement the packages using django framework for website development.	Apply
CO 3: Develop a django project with database connection for real time application	Apply
CO 4: Build the numpy packages for arrays in python	Apply
CO 5: Apply the pandas library for data analysis in python	Apply

Reference Book(s):

R1.   Allen Downey, "Think Python", Second Edition, Green Tea Press, 2018

R2.   Samuel Dauzon, Aidas Bendoraitis, Arun Ravindran, "Django:Web Development with python", Packt Publisher, 2016

R3.   Phuong Vo.T.H, Martin Czygan, "Getting started with python Data Analysis", Packt Publisher, 2015

R4.   Laura Cassell, Alan Gauld, "Python Projects", Wrox Publication, 2015

R5.   Jeffrey Elkner, Chris Meyers Allen Downey, "Learning with Python", Fourth Edition Dream Tech Press Publication, 2015

R6.   Adrian Holovaty, Jacob Kaplan-Moss, et al,"The Django Book" Release 2.0, 2013

R7.   Wes McKinney, "Python for Data Analysis", First Edition, O'Reilly Publication, 2013

Web References:

1.   https://www.coursera.org/learn/python

2.   https://pythonprogramming.net/design-bootstrap-django-python-tutorial/

3.   https://pythonprogramming.net/data-analysis-python-pandas-tutorial-introduction/

Course Code: 19CACN2202	Course Title: Java Programming Laboratory		
Course Category: Professional Core	Course Level: Practice		
L:T:P(Hours/Week) 0: 0:4	Credits:2	Total Contact Hours: 60	Marks:100

Pre-requisites

➢ 19CACN1102 Programming in C

Course Objectives

The course is intended to:

1. Develop an application using control structures and OOPS concepts.
2. Develop an application using Multithread
3. Develop an application using Collection and Exception handling
4. Develop an application using Event handling
5. Develop an application using JDBC

List of Experiments:

1. Develop an application using custom Package

2. Develop an application using Multithreading with synchronization

3. Develop an application using Collection and Exception Handling

4. Develop an application using AWT controls and Event Handling functions.

5. Develop an application with JDBC

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Apply the various OOPS concepts in a real time application	Apply
CO 2: Develop an application using Multithreading for real time problem.	Apply
CO 3: Develop an application using Collections for real time problem.	Apply
CO 4: Develop an application using Event Handling for real time problem.	Apply
CO 5: Develop an application using JDBC for real time problem.	Apply

Reference Book(s):

R1.   H. M. Deitel, P. J. Deitel, ”Java How to Program”, 9th Edition, Prentice Hall, 2014

R2.   H. M. Deitel, P. J. Deitel, S. E. Santry,” Advanced Java 2 Platform How to program”, Prentice Hall, 2012

R3.   Antonio Goncalves, “Beginning Java EE 7”, Apress publication, 2013

R4.   Herbert Schildt, ”The Complete Reference JAVA 2”, 9th edition, Tata McGraw-Hill, 2014

Web References:

1.   http://www.tutorialspoint.com/java

Course Code: 19CACN3201	Course Title: Mini Project - II		
Course Category: Project		Course Level: Practice	
L:T:P(Hours/Week) 0: 0: 6	Credits: 3	Total Contact Hours: 60	Marks:100

Pre-requisites

- ➢ 19CACN1101 - Web Technology
- ➢ 19CACN1104 - Database Management Systems

Course Objectives

The course is intended to:

1. Identify the business problems.
2. Applying the software development life cycle (SDLC) methodology to specific business problems.
3. Develop a trivial application on specific domains
4. Preparing the mini project report and examining.
5. Effectively present the project's results in both written and verbal forms.

The objective of Mini Project - II is to enable the student to develop an application software in the broad field of information technology, either fully practical work to be assigned by the department on an individual basis under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) in software development work. The assignment to normally include:

1. The progress of the mini project is evaluated based on a minimum of three reviews
2. The review committee may be constituted by the Head of the Department.
3. A mini project report is required at the end of the semester.
4. The mini project work is evaluated based on oral presentation and the mini project report evaluates by internal examiners constituted by the Head of the Department.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Obtain exposure in order to gather needs for a specific business problem.	Apply
CO 2: Design an application for a specific business problem with a particular domain	Apply
CO 3: Appropriately explain the project's results with implementation and functionality for the users in both written and verbal form.	Apply

Course Code: 19CACN1301	Course Title: Machine Learning		
Course Category: Professional Core		Course Level: Mastery	
L:T:P(Hours/Week) 3: 1: 0	Credits: 4	Total Contact Hours: 60	Marks:100

Pre-requisites

➢ 19CAFN1101- Probability and Statistics
➢ 19CAEN1004 - Data Mining and Data Warehousing

Course Objectives

The course is intended to:

1. Express the concepts of supervised learning systems.
2. Apply the techniques of parametric and non-parametric classification.
3. Apply the process of various clustering algorithm
4. Apply construction decision tree using diverse methods
5. Apply knowledge of reinforcement learning models.

UNIT I   Introduction and Supervised Learning   12 Hours

Introduction – Examples of ML Applications - Supervised Learning: Learning from examples –VC dimension – Handling Noise – Model selection and Generalization –Dimensions of a supervised Machine learning.

Unit II   Parametric Models and Non-Parametric Models   12 Hours

Parametric Models: Maximum Likelihood Estimation – Baye's Estimators –Parametric Classification- model selection procedures. Non-Parametric Models: Density Estimation – Generalization to Multivariate data –Non parametric Classification.

Unit III   Clustering & Assessing and Comparing Classification   12 Hours
                Algorithms

Clustering: Introduction: k-Means Clustering - Supervised Learning after Clustering- Hierarchical Clustering- Choosing the Number of Clusters. Assessing and Comparing Classification Algorithms: Introduction –Cross validation and resampling methods – Measuring error – Hypothesis testing.

Unit IV   **Decision Trees and Linear Discrimination**   **12 Hours**

Decision Trees: Introduction - Univariate Trees -Classification Trees - Regression Tree - Rule Extraction from Trees -Learning Rules from Data. Linear Discrimination: Introduction - Generalizing the Linear Model –Geometry of Linear discriminant- Pair wise separation.

Unit V   **Reinforcement Learning**   **12 Hours**

Introduction - Elements of Reinforcement Learning - Model-Based learning: Value iteration-policy iteration - Temporal Difference Learning: Exploration strategies, Deterministic and non-deterministic Rewards and actions –Generalization – partially observable states.

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO 1: Infer concepts of supervised learning systems to apply in learning models.	Understand
CO 2: Apply the techniques of parametric, non-parametric models and non-parametric classification for information classification.	Apply
CO 3: Apply process of various clustering algorithm and concepts assessing and comparing Classification algorithms to improve efficiency.	Apply
CO 4: Apply construction decision tree using diverse methods and analyze using linear discrimination techniques for storing datasets.	Apply
CO 5: Apply knowledge of reinforcement learning models for learning models.	Apply

Reference Book(s):

R1.   Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, Third Edition 2018

R2.   Muller Andreas C, Guido Sarah, "Introduction to Machine Learning With Python: A Guide to Data Scientist", Third Edition, 2017

R3.   Per Harrington, "Machine Learning in Action", Wiley India Pvt Ltd, 2012

R4.   Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012

R5.   Stephen Marsland, "Machine Learning - An Algorithmic Perspective", CRC Press, 2009

Web References:

1.   https://onlinecourses.nptel.ac.in/noc16_cs03/

2.   https://onlinecourses.nptel.ac.in/noc16_cs18

Course Code: 19CACN1302	Course Title: Cloud Computing		
Course Category: Professional Core		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours: 45	Marks:100

Pre-requisites

> 19CACN1201 Computer Networks

Course Objectives

The course is intended to:
1. Illustrate the architecture , characteristics and services of cloud computing
2. Plan for the issues of building cloud networks for an enterprise
3. Apply managing and resource sharing in cloud systems
4. Identify the issues in the deployment model of private/public/Hybrid cloud
5. Illustrate the application of Cloud in business and scientific domains.

Unit I   Cloud Computing and Migrating Into Cloud   9 Hours

Cloud Computing in a Nutshell – Roots of Cloud Computing – Layers and Types of Clouds – Desired Features of a Cloud – Cloud Infrastructure Management – Infrastructure as a Service Providers – Platform as a Service Providers – Challenges and Risks Migrating into a Cloud- Broad Approaches to Migrating into the Cloud – The Seven-Step Model of Migration into a Cloud

Unit II   Building Cloud Networks (IAAS)   9 Hours

MSP Model to Cloud -Computing and Software-as-a-Service - From Single-Purpose Architectures to Multipurpose Architectures - Data Center Virtualization-The Cloud Data Center –Collaboration-Enterprise Cloud Computing Paradigm-Introduction – Background – Issues for Enterprise Applications on the Cloud – Transition Challenges -Business Drivers–The Cloud Supply Chain.

Unit III   Management Cloud Infrastructures   9 Hours

Virtual Machines Provisioning and Migration Services-Introduction-Background– Virtual Machines Provisioning and Manageability – Virtual Machine Migration Services-Anatomy of Cloud Infrastructures Distributed Management of Virtual Infrastructures –Scheduling Techniques for Advance Reservation of Capacity.

Unit IV   Platform and Software as a Service (PAAS)   9 Hours

Secure Distributed Data Storage-Introduction – Cloud Storage: from LANs to WANs- Technologies for Data Security in Cloud Computing Integration of

Private and Public Clouds–Introduction –Technologies and Tools for Cloud Computing –Aneka Cloud Platform – Aneka Resource Provisioning Service – Hybrid Cloud Implementation

Unit V   Applications   9 Hours

Scientific Applications - Business and Consumer Applications - Energy Efficiency in Clouds - Market Based Management of Clouds - Federated Clouds / Inter cloud - Third Party Cloud Services.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Illustrate the architecture , characteristics and services of cloud computing of different deployment models	Understand
CO 2: Plan for the issues of building the cloud network with enterprise network	Apply
CO 3: Apply open-source solutions for managing cloud systems and evaluate their applicability for cloud-based resource sharing	Apply
CO 4: Identify the issues in the deployment model of private/public/Hybrid cloud for Aneka Cloud Platform	Apply
CO 5: Illustrate the applications of Cloud in business and scientific domains by exploring various case studies	Apply

Reference Book(s):

R1.   Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing Principles and Paradigms", John Wiley & Sons, 2014

R2.   John W. Rittinghouse, James F. Ransome, "Cloud Computing Implementation, Management and Security,"CRC Press,2014

R3.   Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012

R4.   RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi,"Mastering Cloud Computing",TMGH, 2013

R5.   Anthony T. Velte, Toby J. Velte, Ph.D., Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill, 2009

Web References:

1.   http://nptel.ac.in/courses/106105033/41

2.   http://nptel.ac.in/courses/106106129/28

3.   https://aws.amazon.com/

4.   https://cloud.google.com/

Course Code: 19CACN1303	Course Title: Big Data Analytics		
Course Category: Professional Core	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

- ➤ 19CACN1104Database Management Systems
- ➤ 19CAEN1004Data Warehousing and Data Mining

Course Objectives

The course is intended to:

1. Explain the paradigm of Big data
2. Describe the features of NoSQL
3. Describe the features of Mongo DB
4. Demonstrate the Hadoop commands
5. Develop Map Reduce programming model

Unit I   Introduction to Big Data   8 Hours

Classification of Digital Data, Structured Data, Semi-Structured data, Unstructured Data, Characteristic of Data, Evolution of Big Data, Definition of Big Data, 3Vs of Data- Volume, Velocity and Variety, Big Data requirement, Traditional Business intelligent versus Big Data. Introduction to Big Data Analytics.

Unit II   NoSQL   9 Hours

NoSQL (Not only SQL): Use of NoSQL, Types of NoSQL, Advantages of NoSQL. Use of No SQL in Industry, NoSQL Vendors, SQL versus NoSQL, NewSQL.

Unit III   MONGODB   9 Hours

MongoDB definition, MongoDB Using JSON, creating and generating unique key, support for dynamic queries, Replications, Sharding, Create Database and Drop Database, MongoDB Query Language.

Unit IV   HADOOP   10 Hours

Hadoop: Features of Hadoop, Version of Hadoop, Hadoop Ecosystems, Hadoop Distributions, Hadoop versus SQL. Hadoop definition, Not RDBMS , RDBMS versus Hadoop, Distributed computing challenges, Hadoop Components, HDFS (Hadoop Distributed File System), HDFS Daemons, Anatomy of File read, Write, Replica management Strategy, working with HDFS Commands, Processing Data with Hadoop, Managing Resources and applications with Hadoop YARN (Yet Another Resource Negotiator).

Unit V   Map Reduce Programming   9 Hours

Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression, Interacting With Hadoop Ecosystem, Pig, Hive, Sqoop, HBase, Introduction to Hive, Hive Query Language.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the paradigm of Big data	Understand
CO2: Describe the features of NoSQL in Big data scenario.	Understand
CO3: Describe the features of MongoDB in Big data scenario.	Understand
CO4: Demonstrate the Hadoop commands for distributed data processing.	Apply
CO5: Develop Map Reduce programming model for distributed computation.	Apply

Reference Book(s):

R1.   Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley, 2018

R2.   Tom White, "Hadoop: The Definitive Guide", O'Reilly Publication, 2015

R3.   Chuck Lam, "Hadoop in action", Dream Tech Press, Reprint Edition, 2016

R4.   Vignesh Prajapati, "Big Data analytics with R and Hadoop", PACKT Publishing, 201

R5.   Chodorow Kristina, "MongoDB : Definitive Guide", O'Reilly Publication, 2014

Web References:

1.   http://nosql-database.org/
2.   http://www.mongodb.com/nosql-explained
3.   http://hadoop.apache.org/
4.   https://ipython.org/notebook.html

Course Code: 19CACN2301	Course Title: Software Testing Laboratory	
Course Category: Professional Core	Course Level: Practice	
L:T:P(Hours/Week) 0: 0: 4	Credits:2	Total Contact Hours: 60	Marks:100

Pre-requisites

➢ 19CACN1202 Software Engineering

Course Objectives

The course is intended to:

1. Apply the testing basic concepts, tools and techniques.
2. Apply Selenium tool for test cases and test suite.
3. Apply the testing operation.
4. Apply the website load testing.

List of Experiments:

1. Study and draw the following class diagram, Deployment Diagram, Sequence Diagram, using rational rose for any typical applications.
2. Develop Java program to perform JUnit testing to demonstrate test cases success and failure.
3. Develop Java program to perform the web application connectivity test case using Selenium tool.
4. Develop Java program to create a test suite for Gmail login page using Selenium tool.
5. Develop a Java program to perform load testing using Jmeter.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Apply the testing basic concepts, tools and techniques for UML diagrams.	Apply
CO 2: Apply the testing operation for Junit testing.	Apply
CO 3: Apply Selenium tool for test cases for the given application.	Apply
CO 4: Apply the website load testing using Jmeter	Apply

Reference(s):

R1.   Roger Pressman S.,"Software Engineering: A Practitioner's Approach", Tata McGraw Hill,Seventh Edition, 2019

R2.   Software Testing Laboratory–Manual

Course Code: 19CACN2302	Course Title: Cloud Computing Laboratory		
Course Category: Professional Core	Course Level: Practice		
L:T:P(Hours/Week) 0: 0: 4	Credits:2	Total Contact Hours: 60	Marks:100

Pre-requisites

- ➤ 19CACN1201 Computer Networks
- ➤ 19CACN1204 Java Programming

Course Objectives

The course is intended to:

1. Apply the virtualization tools in cloud environment
2. Make use of open-source solutions in cloud hosting

List of Experiments:

1. Network adapter connection in oracle virtual box
2. Deploying an Java Web Application using Amazon-EC2
3. Hosting a Static Website using Amazon S3
4. Deploy python/Java application using Google cloud app engine

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Apply the virtualization tools to set up private cloud environment and run application on it.	Apply
CO 2: Make use of open-source solutions for developing web applications in cloud.	Apply

Reference Book(s):

R1.   Barrie Sosinsky,"Cloud Computing Bible",First edition Wiley Publisher,2013
R2.   Cloud Computing Laboratory – Manual

Course Code: 19CACN2303	Course Title: Big Data Analytics Laboratory			
Course Category: Professional Core	Course Level: Practice			
L:T:P(Hours/Week) 0: 0: 4	Credits:2	Total Contact Hours: 60		Marks:100

Pre-requisites

- ➢ 19CACN1204 Java Programming
- ➢ 19CAEN1004 Data Mining and Data Warehousing

Course Objectives

The course is intended to:

1. Ilustrate the MongoDB commands

2. Demonstrate the various plots and statistical functions using R

3. Demonstrate a MapReduce application in a Hadoop

List of Experiments:

1. Execute the MongoDB basic commands with suitable collection.

2. Execute the MapReduce function in MongoDB with suitable collection.

3. Demonstrate the Boxplots and Scatterplots with an appropriate data set in the R environment.

4. Demonstrate the simple Linear Correlation and Regression with an appropriate data set using R.

5. Develop a Map Reduce application that counts the number of occurrences of similar words either from a single file or multiple file in a Hadoop.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Deploy MongoDB queries.	Apply
CO 2: Demonstrate the various plots and statistical functions using R	Apply
CO 3: Develop, debug, optimize and deploy MapReduce application in Hadoop	Apply

Reference Book(s):

R1.   Seema Acharya, Subhashini Chellappan, Big Data and Analytics, Wiley, 2018

R2.   Chodorow Kristina, MongoDB : Definitive Guide, O'Reilly Publication, 2014

R3.   Big Data Analytics Laboratory – Manual

Course Code: 19CACN5401	Course Title: Project Work		
Course Category: Project		Course Level: Practice	
L:T:P(Hours/Week) 0: 0: 14	Credits: 12	Total Contact Hours: 240	Marks:100

Pre-requisites

- ➤ 19CACN1204 - Java Programming
- ➤ 19CACN1203 – Python Programming
- ➤ 19CACN1301 – Machine Learning
- ➤ 19CACN1303 – Big Data Analytics

Course Objectives

The course is intended to:

1. Develop the ability to solve a specific business problem, from requirement gathering through producing the solution.
2. Preparing project reports and to face reviews and viva voce examination.
3. Effectively communicate the results of projects in a written and oral format

The goal of the project work is for the student to develop an application software in the software industry on an individual basis, with the help of industry and department experts. This is expected to provide a good initiation for the student(s) in industry work. The assignment to normally include:

1. Under the supervision of a faculty member from industry and the department, the students work independently on a problem provided by the industry and prepare a detailed project report after completing the task to the satisfaction of the supervisor (s).

2. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

3. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly with external and internal examiners constituted by the Head of the Department.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1:On Completion of the project work students will be in a position to take up any challenging practical problems and find solutions by formulating a proper methodology.	Apply
CO 2:Ensure that system development requirements are well defined and subsequently satisfied	Create
CO 3:Deliver quality systems that meet or exceed customer expectations when promised and within cost estimates	Create

List of Professional Electives

Course Code: 19CAEN1001	Course Title: Security in Computing	
Course Category: Professional Elective	Course Level: Mastery	
L:T:P(Hours/Week): 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

➤ 19CACN1201 Computer Networks

Course Objectives

The course is intended to:

1. Apply the encryption standards and symmetric cipher techniques.
2. Apply the public key Encryption Algorithm.
3. Develop the Digital Signatures and Hash Algorithm.
4. Build the Key Generation and Distribution Algorithm.
5. Apply the concepts of Computer Security

Unit I   Introduction to Security and Encryption Techniques   9 Hours

Overview - Computer Security Concepts - the OSI security architecture –Security Attacks-Security Services-Security Mechanisms - Classical Encryption techniques- Block Ciphers and the Data Encryption Standard.

Unit II   Public Key Encryption Algorithms   9 Hours

Number Theory - Public-Key cryptography and RSA – Diffie-Hellman Key Exchange – ElGamal Cryptographic system- Elliptic Curve arithmetic - Elliptic Curve Cryptography

Unit III   Digital Signatures and Hash Algorithms   9 Hours

Cryptographic Hash functions-Message authentication codes-Security of MACs-MAC based on Hash Functions: HMAC-MACs based on Block cipher: DAA and CMAC-Digital Signatures.

Unit IV   Key Management and Distribution   9 Hours

Symmetric Key Distribution Using Symmetric Encryption- Symmetric Key Distribution Using Asymmetric Encryption-Distribution of Public Keys-X.509 Certificates-Public-Key Infrastructure-User Authentication.

Unit V   Security at Layers and Computer Security   9 Hours

Network Access control-Data Protection in the cloud-Cloud security as a Service-Transport layer security-HTTPS-Secure Shell(SSH)-Wireless Security - Mobile Device Security-Pretty Good Privacy-IP Security.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply the encryption standards and symmetric cipher techniques for the given input text	Apply
CO2: Apply the public key Encryption Algorithm to solve the given problem	Apply
CO3: Develop the Digital Signatures and Hash Algorithm for the given input message	Apply
CO4: Build the Key Generation and Distribution Algorithm for a real time application	Apply
CO5: Apply the concepts of Computer Security for data communication	Apply

Reference Book(s):

R1. William Stallings,"Cryptography and Network Security: Principles and Practice",5th Edition, Pearson Education, March 2017

R2. Charles P. Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", Pearson Education, 2009

R3. Bruce Schneier, "Applied Cryptography", John Wiley, 2008

R4. Douglas R Simson "Cryptography – Theory and practice", Third Edition, CRC Press, 2006

R5. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003

Web References:

1. http://nptel.ac.in/courses/106105031/
2. http://williamstallings.com/Cryptography/
3. https://www.cse.iitk.ac.in/users/braman/cs425/slides/security-overview.pdf

Course Code: 19CAEN1002	Course Title: Block Chain Management		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

> ➢ 19CACN1201 Computer Networks

Course Objectives

The course is intended to:

1. Infer the fundamentals of Block chain management
2. Express the block chain contracts.
3. Infer the block chain 3.0
4. Apply the block chain management learning for applications
5. Apply the emerging technologies in advanced concepts

Unit I   Block Chain Currency 1.0   9 Hours

Technology stack: block chain, Protocol, currency – How a crypto currency works-summary: Relation to fat currency- Regulatory status.

Unit II   Block Chain2.0: Contracts   9 Hours

Financial Services-Crowd funding – Bit coin markets - Smart property –smart contracts wallet Development Projects – Block Development Platforms and API.

Unit III   Block Chain 3.0 – Part I   9 Hours

Name coin -Digital Identify verification- Digital Art –Block chain Government.

Unit IV   Block Chain 3.0 – Part II   9 Hours

Global public health–block chain genomics- block health – block chain learning block academic publishing.

Unit V   Advanced Concepts   9 Hours

Terminology and concepts –currency, token, tokenizing –currency multiplicity – Demurrage currencies.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Express the fundamentals of Block chain management for real applications.	Understand
CO2: Explain the block chain contracts for real applications.	Understand
CO3: Apply the block chain 3.0 for real applications.	Apply
CO4: Apply the block chain management learning for real applications.	Apply
CO5: Apply the emerging technologies in advanced concepts for real applications.	Apply

Reference Book(s):

R1.   Melanie Swan," Block Chain: Blue Print For A New Economy", O Reilly publisher, 2018

R2.   Manav Gupta, "Block chain for dummies" IBM Limited Edition,2017

R3.   Sainul Abideen ,"Block chain Expert– E-Book", Cybrosys technologies, 2014

Web References:

1.   https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/

Course Code: 19CAEN1022	Course Title: Wireless Networking		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

> ➢ 19CACN1201 Computer Networks

Course Objectives

The course is intended to:

1. Illustrate the concept about Wireless networks, protocol stack and standards
2. Analyze the network layer solutions for Wireless networks
3. Apply the fundamentals of 3G Services, its protocols and applications
4. Apply the internetworking of WLAN and WWAN
5. Explain the evolution of 4G Networks, its architecture and applications

Unit I   **Wireless LAN**   **9 Hours**

Introduction-WLAN technologies: - IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, Wireless HART

Unit II   **Mobile Network Layer**   **9 Hours**

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT:CoAP

Unit III   **3G Overview**   **9 Hours**

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA

Unit IV   **Internetworking Between WLANS And WWANS**   **9 Hours**

Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

Unit V   4G & Beyond   9 Hours

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Illustrate the wireless LAN technology and architecture	Understand
CO 2: Design and implement the wireless network environment for any application using latest wireless protocols and standards	Analyze
CO 3: Conversant with the latest 3G/4G networks and its architecture	Apply
CO 4: Select the suitable network depending on the availability and requirement	Apply
CO 5: Implement different type of applications for smart phones and mobile devices with latest network strategies	Apply

Reference Book(s):

R1. Gordon Colbach, "Wireless Networking: Introduction to Bluetooth and WiFi", 2017

R2. Nurul Huda Mahmood, Nikolaj Marchenko, Mikael Gidlund, Petar Popovski," Wireless Networks and Industrial IoT", First Edition, 2021

R3. Kurose James F, Ross Keith W, "Computer Networking- A top down approach", Sixth Edition, Pearson, 2017

R4. Jochen Schiller, Mobile Communications, Second Edition, Pearson Education 2012

R5. Simon Haykin , Michael Moher, David Koilpillai, ―Modern Wireless Communications, First Edition, Pearson Education 2013

R6. Vijay Garg, ―Wireless Communications and networkingǁ, First Edition, Elsevier 2007

Web References:

1. https://www.cisco.com/c/en_in/solutions/small-business/resource-center/networking /wireless-network.html

2. https://www.section.io/engineering-education/introduction-to-wireless-networking/

3. https://commotionwireless.net/docs/cck/networking/types-of-wireless-networks/

Course Code: 19CAEN1003	Course Title: Database Architecture and Administration		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

➢ 19CACN1104 Database Management Systems

Course Objectives

The course is intended to:

1. Explain the Oracle 11g Database architecture.
2. Describe the logical, memory, and physical structures of a Database
3. Infer the Monitoring space usage.
4. Execute the Transactions with undo table spaces and Tuning
5. Apply the backup and recovery operations

Unit I   Oracle11g Architecture   9 Hours

An Overview of Databases and Instances - Oracle Logical Storage Structures - Oracle Logical Database Structures.

Unit II   Physical & Memory Structures   9 Hours

Oracle Physical Storage Structures - Multiplexing Database Files - Oracle Memory Structures - Backup/Recovery overview.

Unit III   Monitoring Space Usage   9 Hours

Common Space Management Problems - Oracle Segments, Extents, and Blocks - Data Dictionary Views and Dynamic Performance Views.

Unit IV   Managing Transactions with undo Table Spaces &Tuning   9 Hours

Transaction Basics - Undo Basics - Rollback - Managing Undo Table spaces - Database Tuning: Tuning Application Design - Tuning SQL - Tuning Memory Usage.

Unit V   Backup and Recovery Options & RMAN   9 Hours

Logical Backups - Physical Backups - Using Data Pump Export and Import - Data Pump Import Options - Integration of Backup Procedures - Using Recovery Manager (RMAN): RMAN Features and Components-Overview of RMAN Commands and Options-Backup Operations - Recovery Operations.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the Oracle 11g Database architecture.	Understand
CO2: Describe the logical, memory, and physical structures of a database	Understand
CO3: Infer the Monitoring space usage in a Database administration	Understand
CO4: Execute the Transactions with undo table spaces and Tuning for administration of databases.	Apply
CO5: Apply the Backup and Recovery Operations for administration of databases	Apply

Reference Book(s):

R1. Bob Bryla , Kevin Loney, "Oracle Database 11G DBA Handbook", Oracle Press, McGraw-Hill Edition 2013

R5. Loney Kevin, "Oracle Database 11G: The Complete Reference", Apress, 2013

R6. Lggy Fernandez, "Beginning Oracle Database 11G Administration from Novice to Professional", Apress 2012

R7. John Watsonoca, "Oracle Database 11G: Administration 1 Exam guide", Tata McGraw Hill, Editon 2012

Web References:

1. http://www.oracle-dba-online.com/

2. http://nptel.ac.in/courses/106106093/

Course Code: 19CAEN1004	Course Title: Data Mining and Data Warehousing		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

➢ 19CACN1104 Database Management Systems

Course Objectives

The course is intended to:

1. Explain the architecture of data warehousing
2. Explain the various pre-process steps in data mining
3. Develop the classification algorithms in data mining
4. Apply the various clustering algorithms in data mining
5. Apply data mining techniques in spatial data analysis

Unit I   Introduction to Data Warehouse   9 Hours

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

Unit II   Data Mining & Data Preprocessing   9 Hours

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

Unit III   Classification & Prediction   9 Hours

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree-Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit IV   Clustering   9 Hours

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-

Based Methods – Model- Based Clustering Methods – Clustering High Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

Unit V   Spatial Data Analysis

9 Hours

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Describe the various architectures and main components of a data warehouse.	Understand
CO 2: Explain the data mining pre-process steps for solving real time problems	Understand
CO 3: Develop the classification algorithms for analyze a given data set.	Understand
CO 4: Apply the various clustering techniques for partition a given data set..	Apply
CO 5: Apply data mining techniques for analyze the spatial, multimedia, text and web data.	Apply

Reference Book(s):

R1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Third Edition, Morgan Kaufmann Publishers, 2014

R2. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGrawHill, 2009

R3. Sean Kelly, Data Warehousing in Action, John Wiley & Sons Inc., 2007

Web References:

1.   https://nptel.ac.in/courses/106106093/31

2.   https://nptel.ac.in/courses/110105076/28

3.   https://www.tutorialspoint.com/dwh/

Course Code: 19CAEN1005	Course Title: Information Storage and Management	
Course Category: Professional Elective	Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

➢ 19CACN1104 Database Management Systems

Course Objectives

The course is intended to:

1. Identify the storage technology
2. Select from various storage technologies.
3. Deploy the storage networking technologies
4. Apply the networked storage technologies
5. Apply security measures to safeguard storage

Unit I   Storage Technology   9 Hours

Introduction to Information Storage-Evolution of Storage Architecture - Data Center Infrastructure Virtualization and Cloud Computing-Data Center Environment-Application-Database Management System.

Unit II   Storage Systems Architecture   9 Hours

RAID Implementation Methods-RAID Array Components-RAID Techniques-RAID Levels-RAID Impact on Disk Performance-Intelligent Storage Systems-Components-Storage Provisioning

Unit III   Storage Networking Technologies   9 Hours

Fibre Channel Storage Area Networks- Fibre Channel: Overview-SAN and Its Evolution-Components of FC SAN-FC Connectivity-Virtualization in SAN-iSCSI-FCIP-FcoE.– Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit IV   Networked Storage   9 Hours

Servers versus NAS Devices-Benefits of NAS File Systems and Network File Sharing-Components of NAS-NAS I/O Operation-File-Level Virtualization -Object-Based Storage Devices- Content-Addressed Storage

Unit V   Case Study   9 Hours

Introduction to Business Continuity-Information Availability-BC Terminology - BC Planning Life Cycle- Failure Analysis-Business Impact Analysis-Information Security Framework-Risk Triad-Storage Security Domains.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Identify the storage technology used for information storage management	Understand
CO 2: Select from various storage technologies to suit for required application	Apply
CO 3: Deploy the storage networking technologies for effective data retrieval	Apply
CO 4: Apply the networked storage technologies used in virtualized environment	Apply
CO 5: Apply security measures to safeguard storage of the applications	Apply

Reference Book(s):

R1. Somasundaram Gnanasundaram, Alok Shrivastava," Information Storage and Management", EMC2 John Wiley & Sons, Inc., Second Edition, 2016

R2. Marc Farley, "Building Storage Networks" Tata McGraw Hill , Osborne, 2010

R3. Robert Spalding, "Storage Networks: The Complete Reference" Tata McGraw Hill, 2010

R4. John Watsonoca, "Oracle Database 11G: Administration 1 Exam guide", Tata McGraw Hill, Editon 2012

Web References:

1. https://nptel.ac.in/courses/106108058/

2. https://nptel.ac.in/courses/106105175/25

3. www.e-learningcenter.com/courses/emc-information-storage-and-management-ism-v2

Course Code: 19CAEN1006	Course Title: Information Retrieval Techniques		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Marks:100

Pre-requisites

  ➢ 19CACN1103 Data Structures and Algorithms

Course Objectives

The course is intended to:

1. Explain the basics of information retrieval with pertinence to modeling
2. Apply the information retrieval with query operations
3. Apply the text operations like text classification, clustering and indexing
4. Apply various information retrieval techniques
5. Develop the applications of information retrieval

Unit I   Introduction   9 Hours

Basic concepts – Retrieval process – Classic Information retrieval – set probabilistic models – Structured Text Retrieval models –Retrieval evaluation.

Unit II   Querying   9 Hours

Languages – Keyword based querying –Pattern Matching –Structural Queries – Query Operations – User Relevance Feedback- Text and Multimedia language.

Unit III   Text Operations and User Interface   9 Hours

Document preprocessing –Clustering –Text Compression –Indexing and searching –Inverted files – Boolean Queries –User Interface and Visualization –Query Specification.

Unit IV   Multimedia Information Retrieval   9 Hours

Data Models – Query Languages –Spatial Access Methods –Generic Approach –Two Dimensional Color Images –Feature Extraction.

Unit V   Applications   9 Hours

Searching the web – Challenges – Browsing-Meta-searchers –Parallel Information Retrieval – Distributed Information retrieval.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the basics of information retrieval with pertinence to modeling	Understand
CO 2: Apply the information retrieval with query operations.	Apply
CO 3: Apply the text operations like text classification, clustering and indexing.	Apply
CO 4: Apply various information retrieval techniques for emphasis multimedia IR and web search	Apply
CO 5: Develop the applications of information retrieval for the given scenario	Apply

Reference Book(s):

R1.   Ricardo Baeza-Yates, Bethier Ribeiro - Neto,"Modern Information Retrieval", Second Edition, ACM Press Books, 2019

R2.   Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze,"Introduction to Information Retrieval", Cambridge University Press, 2012

R3.   D.A. Grossman, O. Frieder,"Information Retrieval: Algorithms and Heuristics", Springer,2010

R4.   Stefan Buttcher, Charles L.A.Clarke, "Information Retrieval, Implementing and Evaluating search Engines", Massachusetts Institute of Technology, 2010

Web References:

1.   https://nptel.ac.in/courses/106108058/

2.   https://nptel.ac.in/courses/106105175/25

3.   www.e-learningcenter.com/courses/emc-information-storage-and-management-ism-v2

Course Code: 19CAEN1007	Course Title: Software Project Management		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

➢ 19CACN1202 Software Engineering

Course Objectives

The course is intended to:
1. Explain the process of project management and stepwise project planning
2. Apply the evaluation techniques and forecasting involved in Software projects development
3. Apply the techniques available for software effort estimation
4. Apply the risk management analysis techniques
5. Apply the project control metrics

Unit I   Introduction To Software Project Management   9 Hours

Definition – Contract Management – Activities Covered by Software Project Management – Overview of Project Planning – Stepwise Project Planning

Unit II   Project Evaluation   9 Hours

Strategic Assessment – Technical Assessment – Cost Benefit Analysis –Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

Unit III   Software Effort Estimation   9 Hours

Problems with over and under estimates-Software effort estimation techniques – Function Point- Object Point – COCOMO Parametric Model.

Unit IV   Risk Management   9 Hours

Nature of Risk – Managing Risk – Risk Identification – Risk Analysis – Reducing the Risk – Evaluating risks to the schedule. Monitoring And Control: Creating Framework – Collecting the Data – Visualizing Progress – Cost Monitoring–Earned Value–Prioritizing Monitoring –Getting Project Back to Target– Change Control

Unit V   Project Control Metrics   9 Hours

The seven core metrics -management indicators -quality indicators -life cycle expectations – pragmatics software metrics - metrics automation. Change Metrics: Overview –Metrics Derivation –Pragmatic Metrics.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the process of project management and stepwise project planning for delivering successful software projects	Understand
CO 2: Apply the evaluation techniques and forecasting involved in Software projects development with various cost benefit analysis	Apply
CO 3: Apply the techniques available for software effort estimation and activity planning for smooth progress of project development	Apply
CO 4: Apply the risk management analysis techniques to quantify efficiency and monitoring &control	Apply
CO 5: Apply the project control metrics and its effect on changing /updating the project	Apply

Reference Book(s):

R1. Bob Hughes & Mike Cotterell, "Software Project Management", Tata McGraw- Hill Publications, Fifth Edition, 2015

R2. Walker Royce,"Software Project Management–A unified Framework", Pearson Education, 2007

R3. S. A. Kelkar," Software Project Management", PHI, New Delhi, Third Edition, 2013

R4. Roger Pressman S., "Software Engineering: A Practitioner's Approach", Tata McGraw Hill, Seventh Edition, 2019

Web References:

1. http://nptel.ac.in/syllabus/106101061/

2. http://www.nptelvideos.com/video.php?id=918

Course Code: 19CAEN1008	Course Title: Resource Management Techniques		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

➢ 19CAFN1101 Probability and Statistics

Course Objectives

The course is intended to:

1. Explain the opportunity of using various software package
2. Apply the complex mathematical models
3. Apply the methodology for the solution of linear programs
4. Apply the network models to find shortest path
5. Utilize optimality conditions for single and multiple variables

Unit I   Linear Programming Solving   9 Hours

Principal components of decision problem-Modeling phases – LPFormulation and graphical solution –Simplex method – Big M method

Unit II   Transportation and Assignment Models   9 Hours

Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution- Optimal solution- Degeneracy- Mathematical formulation of Assignment models- Hungarian algorithm- Variables of the assignment problems

Unit III   Integer Programming   9 Hours

Cutting plan algorithm- Branch and bound methods, Multistage (Dynamic) Programming

Unit IV   Scheduling by Pert and CPM   9 Hours

Network construction - Critical path method - Project Evaluation and Review Technique - Resource Analysis in Network scheduling

Unit V   Queuing Theory   9 Hours

Markovian models- M/M/1, M/M/C, finite and infinite capacity- M/M/1 queues- Finite source model-M/G/1 queue (steady state solutions only).

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the opportunity package for solving linear programming models of using various programming and software integer	Understand
CO 2: Apply the complex mathematical models in management science, industrial engineering and transportation science.	Apply
CO 3: Apply the methodology for the solution of linear programs and integer programs	Apply
CO 4: Solve network models like the shortest path, minimum spanning tree, and maximum flow problems.	Apply
CO 5: Utilize optimality conditions for single and multiple variable unconstrained and constrained non-linear optimization problems, and corresponding solution methodologies.	Apply

Reference Book(s):

R1. Taha H. A., Operations Research - An Introduction", 7th Edition, Pearson Education, Delhi, 2002

R2. Winston, Operations Research", Thomson Learning, 2003

R3. P K Gupta and D S Hira, "Operations Research", S Chand & Co., 2003

Web References:

1. http://nptel.ac.in/courses/111105039/

2. http://nptel.ac.in/courses/Webcourse-contents/IISc-BANG

Course Code: 19CAEN1009	Course Title: Human Values and Professional Ethics		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

➢ NIL

Course Objectives

The course is intended to:
1. Explain the concepts of ethics and professional skills
2. Identify the threats in computing environment
3. Make use of computer crime and intellectual property rights
4. Solve the ethical and professional issues in internet technologies and privacy
5. Experiment with the intricacies of technical accessibility issues

Unit I   Human Values and Engineering Ethics   9 Hours

Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character– Engineering Ethics: The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy –Professional and Professionalism –Professional Roles to be played by an Engineer –Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics-Types of Inquiry – Engineering and Ethics- Kohlberg"s Theory – Gilligan"s Argument –Heinz"s Dilemma.

Unit II   Computer Hacking   9 Hours

A General Introduction – Computer Ethics: An Overview – Computer Hacking – Introduction – Definition of Hacking – Destructive Programs – Hacker Ethics – Professional Constraints – BCS Code of Conduct – To Hack or Not To Hack – Ethical Positions on Hacking.

Unit III   Computer Crime and Intellectual Property Rights   9 Hours

Aspects of Computer Crime Introduction – What is Computer Crime – Computer Security Measures – Professional Duties and Obligations – Intellectual Property Rights – The Nature of Intellectual Property– Intellectual Property – Patents, Trademarks, Trade Secrets, Software Issues, Copyright – The Extent and Nature of Software Piracy – Ethical and Professional Issues – Free Software and Open Source Code

Unit IV   Regulating Internet Content, Technology and Safety   9 Hours

Introduction – In Defense of Freedom Expression – Censorship – Laws Upholding Free Speech – Free Speech and the Internet – Ethical and Professional Issues – Internet Technologies and Privacy – Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk.

Unit V   Computer Technologies Accessibility Issues   9 Hours

Introduction – Principle of Equal Access – Obstacles to Access for Individuals – Professional Responsibility–Empowering Computers in the Workplace–Introduction Computers and Employment – Computers and the Quality of Work – Computerized Monitoring in the Work Place – Telecommuting – use of artificial intelligence and expert systems - Social, Legal and Professional Issues

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the concepts of ethics and professional skills in working environment.	Understand
CO 2: Identify the threats in computing environment on ethical Hacking	Apply
CO 3: Make use of computer crime and intellectual property rights for free and open source software.	Apply
CO 4: Solve the ethical and professional issues in internet technologies and privacy for the assessment of safety and Risk.	Apply
CO 5: Experiment with the intricacies of technical accessibility issues in designing the software project.	Apply

Reference Book(s):

R1. M.Govindarajan, S.Natarajan and V.S.SenthilKumar, "Professional Ethics and Human Values", PHI Learning Pvt. Ltd, 2013

R2. Penny Duquenoy, Simon Jones and Barry G Blundell, "Ethical, legal and Professional Issues in Computing", Middlesex University Press, 2008

R3. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996

R4. George Reynolds,"Ethics in Information Technology", Cengage Learning, 2011

R5. Caroline Whitback,"Ethics in Engineering Practice and Research", Cambridge University Press 2011

Web References:

1. http://nptel.ac.in/courses/109104032/

2. http://nptel.ac.in/syllabus/syllabus.php?subjectId=109104033

Course Code: 19CAEN1010	Course Title: Agile Software Development		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

➢ 19CACN1202 Software Engineering

Course Objectives

The course is intended to:

1. Explain about the extreme programming and its practicing
2. Explain the Scrum concepts with different job roles
3. Apply the concepts of Scrum in teamwork with real time scenarios
4. Apply the aspects of scrum specifications and user stories
5. Apply the scrum specifications and user stories.

Unit I   Agile Methodology   9 Hours

Understanding Success-Beyond deadlines-importance of Organizational Success-Agile model - classification of agile methods.

Unit II   Extreme Programming(XP)   9 Hours

Method overview – lifecycle – XP Team-XP concepts –practicing XP –Thinking collaborating-Releasing-Development .Mastering Agility :XP values and principles: commonalities – About values, principles ANDPRACTICES

Unit III   Scrum Practices and Individuals   9 Hours

Master – Product Owner – Changed Roles: Analysts, Project Managers, Architects, Functional Managers, Programmers, DB Administrators, Testers, User Experience Designers - Technical Practices –Test-driven development –Collective Ownership – Continuous Integration – Pair Programming.

Unit IV   Scrum Teamwork   9 Hours

Team Structures – Small Team Productivity – Feature Teams – Component Teams – Guidelines for Good Team Structure – Team Responsibility – Foster Team Learning – Self Organizing Team – Influencing Evolution: Selecting Environment, Defining Performance, Manage Meaning, Energizing the System

Unit V   **Scrum Specification**   **9 Hours**

Product Backlog – Documents to Discussions – Written Documentation Disadvantages – User Stories Progressively Refine Requirements – Emergent Requirements – Backlog Iceberg

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the Agile Methods and its classifications	Understand
CO 2: Apply the extreme programming with its values principles	Apply
CO 3: Apply the concepts of SCRUM Technology for various job roles	Apply
CO 4: Apply the concepts of SCRUM in agile-based software development including practices, individuals and team work	Apply
CO 5: Apply about the scrum specifications and user stories in product development.	Apply

Reference Book(s):

R1. James Shore and Shane Warden, "The Art of Agile Development", O'Reilly Media, 2008

R2. Mike Cohn, "Succeeding with Agile: Software Development Using Scrum", Addison-Wesley Professional, 1st Edition, 2009

R3. Craig Larman,"Agile and Iterative Development A Manager's Guide", Pearson Education 2004

R4.   Alistair, "Agile Software Development series", Cockburn - 2007

R5.   Elisabeth Hendrickson, "Agile Testing ", Quality Tree Software Inc 2008

Web References:

1.   http://nptel.ac.in/courses/106101061/26

Course Code: 19CAEN1023	Course Title: Software Quality and Testing			
Course Category: Professional Elective	Course Level: Mastery			
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45		Marks:100

Pre-requisites

➢ 19CACN1202 - Software Engineering

Course Objectives

The course is intended to:
1. Infer the concept of tenets of software quality and quality factors.
2. Analyze the SQA components can be integrated into the project life cycle
3. Illustrate the software quality infrastructure
4. Demonstrate the software quality assurance ,metrics, defect prevention techniques
5. Illustrate the techniques for quality assurance and applying for applications.

Unit I   Introduction to Software Quality & Architecture   9 Hours

Need for Software quality – Quality challenges – Software quality assurance (SQA) – Definition and objectives – Software quality factors- McCall's quality model – SQA system and architecture – Software Project life cycle Components – Pre project quality components – Development and quality plans.

Unit II   SQA Components and Project Life Cycle   9 Hours

Software Development methodologies – Quality assurance activities in the development process- Verification & Validation – Reviews – Software Testing – Software Testing implementations – Quality of software maintenance – Pre-Maintenance of software quality components – Quality assurance tools – CASE tools for software quality – Software maintenance quality – Project Management.

Unit III   Software Quality Infrastructure   9 Hours

Procedures and work instructions – Templates – Checklists – 3S developmenting – Staff training and certification Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control – Storage and retrieval.

Unit IV   Software Quality   9 Hours

Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria – Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement, Testing Maturity Model.

Unit V   Software Quality Assurance   9 Hours

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Infer the concepts of quality standards.	Understand
CO 2: Utilize the concepts in software development life cycle.	Apply
CO 3: Demonstrate procedures and instructions of software quality infrastructure	Understand
CO 4: Assess the quality of software product.	Apply
CO 5: Apply the concepts in preparing the quality plan & documents.	Apply

Reference Book(s):

R1. R. Chopra , " Software Quality Assurance: A Self-Teaching Introduction Paperback – Import, 13 April 2018

R2. Claude Y. Laporte, Alain, "Software Quality Assurance", First Edition, wiley, 2018

R3. Ivan Mistrik, Richard M Soley, Nour Ali, John Grundy, Bedir Tekinerdogan , "Software Quality Assurance" Morgan Kaufmann , 2015

R4. Software Quality Assurance, Milind Limaye, TMH ,New Delhi, 2011

R5. Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009

Web References:

1. https://www.softwaretestinghelp.com/software-quality-assurance/

2. https://www.bmc.com/blogs/quality-assurance-software-

3. https://www.javatpoint.com/software-quality-assurance

Course Code: 19CAEN1011	Course Title: Evolutionary Computing			
Course Category: Professional Elective	Course Level: Mastery			
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45		Marks:100

Pre-requisites

➢ 19CAEN1008 Resource Management Techniques
➢ 19CAEN1004 Data Mining and Data Warehousing

Course Objectives

The course is intended to:

1. Explain the fundamentals of Evolutionary Algorithm with the applications
2. Explain the fitness, selection, and population management strategies for Evolutionary computing
3. Apply the methodological issues in Evolutionary computing
4. Apply the Ant Colony Optimization with its procedures
5. Apply the Particle Swarm Optimization with its procedures

Unit I   Evolutionary Algorithm   9 Hours

Introduction on Evolutionary Algorithm - COMPONENT of Evolutionary Algorithms – Example Applications: The Eight-Queens Problem -The Knapsazck Problem –operations of Evolutionary algorithm - Evolutionary Computing, Global Optimization, and Other Search Algorithms.

Unit II   Fitness, Selection and Population Management   9 Hours

Population Management Models- parent selection - Evolutionary Algorithm Variants: Genetic algorithm - Evolutionary strategies - Evolutionary programming - Genetic programming -. Particle swarm optimization.

Unit III   Methodological Issues   9 Hours

Parameters and parameter Tuning- Evolutionary Algorithm parameters – EA and EA Instances – Designing Evolutionary Algorithms – Tuning problems – Tuning Methods- Parameter control- Examples of changing parameters.

Unit IV   Ant Colony Optimization   9 Hours

Ant foraging behavior - Theoretical considerations – Convergence proofs – ACO Algorithm – ACO and model based search – Variations of ACO: Elitist Ant System (EAS), Min Max Ant System (MMAS) and Rank Based Ant Colony System (RANKAS)

Unit V   Particle Swarm Optimization   9 Hours

Principles of bird flocking and fish schooling – Evolution of PSO – Operating principles – PSO Algorithm – Neighborhood Topologies – Convergence criteria – Variations of PSO: Binary, weighted, repulsive, combined effect PSO.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the fundamentals of Evolutionary Algorithm with the applications	Understand
CO 2: Explain the fitness, selection, and population management strategies for evolutionary computing	Understand
CO 3: Apply the methodological issues in Evolutionary computing for real time applications	Apply
CO 4: Apply the Ant Colony Optimization with its procedures for real time examples	Apply
CO 5: Apply the Particle Swarm Optimization with its procedures for real time applications	Apply

Reference Book(s):

R1. Kenneth A. De Jong, "Evolutionary Computation A Unified Approach", Prentice Hall of India, New Delhi, 2008

R2. Marco Dorigo and Thomas Stutzle, "Ant Colony optimization", Prentice Hall of India, New Delhi, 2004

R3. Jun Sun, Choi-Hong Lai and Xiao-Jun Wu, "Particle Swarm Optimisation: Classical and Quantum Perspectives", Taylor and Francis, USA, 2012

R4. Eiben A.E and Smith J.E," Introduction to Evolutionary Computing" Springer, 2008

R5. Dervis Karaboga, Bahriye Akay," A comparative study of Artificial Bee Colony algorithm" Applied Mathematics and Computation 214, Elsevier Publications, 2009

Web References:

1.   https://onlinecourses.nptel.ac.in/noc21_me43/preview

2.   https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_8/M8L5slides.pdf

Course Code: 19CAEN1012	Course Title: Semantic Web Technologies		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

➢ 19CACN1101 Web Technology

Course Objectives

The course is intended to:

1. Explain the evolution of Semantic Web
2. Build an engineering process for Ontology
3. Explain the web services in Semantic Process
4. Apply the Software Tools in Semantic Web
5. Apply the concepts of Semantic Web in real world applications

Unit I   Evolution of Semantic Web   9 Hours

Introduction - Syntactic Web and Semantic Web – Ontology-Taxonomies, Thesauri and Ontologies-Classification of Ontologies-Web Ontology Description Language - Inference Problems- RDF & RDF Schema

Unit II   Ontology Web Language   9 Hours

Requirements-Properties-Classes-Individual-Data Types-Rule Languages- RuleML SWRL-TRIPLE

Unit III   Semantic Web Services   9 Hours

Web Service Essentials - OWL–S Service Ontology - Ontology Development: Uscholdand King Method-Toronto Virtual Enterprise Method

Unit IV   Semantic Web Software Tools   9 Hours

Ontology Sources: Metadata-Upper Ontologies-Ontology Libraries-Metadata and Ontology Editors - Reasoners

Unit V   Applications   9 Hours

Software Agents-Semantic Desktop-Ontology Applications in Art-Geospatial Semantic.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the evolution of Semantic Web	Understand
CO 2: Build an engineering process for Ontology language	Apply
CO 3: Explain the services of Semantic Web	Understand
CO 4: Apply the software tools in semantic web for reasoning features	Apply
CO 5: Develop the concepts of Semantic Web in real world applications like Art	Create

Reference Book(s):

R1. K.K. Breitman, Marco Antonio Casanova and Walter Truszowski, "Semantic WebConcepts: Technologies and Applications" , Springer, 2013

R2. Grigoris Antoniou, Frank Van, "Semantic Web Primer", MIT Press, 2010

R3. Liyang Yu , "Introduction to the Semantic Web and Semantic web services", Chapman & Hall/CRC, Taylor & Francis group, 2009

R4. Peter Mika, "Social networks and the Semantic Web", Springer, 2ndedition 2013.

R5. Pascal Hitzler, Sebastian Rudolph, Markus Krotzsch, "Foundations of Semantic Web Technologies", Chapman & Hall (CRC press), 2010

Web References:

1.   https://www.w3.org/RDF
2.   www.webcivics.org/resource.html
3.   https://www.w3.org/RDF

Course Code: 19CAEN1013	Course Title: Business Intelligence		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

> ➢ 19CACN1104 Database Management Systems
> ➢ 19CAEN1004 Data Mining and Data Warehousing

Course Objectives

The course is intended to:

1. Explain the basic rudiments of business intelligence system
2. Express the modeling aspects
3. Choose the CCR algorithm
4. Apply the business intelligence models.
5. Apply the emerging technologies in business intelligence.

Unit I   Business Intelligence   9 Hours

Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence

Unit II   Knowledge Delivery   9 Hours

The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message

Unit III   Efficiency   9 Hours

Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis

Unit IV   Business Intelligence Applications   9 Hours

Marketing models – Logistic and Production models – Case studies

Unit V   Future of Business Intelligence   9 Hours

Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the basic rudiments of business intelligence system.	Understand
CO 2: Explain the modeling aspects for Knowledge Delivery.	Understand
CO 3: Choose the CCR Algorithm for efficiency measures	Apply
CO 4: Apply the various models for business intelligence applications.	Apply
CO 5: Apply the emerging technologies in business intelligence applications.	Apply

Reference Book(s):

R1. Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson Education,2014

R2. Larissa T. Moss, S. Atre, "Introduction to Business Intelligence and Data Warehousing", IBM, 2004

R3. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009

R4. David Loshin Morgan, Kaufman, "BusinessIntelligence: The Savvy Manager's Guide", 2nd Edition,2012

R5. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw- Hill,2007

Web References:

1. http://www.umsl.edu/~sauterv/DSS4BI

Course Code: 19CAEN1014	Course Title: Internet of Things	
Course Category: Professional Elective	Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

➤ 19CACN1201 Computer Networks

Course Objectives

The course is intended to:

1. Explain the fundamentals of Internet of Things
2. Apply the various domain specific Internet of Things
3. Describe the concepts of M2M to IoT
4. Explain the concepts of M2M and IoT technology &architecture
5. Apply the concepts of IoT in Real-World Applications

Unit I   IOT Introduction   9 Hours

Overview: Key features – Advantages – Disadvantages - IoT Hardware - IoT Software - IoT Technology and Protocol. Introduction: Definition & Characteristics of IoT – Physical Design of IoT – Logical Design of IoT – IoT enabling Technologies - IoT Levels & deployment Templates.

Unit II   Domain Specific IOTS   9 Hours

Introduction: Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health & Lifestyle. IoT and M2M: Introduction – M2M – Difference between IoT and M2M – Software Defined Networking (SDN) and Network Function Virtualization (NFV) for IoT. IoT System Management with NETCONF-YANG: Need for IoT System Management – SNMP – Network Operator Requirements – NETCONF – YANG – IoT System Management with NETCONF-YANG.

Unit III   M2M to IOT   9 Hours

M2M to IoT-the Vision: Introduction - From M2M to IoT – M2M towards IoT - the Global context. M2M to IoT - A Market Perspective: Introduction – Definition - M2M value chains - IoT value chains - An emerging industrial structure for IoT. M2M to IoT-an Architectural Overview: Building architecture - Main design principles and needed capabilities - An IoT architecture outline – Standards considerations.

Unit IV   M2M and IOT Technology & Architecture   9 Hours

M2M and IoT Technology Fundamentals: Devices and gateways - Local and wide area networking-Data management-Business processes in IoT-Everything as a service(XaaS) - M2M and IoT analytics - Knowledge management. Architecture Reference Model: Introduction -

Reference model and architecture - IoT domain model - Information model - Functional model - Functional model - Safety, privacy, trust, security model.

Unit V   Case Studies and Real-World Applications   9 Hours

Real world design constraints - Asset management - Industrial automation - Smart grid - Commercial building automation - Smart cities - participatory sensing.

Course Outcomes	Cognitive
At the end of this course, students will be able to:	Level
CO 1: Explain the fundamental concepts of Internet of Things for real time issues	Understand
CO 2: Apply the domain specific Internet of Things in various Industry domains	Apply
CO 3: Apply the concepts of M2M to IoT for defining market driven systems	Apply
CO 4: Illustrate the concepts of M2M and IoT technology & architecture reference model.	Understand
CO 5: Apply the concepts of IoT in various Real-World Applications.	Apply

Reference Book(s):

R1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things - A hands-on approach", Universities Press,2017

R2. Jan Ho ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand David Boyle, "From Machine-to-Machine to the Internet of Things -Introduction to a New Age of Intelligence", Elsevier, 2014

R3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internetof Things", Springer,2011

R4. Tutorials point, "Internet of Things", Tutorials Point (I) Pvt. Ltd, 2016

R5. Peter Waher, "Learning Internet of Things", packt publishing, Birmingham Mumbai, 2015

Web References:

1. https://www.tutorialspoint.com/internet_of_things/internet_of_things_overview.html

2. http://kartolo.sby.datautama.net.id/PacktPub/9781783553532learning_internet_of_thing.pdf

3. https://www.codeproject.com/Learn/IoT/

Course Code: 19CAEN1015	Course Title: Web Mining and Social Networking		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

> 19CACN1104 Database Management Systems
> 19CAEN1004 Data Mining and Data Warehousing

Course Objectives

The course is intended to:

1. Explain various models and concepts in information retrieval system
2. Explain various techniques in Web search
3. Apply the various algorithms for social network analysis
4. Apply the web crawler techniques in Web
5. Apply the Wrapper methods in Webpages

Unit I   Information Retrieval   9 Hours

Basic Concepts of Information Retrieval - Information Retrieval Models - Relevance Feedback - Evaluation Measures - Text and Web Page Pre-Processing - Inverted Index and Its Compression

Unit II   Information Retrieval and Web Search   9 Hours

Latent Semantic Indexing - Web Search - Meta-Search - Web Spamming

Unit III   Social Network Analysis   9 Hours

Social Network Analysis - Co-Citation and Bibliographic Coupling – PageRank – HITS

Unit IV   Web Crawling   9 Hours

A Basic Crawler Algorithm - Implementation Issues - Universal Crawlers - Focused Crawlers - Topical Crawlers - Evaluation.

Unit V   Structured Data Extraction   9 Hours

Preliminaries - Wrapper Induction - Instance-Based Wrapper Learning - Automatic Wrapper Generation: Problems - String Matching and Tree Matching - Multiple Alignment - Building DOM Trees.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain various models and concepts to retrieve the relevant information from databases or servers	Understand
CO 2: Explain various techniques in web search to retrieve the relevant information from web servers	Understand
CO 3: Apply the various algorithms for social network analysis.	Apply
CO 4: Apply the Web crawler techniques for discovering information from the Web	Apply
CO 5: Apply the Wrapper methods for extracting structured data from the Webpages	Apply

Reference Book(s):

R1. Bing Liu, "Web Data Mining: Exploring Hyperlinks, Content, and Usage Data", 2nd Edition, Springer, 2015

R2. Xu, Guandong, Zhang, Yanchun, Li, Lin, "Web Mining and Social Networking: Techniques and Applications", Springer, 2013

R3. Ricardo Baeza- Yates, Ribeiro-Neto, "Modern Information Retrieval", Pearson, 2016

R4. Aggarwal Charu C, "Social Network Data Analytics", Springer, 2015

Web References:

1. https://www.cs.uic.edu/~liub/WebMiningBook.html

2. https://nlp.stanford.edu/IR-book/information-retrieval-book.html

3. https://www.cs.utexas.edu/users/mooney/ir-course/

Course Code: 19CAEN1016	Course Title: Artificial Intelligence		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

- ➤ 19CAFN1101 Probability and statistics
- ➤ 19CACN1103 Data Structures and Algorithms
- ➤ 19CACN1301 Machine Learning

Course Objectives

The course is intended to:

1. Describe the agent type and behavior
2. Analyze the efficiency of various searching techniques
3. Apply Inference rules to the given knowledge Base
4. Choose the appropriate planning technique
5. Explain the application of artificial Intelligence techniques

Unit I   Intelligent Agents   9 Hours

Foundation and history of artificial intelligence – Agents and Environments-Nature of environments-Structure of Agents

Unit II   Problem and Searching   9 Hours

Problem solving agents – Measuring Problem Solving Performance- Uninformed Search Strategies : BFS, DFS, DLS, IDS, Bidirectional Search – Informed Search Strategies : Greedy BFS- A* Search – Heuristic function – Local search algorithms- Online Search Agent – Constraint Satisfaction Problem – Backtracking Search for CSP – Adversarial Search.

Unit III   Knowledge and Reasoning   9 Hours

Logical Agents – Propositional Logic – Reasoning Patterns- Resolution – Forward and Backward chaining- First order Logic – Syntax And Semantics of FOL – Using first order logic_ knowledge engineering in FOL-Inference in FOL – Unification and lifting- Forward and Backward chaining –Resolution.

Unit IV   Planning   9 Hours

Classical Planning – Planning As state space search- Planning and acting in Real world and Non Deterministic domains- Hierarchical Planning- Multi agent Planning

Unit V   Applications   9 Hours

Natural Language Processing –Language Model- Text classification –Information retrieval–
Information extraction-Speech recognition

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Describe the type and behavior for given agent.	Understand
CO 2: Analyze the efficiency of various searching techniques for solving a problem	Apply
CO 3: Apply inference rules to the given knowledge Base for theorem Proving	Apply
CO 4: Apply inference rules to the given knowledge Base for theorem Proving	Apply
CO 5: Explain the application of artificial Intelligence techniques in Real World System	Apply

Reference Book(s):

R1. Stuart Russell, Peter Norving , "Artificial Intelligence - A Modern Approach", Prentice Hall   3rd Edition,2014

R2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 2nd Edition, 2003

R3. Patrick Henry Winston, "Artificial Intelligence", Pearson Education /PHI, 3rd Edition, 2004

Web References:

1.   http://www.people.fas.harvard.edu/~lib215/lectures/

2.   https://www.tutorialspoint.com/AI

Course Code:19CAEN1021	Course Title: Mobile Programming with Swift		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

➢ 19CACN1204 Java Programming

Course Objectives

The course is intended to:

1. Illustrate the basic building block of Swift Programming
2. Choose the different operators and Strings for data manipulation
3. Apply the different types of collections and control statements
4. Choose Functions and Classes with Multiple UI elements
5. Develop programs with Inheritance and Exception handing mechanisms

Unit I   Basic Building Blocks   9 Hours

Declaring Constants and Variables –Comments –Data Types-Type Safety and Type Inference-Numeric Literals -Numeric Type Conversion -Type Aliases –Booleans –Tuples-Optional–Optional Binding

Unit II   Working with Operators and Strings   9 Hours

Assertions and Preconditions-Working with Operators-Strings and Characters- Manipulations on Strings

Unit III   Collections and Control Flow   9 Hours

Mutability of Collections –Arrays-Sets and its Operations-Dictionaries-Control Flow Statements-Conditional Statements

Unit IV   Functions   9 Hours

Working with Functions-Closures-Enumerations-Associated Values-Raw Values-Structures and Classes-Instance Methods

Unit V   Inheritance and Error Handling   9 Hours

Inheritance-De initialization-Error Handling with Exceptions –Protocols- Delegations-Automatic Reference Counting

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Illustrate the basic building block of Swift Programming for the given scenario	Understand
CO 2: Choose the different operators and Strings for data manipulation of the given problem	Apply
CO 3: Apply the different types of collections and control statements for the given applications	Apply
CO 4: Use Functions and Classes with Multiple UI elements for the given scenario	Apply
CO 5: Develop programs with Inheritance and Exception handing mechanisms for handing data between functions.	Apply

Reference Book(s):

R1. Lee Wei Meng, "Beginning SWIFT Programming", 2015

R2. The Swift Programming Language, Swift 5.2,Apple Inc, Swift Programming series,2014

R3. Brad Lees, Gary Bennett, Stefan Kaczmarek,"Swift 5 for Absolute Beginners", 5th Edition, 2019

Web References:

1. https://www.udemy.com/course/make-me-an-iphone-app-developer-beginner-series/
2. https://developer.apple.com/swift/

Course Code: 19CAEN1024	Course Title: Deep Learning		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

- ➢ 19CAFN1101 Probability and Statistics
- ➢ 19CACN1301 Machine Learning

Course Objectives

The course is intended to:

1. To identify the basics of deep networks.
2. To apply CNN architectures of deep neural networks
3. To explain the concepts of Deep Network Architecture
4. To apply the basics of Neural Networks and Deep Learning
5. To apply about applications of deep learning

Unit I   Deep Networks Basics   9 Hours

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions – Gradient based Optimization – Machine Learning Basics: Regression -- Classification – Clustering Over fitting and under fitting -- Stochastic gradient descent -- Deep Networks: Parameters-- Layers – Activation Functions – Optimization algorithms – Hyper parameters

Unit II   Convolutional Neural Networks   9 Hours

CNN Architectures – Input Layers -- Convolutional layers – Pooling Layers –Fully Connected Layers – Applications. Case Study: Sentence Classification using Convolutional Neural Networks

Unit III   Deep Network Architecture   9 Hours

Recurrent Neural Networks -- Recursive Neural Networks – Restricted Boltzmann Machines – DBNs – Case Study: Dialogue Generation with LSTMs.

Unit IV   Neural Networks and Deep Learning   9 Hours

Neural Networks – Biological Motivation- Perceptron – Multi-layer Perceptron – Feed Forward Network – Back Propagation-Activation and Loss Functions- Hyper Parameters – Case Study : Opinion Mining using Recurrent Neural Networks

Unit V   Applications of Deep Learning   9 Hours

Natural Language Processing -- object detection – Image Segmentation--Transfer Learning -- Case Study: Named Entity Recognition – Parsing and Sentiment Analysis using Recursive Neural Networks

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the basics in deep networks	Understand
CO2: Apply Convolutional Neural Network for sentence classification	Apply
CO3: Explain the basics of Deep Network Architecture	Understand
CO4: Apply Neural Networks and Deep Learning for opinion mining	Apply
CO5: Apply deep learning algorithms for variety applications	Apply

Reference Book(s):

R1.   Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017

R2.   Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017

R3.   Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), Deep Learning Applications, Volume 3,Springer Publications 2022

R4.   Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook'', Springer International Punlishing, 2018

Web References:

1.   https://nptel.ac.in/courses/106/106/106106184/

2.   https://www.coursera.org/courses?query=deep%20learning

3.   https://www.greatlearning.in/academy/learn-for-free/courses/introduction-to-neural networks-and-deep-learning

Course Code: 19CAEN1025	Course Title: Cyber Security			
Course Category: Professional Elective	Course Level: Mastery			
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45		Marks:100

Pre-requisites

➢ 19CACN1201 Computer Networks

Course Objectives

The course is intended to:

1. Outline the cyber security metrics and frameworks.
2. Examine the cyber security issues
3. Discuss cyber hacking and cybercrime.
4. Identify the computer forensics knowledge requirement
5. Examine network and mobile forensics

Unit I   Cyber security Objectives And Guidance   9 Hours

Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks: E-Commerce Systems, Industrial Control Systems, Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers- Cyber Security Management – Catalog Approach.

Unit II   Cyber Security Issues   9 Hours

Cyber Governance Issues: Net Neutrality -- Internet Names and Numbers, Copyright and Trademarks, Email and Messaging - Cyber User Issues: Malvertising, Impersonation, Appropriate Use, Cyber Crime, Geo location, Privacy - Cyber Conflict Issues: Intellectual, Property Theft, Cyber Espionage, Cyber Sabotage, Cyber Welfare

Unit III   Cyber Crime and Cyber Offenses   9 Hours

Introduction to Cyber Crime – Classifications of Cyber Crime – Methods in Cyber Crime Cyber Offences: Plans and Attacks – Social Engineering – Cyber Stalking – Cyber Cafe and Cyber Crimes – Botnets

Unit IV   Computer Forensics   9 Hours

Introduction – Digital Forensics Science – Cyber forensics and Digital Evidence – Forensics Analysis of E-mail – Digital Forensics Life Cycle – Network Forensics – OSI Layer Model to Computer Forensics , Security/Privacy Threats –Challenges in Computer Forensics- Tools: OSForensics.

Unit V   Hand-Held Devices and Digital Forensics   9 Hours

Hand-Held Devices and Digital Forensics – Forensics of iPods and digital music devices – Techno-legal Challenges – Organizational guidelines on mobile device forensics – Tools: Network Mapper(Nmap), BitPim

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Outline the cyber security metrics and frameworks for cyber decision making	Understand
CO 2: Examine the cyber governance and user issues faced.	Apply
CO 3: Discuss cyber hacking and cyber-crime of digital era	Understand
CO 4: Identify the knowledge requirement for computer forensics investigation	Apply
CO 5: Examine network and mobile forensic techniques for cyber-crime investigation	Apply

Reference Book(s):

R1. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss, "Cyber Security Policy Guidebook", John Wiley & Sons, 2012

R2. National Cyber Safety and Security Standards, Govt. of India, "National Cyber Crime Reference Handbook", 2014

R3. Nina Godbole, Sunit Belapure, "Cyber Security", Wiley India, 2013

Web References:

1.   Cyber Security, URL: https://www.sans.org/course/introduction-cyber-security

2.   Fundamentals of cyber security, URL: http://www.cyberaces.org/courses/

3.   A Guide to Computer Forensics, URL: https://forensiccontrol.com/resources/beginners-guide-computer-forensics

4.   https://www.osforensics.com/download.html

5.   https://nmap.org/download

6.   http://www.bitpim.org/

Course Code: 19CAEN1026	Course Title: Virtual Reality		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

➢ 19CACN1204 Java Programming

Course Objectives

The course is intended to:

1. Describe the potential of a virtual world for delivering application
2. Apply the role of modeling
3. Analyze the human factors involved in virtual systems.
4. Apply the virtual reality techniques in programming
5. Explore the applications of Virtual reality systems.

Unit I   Introduction   9 Hours

The three I"s of virtual reality-commercial VR technology and the five classic components of a VR system - Input Devices : (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation-interfaces and gesture interfaces - Output Devices: Graphics displays-sound displays & haptic feedback
.
Unit II   Modeling   9 Hours

Geometric modeling - kinematics modeling- physical modeling - behaviour modeling - model management

Unit III   Human Factors   9 Hours

Methodology   and   terminology-user   performance   studies-VR   health   and   safety issues-Usability of virtual reality system- cyber sickness -side effects of exposures to virtual reality Environment.

Unit IV   VR Programming   9 Hours

Introducing Java 3D-loading and manipulating external models-using a lathe to make shapes. 3D Sprites- animated 3D sprites-particle systems.

Unit V   Applications   9 Hours

Medical applications-military applications-robotics applications- Advanced Real time Tracking-other applications- games, movies, simulations, therapy

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Describe the potential of a virtual world for delivering application	Understand
CO 2: Apply the role of modeling	Apply
CO 3: Analyze the human factors involved in virtual systems	Analyze
CO 4: Apply the virtual reality techniques in programming	Apply
CO 5: Explore the applications of Virtual reality systems.	Apply

Reference Book(s):

R1. C. Burdea & Philippe Coiffet, "Virtual Reality Technology", Second Edition, Gregory, John Wiley & Sons, Inc., 2014

R2. Andrew Davison, "Killer Game Programming in Java", Oreilly SPD, 2008

R3. William R.Sherman, Alan Craig, "Understanding Virtual Reality, interface, Application and Design", Elsevier, Morgan Kaufmann, 2002

Web References:

1. https://webvr.info/
2. https://www.interaction-design.org/literature/topics/virtual-reality

Course Code: 19CAEN1017	Course Title: Human Computer Interface		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

> ➢ 19CACN1101 Web Technology
> ➢ 19CACN1204 Java Programming

Course Objectives

The course is intended to:

1. Explain the foundations & design of HCI with evaluation techniques
2. Apply the Multimedia UI Design with its architecture, navigation and media selection
3. Express the Mobile architecture, applications and mobile elements
4. Apply the concepts of front end Web designing interfaces
5. Analyze the aspects of advanced Web designing interfaces

Unit I   Foundations & Design of HCI   9 Hours

Interaction Models – Frameworks – Ergonomics – Styles – Elements – Interactivity Paradigms. HCI in software process – Software life cycle – Prototyping – Evaluation Techniques- Universal Design.

Unit II   Multimedia UI   9 Hours

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. Multimedia UI: Multimedia User Interface Design - Information Architecture - Media Selection and Combination - Interaction and Navigation.

Unit III   Mobile HCI   9 Hours

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets-Applications- Games- Mobile Information Architecture- Mobile 2.0.

Unit IV   Web Interface Design   9 Hours

Drag & Drop- Direct Selection- Contextual Tools- Overlays & its types- Inlays its types – Virtual Pages.

Unit V   Advanced Web Interface Design   9 Hours

Flow – Google blogger –Interactive single page process- Inline assistant process- dialog overlay process-static single page process.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Outline the foundations & design of HCI with evaluation techniques.	Understand
CO2: Apply the Multimedia UI Design with its architecture, navigation and media selection for website.	Apply
CO3: Apply the Mobile architecture, mobile elements and applications for development.	Apply
CO4: Apply the concepts of front end web designing interfaces for real web sites.	Apply
CO5: Apply the aspects of advanced web designing interfaces for transactions.	Apply

Reference Book(s):

R1.   Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2015

R2.   Brian Fling, "Mobile Design and Development, O'Reilly Media Inc., 1st Edition, 2012

R3.   Bill Scott and Theresa Neil, "Designing Web Interfaces", O'Reilly, 1st Edition, 2013

R4.   Andrew Sears, Julie A. Jacko,"The Human Computer Interaction Handbook", 2nd Edition, Lawrence Erlbaum Associates, New York, 2012

Web References:

1.   http://nptel.ac.in/courses/106103115/

2.   http://iiscs.wssu.edu/drupal/node/4607

Course Code: 19CAEN1018	Course Title: Visualization Techniques		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

> 19CACN1202 Software Engineering
> 19CAEN1004 Data Mining and Data Warehousing

Course Objectives

The course is intended to:

1. Outline the foundation of data visualization
2. Explain the visual perception and attention pertaining to visualization
3. Choose the concepts of Patterns, Visual objects and Space perception
4. Apply the interaction with visualization.
5. Make use of DOM and Web technologies

Unit I   Foundations of Data visualization   9 Hours

A Model of Perceptual processing - Types of Data – Environment - Eye - Optimal display-Luminance, Brightness, lightness and Gamma.

Unit II   Multimedia UI   9 Hours

Color Standards- Appearance and Applications in Visualization - Visual Attention and Information - Visual field- Iconic Buffer-Gabor Model- Texture in Visualization,-glyphs and Multivariate Discrete data.

Unit III   Mobile HCI   9 Hours

Static and Moving Patterns-Gestalt laws-Contours-Patterns in Motion - Visual Objects and Data Objects- Image-Based Object recognition-Structure-based Object Recognition- Geon diagram-Depth Cue Theory - Task Based Space Perception.

Unit IV   Interacting with Visualizations   9 Hours

Interacting with Visualizations- Data Selection and Manipulation loop- Exploration and Navigation loop- Memory systems -Eye movements -Problem Solving with Visualizations.

Unit V   Visualization Techniques and Systems   9 Hours

Structural Analysis - Statistical Exploration - Practical problems in conducting user studies-Data Driven Documents (D3) Technology Fundamentals - web DOM - web CSS -web JavaScript - Data for visualization.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Outline the foundation of Data Visualization.	Understand
CO 2: Explain the visual perception and Attention pertaining to Visualization.	Understand
CO 3: Choose the concepts of Patterns, Visual Objects and Space Perception.	Apply
CO 4: Apply the interaction with visualization for the given scenario.	Apply
CO 5: Make use of DOM and Web Technologies for developing Visualization Systems.	Apply

Reference Book(s):

R1. Colin Ware, "Information Visualization: Perception for Design", Morgan Kaufmann, 2013

R2. Scott Murray, "Interactive Data Visualization for the Web-An Introduction to Designing with D3", O'Reilly, 2013

R3. Ben Fry, "Visualizing Data", 2nd Edition, O'Reilly, 2012

R4. Stephen Few, "Now you see it: Simple Visualization techniques for quantitative analysis", Analytics Press, 2013

Web References:

1. https://www.coursera.org/learn/datavisualization/
2. https://www.udacity.com/course/data-visualization-and-d3js--ud507

Course Code: 19CAEN1019	Course Title: Advanced Operating Systems		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

> ➢ NIL

Course Objectives

The course is intended to:

1. Explain process management, CPU scheduling, memory management and file system
2. Apply synchronization and Dead Lock
3. Apply the memory management algorithms
4. Analyze the disk scheduling and directory methods
5. Interpret the concepts in Mobile Operating Systems

Unit I   Introduction   9 Hours

Evolution of OS - Operating Systems Structures: System Components – Operating System Services – Process Concepts –Process & Cooperating Process – Inter Process Communication – Threads.

Unit II   Scheduling & Deadlock   9 Hours

CPU Scheduling– Scheduling Algorithms – Process Synchronization: Critical Section Problems – Semaphores. Deadlock - System Model – Deadlock Characterization – Methods for Handling Deadlocks - Deadlock Prevention – Deadlock Avoidance – Deadlock Detection -– Recovery from Dead locks.

Unit III   Memory Management   9 Hours

Memory Management - Background – Swapping – Contiguous Memory Allocation – Paging – Segmentation – Virtual Memory: Demand Paging –Replacement Algorithms
–   Thrashing.

Unit IV   File Management   9 Hours

File Concept-Access Methods-Directory Structure-File System Structure Implementation of File System & Directory - Allocation Methods-Free Space Management – Disk Structure & Scheduling.

Unit V Mobile Operating System 9 Hours

Mobile Operating Systems: ARM and Intel architectures - Power Management – Mobile OS Architectures - Kernel structure and native level programming - Runtime issues- Approaches to power management.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Outline the Importance of personal computers and internal components of a computer.	Understand
CO 2: Assemble the computer with the help of hardware components	Apply
CO 3: Experiment the Installation of Operating Systems in computer	Apply
CO 4: Identify the components in Laptop and Mobile devices	Apply
CO 5: Experiment the installation of Printers and troubleshooting of systems	Apply

Reference Book(s):

R1.   Abraham Silberschatz, P.B.Galvin, G.Gagne, "Operating System Concepts", 9th Edition, Wiley & Sons, 2018

R2.   William Stallings, "Operating Systems: Internals and Design Principles", 8th Edition, Pearson Education, 2014

R3.   HM Deitel, PJ Deitel and DR Choffnes, "OperatingSystems", 3rd edition, Pearson Education,2018

R4.   Source: Wikipedia, "Mobile Operating Systems", General Books LLC, 2010

Web References:

1.   https://www.tutorialspoint.com/operating_system/index.htm
2.   http://www.nptel.ac.in/courses/106108101/

Course Code: 19CAEN1020	Course Title: Unix and Networking Programming			
Course Category: Professional Elective	Course Level: Mastery			
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45		Marks:100

Pre-requisites

➢ 19CACN1201 Computer Networks

Course Objectives

The course is intended to:
1. Explain the environment of UNIX.
2. Apply Process Control and Creation of Sessions.
3. Apply the Inter process communication in Pipes &Semaphores.
4. Apply the TCP & UDP Sockets in UNIX.
5. Develop programs using the Client-Server Model.

Unit I   Introduction to UNIX and File System   9 Hours

Unix Architecture and Command Usage - General Purpose Utilities – File System – Handling Ordinary Files – Basic File Attributes – File I/O – Files and Directories – System Data Files and Information: Password File – Group File – Login Accounting.

Unit II   Process   9 Hours

Process Environment – Process Control – Process Relationships: Terminal Logins – Network Login –Process Groups – Session – Signals.

Unit III   Inter process Communication   9 Hours

Introduction – Message Passing (SVR4) – Pipes – FIFO – Message Queues – Semaphores – Shared Memory.

Unit IV   Sockets   9 Hours

Introduction – Transport Layer – Socket Introduction – Elementary TCP Sockets – UDP Sockets –Socket Options – Name and Address conversions.

Unit V   Applications   9 Hours

Debugging Techniques – TCP Echo Client Server – UDP Echo Client Server – Ping – Trace Route – Client Server Applications like File Transfer and Chat.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Express the environment of UNIX and implement the concepts of file system.	Understand
CO 2: Apply Process Control and Creation of Sessions for session Management.	Apply
CO 3: Apply the inter process communication in Pipes & Semaphores of a process.	Apply
CO 4: Apply the TCP & UDP Sockets in UNIX Environments	Apply
CO 5: Develop programs using the Client-Server Model.	Create

Reference Book(s):

R2.   W. Richard Stevens, Advanced Programming in the UNIX Environment, Addison Wesley, New Delhi, 3rd Edition, 2016

R3.   W. Stevens, Bill Fenner, Andrew Rudoff , "Unix Network Programming Volume-1: The Sockets Networking API", Addison- Wesley Professional, 2014

R4.   Maurice J. Bach, "The Design of the Unix Operating System", Prentice Hall, New Delhi, 2007

Web References:

1.   http://www.people.fas.harvard.edu/~lib215/lectures/

2.   https://www.tutorialspoint.com/unix

3.   http://www.people.fas.harvard.edu/~lib215/lectures/

Course Code: 19CAEN1027	Course Title: Research Methodology and Intellectual Property Rights		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Marks:100

Pre-requisites

➤ 19CAFN1101 Probability and Statistics

Course Objectives

The course is intended to:

1. Identify an appropriate research problem in their interesting domain.
2. Explain ethical issues; understand the Preparation of a research project thesis report.
3. Describe the Preparation of a research project thesis report.
4. Describe the law of patent and copyrights.
5. Acquire adequate knowledge of IPR.

Unit I   Research Methodology   9 Hours

Research Methodology – An Introduction, Objectives, Types of research, Research approaches, Significance, Research methods versus Methodology, Research and Scientific Method, Importance, Research process, Criteria, Problems encountered by researchers.
Defining the research problem – Research problem, Selecting the problem, Necessity, Technique involved an illustration.
Reviewing the Literature – The place of the literature review in research, How to review the Literature, Writing about the literature reviewed.

Unit II   Research Design   9 Hours

Research Design – Meaning, Need, Features, Different research design, Basic principles of experimental designs, Important experimental designs.
Measurement & Scaling techniques – Sampling Design, Measurement in research, Measurement scales, Error, Measurement tools, Scaling, Meaning, Scale classification, Scale construction techniques
Data Collection – Collection of primary data, Collection of secondary data, Selection of appropriate method for data collection.

Unit III   Research Technique and Tools   9 Hours

Testing of Hypothesis – Basic concepts, Procedure, Test of Hypothesis, Important parametric Tests, Hypothesis Testing unifications.

Interpretation & Report writing – Meaning, techniques, Precaution in Interpretation,

Significance of Report writing, steps, Layout, types, mechanics, precautions.
Use of Tools/ Techniques for research – Use of Encyclopedias, Research Guides,Handbook etc., Academic Databases for Computer Science Discipline, Use of tools /techniques for Research methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

Unit IV   Intellectual Property Rights   9 Hours

Intellectual Property – The concept, IPS in India, development, Trade secrets, utility Models, IPR & Bio diversity, CBD, WIPO, WTO, Right of Property, Common rules, PCT, Features of Agreement, Trademark, UNESCO.

Unit V   Patents   9 Hours

Patents – Learning objectives, Concept, features, Novelty, Inventive step, Specification,Types of patent application, E-filling, Examination, Grant of patent, Revocation, Equitable Assignments, Licences, Licencing of related patents, patent agents, Registration of patent agents.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the research problem and Literature review.	Understand
CO 2: Describe the various research designs and their characteristics.	Understand
CO 3: Prepare a well-structured research paper and scientific presentations.	Understand
CO 4: Explore on various IPR Components and process of filing.	Understand
CO 5: Develop awareness the patent law and procedural mechanism in obtaining a patent.	Apply

Reference Book(s):

R1. Research Methodology: Methods and Techniques by C.R.Kothari, GauravGarg, New Age International 4th Edition 2018

R2. Research Methodology a step-by-step guide for beginners by Ranjit Kumar, SAGE publications Ltd 3rd Edition 2011 (For the topic Reviewing the Literature under Unit I)

R3. Stuart Melville and Wayne Goddard, "Research Methodology: An Introduction for Science & engineering students. Juta and Co., Limited, 1996, First edition

R4. Professional Programme Intellectual Property Rights, Law and practice, The Institute of Company Secretaries of India, Statutory body under an Act of parliament, September 2013

Web References:

1. https://nptel.ac.in/courses/106/106/106106184/
2. https://www.coursera.org/courses?query=deep%20learning
3. https://www.greatlearning.in/academy/learn-for-free/courses/introduction-to-neural-networks-and-deep-learning