VIRUDHUNAGAR HINDU NADARS' SENTHIKUMARA NADAR COLLEGE
(An Autonomous Institution Affiliated to Madurai Kamaraj University)
Virudhunagar – 626 001.

Course Name : Bachelor of Computer Applications
Discipline : Computer Applications

(Who those joined in the year June 2022 and after)

III year BCA

Semester	Part	Subject Name	Hours	Credit	Int + Ext =Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject Code	Revised / New / No Change / Interchanged & Percentage of Revision
V	Core 12	Operating System	4	4	25+75=100				✔							✔	U3CAC51/ **U24CAC51**	No Change
	Core 13	Data Communications and Networks	4	4	25+75=100			✔						✔			U1CAC52/ **U24CAC52**	No Change
	Core 14	**LAB:** Mobile Application Development	5	3	40+60=100				✔					✔		✔	U3CAC5P1/ **U24CACP51**	No Change
	Core 15	**LAB: Web Technology**	4	3	40+60=100				✔					✔		✔	**U24CACP52**	**20 % Changed**
	Elective	**Web Technology / Data Mining / TCP/IP**	5	4	25+75=100				✔							✔	**U24CAE51/ U24CAE52/ U24CAE53**	**80% Revision 20% Revision Credit Change**
	Elective	**Software Engineering / Mobile Application Development / Mobile Computing**	5	4	25+75=100			✔						✔			**U24CAE54/ U24CAE55/ U24CAE56**	**NEW NEW NEW**
	NME	Basics of Computer	2	2	25+75=100		✔									✔	U3CAN51/ **U24CAN51**	No Change
	SBE - 5	**Employability Skills**	2	1	25+75=100		✔							✔			**U24PS51**	**Revised 50%**
		Total	**30**	**25**														
		Internship (Extra Credit)	**60**	**2**													**U24IP51**	**New**
VI	Core 16	**Software Testing**	4	3	25+75=100			✔						✔		✔	**U24CAC61**	**NEW**
	Core 17	**Cryptography**	4	3	25+75=100			✔								✔	**U24CAC62**	**20% Changed**
	Core 18	**LAB: Dot Net Programming**	4	2	40+60=100			✔						✔		✔	**U24CACP61**	**20% Changed**
	Core 19	**LAB: Software Testing**	4	2	40+60=100			✔						✔			**U24CACP62**	**NEW**

Elective 3	Embedded Systems / Computer Algorithms / Cloud Computing	5	4	25+75=100	✔								✔		✔	**U24CAE61/ U24CAE62/ U24CAE63**	**Credit Change**
SBE - 6	**Internet of Things**	2	2	25+75=100		✔							✔			**U24CAS61**	**20 % Changed**
NME	**Internet and Web Technology**	2	2	25+75=100	✔										✔	**U24CAN61**	**NEW**
	Project and Viva Voce	5	5	50+50=100	✔								✔			U1CA6PR/ **U24CA6PR**	No Change
Total		**30**	**23**														

Year	Semester	Subject	Credit	Hours	Code
II	IV Semester Vacation	**Internship Programme** (Industrial Training)	2 (Extra)	60	**U24IP51**

Syllabus for those who joined in 2022 – 2023 and afterwards   III – B.C.A.

1307

Core 12

Course Title : **Operating System**	Total Hours :**60 Hours**
Course Code :U3CAC51/ **U24CAC51**	Total Credits : 4

Course Outcomes:

COs	CO Statement
CO1	Learnthedifferenttypesof operating systemsand I/OStructure
CO2	Learn the process scheduling in the system, how processes communicate with eachother.
CO3	Learnthesynchronizationbetweentheprocesses,whendeadlockwillhappen,howtoprevent and recoverfrom deadlock.
CO4	Learnmemorymanagementschemesandvirtualmemoryconceptsinthesystem.
CO5	Learndifferentwaysofdirectoryimplementationandallocationmethodsinoperatingsystem.

Unit I   **12 Hours**
Introduction: What Operating Systems Do - Computer-System Organization – Computer-System Architecture – Operating-System Structure – Operating-System Operations – Process Management–Memory Management–Storage Management–Computing Environments.

Unit II   **12 Hours**
System Structures: Operating-System Services–User Operating-System Interface –System Calls– Types of System Calls – System Programs.
Process Concept: Process Concept-Process Scheduling-Inter Process Communication.
Process Scheduling: Scheduling Criteria–Scheduling Algorithms.

Unit III   **12 Hours**
Synchronization: The Critical Section Problem–Peterson's Solution–Monitors.
Deadlocks: System Model–Deadlock Characterization – Methods for Handling Deadlocks Deadlock Prevention–Deadlock Avoidance–Deadlock Detection – Recovery from Deadlock.

Unit IV   **12 Hours**
Memory-Management Strategies: Background – Contiguous Memory allocation – Paging – Structure of the Page Table– Segmentation.
Virtual-Memory Management: Background– Demand Paging-Page Replacement.

Unit V   **12 Hours**
Implementing File Systems: Directory Implementation – Allocation Methods – Free Space Management – Recovery.
Secondary-Storage Structure: Disk Structure –Disk Attachment–Disk Scheduling–Disk Management– RAID Structure.

Text Book:

Abraham Silberschatz, Peter B.Galvin, Greg Gagne, *Operating System Concepts,* WileyIndiaPvt.Ltd.,8th Edition,2015.

UnitI	: Chapter1.1– 1.8,1.12
Unit II	: Chapter 2.1, 2.5,Chapter3.1,3.2,3.4,Chapter5.2,5.3
Unit III	: Chapter6.2, 6.3,6.7, Chapter7.1– 7.7
UnitIV	: Chapter8.1, 8.3– 8.6, Chapter9.1,9.2,9.4
UnitV	: Chapter11.3 –11.5, 11.7, Chapter12.2 – 12.5,12.7

Reference Books:

1. MilanMilenkovic,*Operating System Concepts and Design*,TataMcGraw-Hill Private Limited, NewYork., 2007.
2. AchyutGodbole, Operating Systems, Tata McGraw Hill Education Private Limited, New Delhi, 2009.

e-Resources:

1. https://www.vssut.ac.in/lecture_notes/lecture1423726024.pdf
2. https://www.geeksforgeeks.org/last-minute-notes-operating-systems/
3. https://www.tutorialspoint.com/operating_system/os_overview.htm
4. https://www.youtube.com/watch?v=um18qXCOcRg
5. https://www.youtube.com/watch?v=vBURTt97EkA

Core - 13

Course Title : Data Communications and Networks	Total Hours :60 Hours
Course Code : U1CAC52/ U24CAC52	Total Credits : 4

Course Outcomes:

COs	CO Statement
CO1	Describe how computer networks are organized with approach
CO2	To contrast the protocol architectures such as OSI and TCP/IP.
CO3	To explain how a collision occurs and how to solve it.
CO4	Identify the different types of network devices and their functions within a network
CO5	Describe how routing protocols work.
CO6	Define information security and to identify the challenges for information security.

Syllabus for those who joined in 2022 – 2023 and afterwards   III – B.C.A.

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Unit I   **12 Hours**

Introduction: A Brief History – Applications –Computer Networks –Categories of Networks - Standards and Standards Organizations.

Network Architectures and OSI Model: Networks Architecture-Open Systems and OSI Model – TCP/IP Architecture.

Communication Media and Data Data Transmission: Fourier Analysis – Analog and Digital Data Transmission – Modulation and Demodulation - Transmission Media – Wireless Communications – Data Transmission Basics - Transmission Mode- Interfacing –Multiplexing.

Unit II   **12 Hours**

Error Detection and Correction: Types of Errors – Error Detection – Error Correction.

Data Link Control and Protocol Concepts: Flow Control – Error Control –Asynchronous Protocols – Synchronous Protocols - High-Level Data Link Control (HDLC).

Local Area Networks: Types of Networks and Topology - LAN Transmission Equipment-Ethernet: IEEE Standard 802.3 Token Bus - IEEE Standard 802.4 Token Ring - IEEE Standard 802.5 – Fiber Distributed Data Interface (FDDI) - Distributed Queue Dual Bus (DQDB): IEEE Standard 802.6 - Ethernet Technologies.

Unit III   **12 Hours**

Wide Area Networks: WAN Transmission Methods – WAN Carrier Types - WAN Transmission Equipment-WAN Protocols

Integrated Services and Routing Protocols: Integrating Services – ISDN Services– ISDNTopology – ISDN Protocols – Broadband ISDN – Asynchronous Transfer Mode (ATM) - Principal Characteristics of ATM – Frame Relay.

Unit IV   **12 Hours**

Internetworking: Principles of Internet Working Protocols (IP) – – Routing Principles – Internetwork Protocols (IP) – Shortcomings of IPv4– IP Next Generation.

TCP Reliable Transport Service Applications: Transport Protocols – The Service TCP Provides to Applications – End-to-End Service and Datagrams - Transmission Control Protocol – User Datagram Protocol.

Unit V   **12 Hours**

Network Applications: Client-Server Model – Domain Name System (DNS) – Telnet – File – Transfer and Remote File access - Electronic Mail – World Wide Web (WWW).

Network Management: Simple Network Management Protocol (SNMP).

Network Security: Fundamental Concepts Control - Identification and Authentication - Access Control –A Model for Network Security - Malicious Software.

Text Book:

Brijendra Singh. *Data Communications and Computer Networks.* Edition, 2014.

Unit I: Chapter 1(1.1 to 1.4, 1.8), 2(2.1 to 2.3), 3(3.2 to 3.9, 3.11).
Unit II: Chapter 4,6, 7 (7.1 to 7.7,7.10)
Unit III: Chapter 8 (8.1 to 8.5), 9(9.1 to 9.8)
Unit IV: Chapter 12(12.1, 12.3, 12.5 to12.7), 13(13.2 to 13.6)
Unit V: Chapter 14,15 (15.5), 16(16.1 to 16.5)

Reference Books:

1. Andrew S Tanenbaum.Computer Networks. Prentice Hall of India, 4thEdition.2006.
2. Prakash C. Gupta. Data Communications and Computer Networks. Prentice Hall of India;2005.
3. Behrouz A. Forouzan. Data Communication and Networking. TMH; 2005

e-Resources:

1. https://www.geeksforgeeks.org/open-systems-interconnection-model-osi/
2. https://www.tutorialspoint.com/error-detection-and-correction-in-data-link-layer
3. https://www.cisco.com/c/en/us/products/switches/what-is-a-lan-local-area-network.html
4. https://www.cloudflare.com/learning/network-layer/what-is-a-wan/
5. https://www.nextiva.com/blog/what-is-isdn.html
6. https://www.techtarget.com/searchnetworking/definition/domain-name-system
7. https://en.wikipedia.org/wiki/World_Wide_Web

Core- 14

Course Title : LAB: Mobile Application Development	Total Hours :75 Hours
Course Code : U3CAC5P1/ **U24CACP51**	**Total Credits : 3**

Course Outcomes:

COs	CO Statement
CO1	Understand the android development environment and deployment tools.
CO2	Create simple applications using activities and intents.
CO3	Develop user-friendly applications using menus and action bar.
CO4	Develop interactive applications using picker and list views.
CO5	Understanding the communication between components in android.

1. Develop a sample android application using eclipse.
2. Develop an android application for registration form using Basic Views.

3. Develop an android application using Activities.
4. Develop an android application using Intents.
5. Develop an android application using Built-in Intents
6. Develop an android application using Fragments.
7. Develop an android application using Action bar.
8. Develop an android application using Picker Views.
9. Develop an android application using List Views.
10. Develop an android application for Gallery using Image Views.
11. Develop an android application using Menus.
12. Develop an android application to save and retrieve user data using Preferences.
13. Develop an android application using 'Messaging' and 'E-Mail'
14. Develop an android application using Maps.

e-Resources:

1. https://www.codingconnect.net/mobile-application-development-lab/#google_vignette
2. https://annamalaiuniversity.ac.in/studport/download/CSE_Engg/Lab_Manual/08EP609_Mobile_App_Development_Lab.pdf
3. https://www.studocu.com/in/document/psg-college-of-arts-and-science/computer-science/mobile-application-development-lab-manual/27276314
4. http://www.innovativecodesacademy.in/mobile-application-development-laboratory-experiment/
5. https://www.geeksforgeeks.org/android-tutorial/?ref=lbp

Core- 15

Course Title : LAB: Web Technology	Total Hours :60 Hours
Course Code : U24CACP52	Total Credits : 3

Course Outcomes:

COs	CO Statement
CO1	Develop simple web applications using conditionals and looping statements.
CO2	Create simple applications using arrays and functions.
CO3	Able to create simple databases and tables to perform simple query operations.
CO4	Perform CRUD operations on MySQL database through PHP application.
CO5	Develop secure applications using session and cookies in PHP.

1. Creating simple webpage using PHP
2. Use of conditional statements in PHP
3. Use of looping statements in PHP

4. Creating different types of arrays in PHP.
5. Usage of array functions in PHP.
6. Creating user defined functions in PHP
7. File manipulation using PHP
8. Creating simple table with constraints in MySQL.
9. Insertion, Updation and Deletion of rows in MYSQL tables
10. Searching of data by different criteria in MySQL.
11. Sorting of data in MySQL.
12. Demonstration of joining tables in MySQL.
13. Usage of subqueries in MySQL.
14. Usage of aggregate functions in MySQL.
15. Usage of set operators in MySQL.
16. Working with string, numeric and date functions in PHP
17. Database connectivity in PHP with MySQL
18. Creation of sessions in PHP with MySQL.
19. Creation of cookies in MySQL.
20. Creating simple applications using PHP.

e-Resources:

1. https://www.simplilearn.com/tutorials/php-tutorial/php-with-sql
2. https://www.geeksforgeeks.org/php-mysql-database-introduction/
3. https://www.tutorialspoint.com/php/php_and_mysql.htm
4. https://www.cloudways.com/blog/connect-mysql-with-php/
5. https://alexwebdevelop.com/php-with-mysql/

Elective- 1

Course Title :Web Technology	**Total Hours :75 Hours**
Course Code : U24CAE51	**Total Credits : 4**

Course Outcomes:

COs	CO Statement
CO1	Learn PHP's Unique capabilities for web application development.
CO2	Learn to use conditional and looping statements in PHP.
CO3	Understand the different array types supported by PHP.
CO4	Learn database concepts and Structured Query Language.
CO5	Understand PHP's error levels and control which errors are displayed in page.

Unit I   **15 Hours**

Introducing PHP –History; Unique Features; Basic Development Concepts; Creating Your First PHP Script; Try this 1-1 Mixing PHP with HTML; Sample Applications

Using Variables and Operators – Storing Data in Variables; Understanding PHP's Data Types; Setting and Checking Variable Data Types; Using Constants; Manipulating Variables with Operators; Try This 2-1: Building a Dollars-to-Euros Converter; Handling Form Input; Try This 2 – 2: Building an Interactive HTML Color Sampler.

Unit II   **15 Hours**

Controlling Program Flow –Writing Simple Conditional Statements; Try This 3 - 1: Testing Odd and Even Numbers; Writing More Complex Conditional Statements; Try This 3 - 2: Assigning Boy Scouts to Tents – Repeating Actions with Loops; Try This 3 - 3: Building a Factorial Calculator; Working with String and Numeric Functions; Try This 3 - 4: Processing a Member Registration Form.

Working with Arrays –Storing Data in Arrays; Processing Arrays with Loops and Iterators; Try This 4 - 1: Averaging the Grades of a Class; Using Arrays with Forms; Try This 4 - 2: Selecting Pizza Toppings; Working with Array Functions; Try This 4 - 3: Checking Prime Numbers; Working with Dates and Times; Try This 4 - 4: Building an Age Calculator.

Unit III   **15 Hours**

Using Functions and Classes –Creating User-Defined Functions; Try This 5 - 1: Calculating GCF and LCM; Creating Classes; Try This 5 - 2: Encrypting and Decrypting Text.

Working with Files and Directories: Reading Files; Writing Files.

Unit IV   **15 Hours**

Working with Databases and SQL –Introducing Databases and SQL – Try This 7 - 1: Creating and Populating a Database; Using PHP's MySQLi Extension; Adding or Modifying Data; Handling Errors; Try This 7 - 2: Adding Employees to a Database.

Working with Cookies, Sessions, and Headers – Working with Cookies; Try this 9 - 1: Saving and Restoring User Preferences; Working with Sessions; Try This 9 - 2: Tracking Previous Visits to a Page; Using HTTP Headers; Try This 9 - 3: Building a Better Login Form.

Unit V   **15 Hours**

Handling Errors – Handling Script Errors; Try This 10 - 1: Generating a Clean Error Page.

Securing PHP – Sanitizing Input and Output; Securing Data; Validating User Input; Try This 11 - 1: Validating Form Input; Configuring PHP Security.

Text Book:

VikramVaswani, "***PHP A Beginner's Guide",*** Tata McGraw Hill Education Private Limited, Fifth Reprint, 2011.

Unit I Chapter 1 (Page No: 3-18) Chapter 2 (Page No: 21-44)

Unit II Chapter 3 (Page No: 49-81) Chapter 4 (Page No: 85-118)
Unit III Chapter 5 (Page No: 121-141) Chapter 6 (Page No: 160-164)
Unit IV Chapter 7 (Page No: 186-216) Chapter 9 (Page No: 294-313)
Unit V Chapter 10(Page No: 318-329) Chapter 11(Page No: 350-375)

Reference Books:

1. Larry Ullman, "PHP 6 and MySQL 5", Pearson Education, 2008.

e- Resources:

1. https://www.geeksforgeeks.org/php-tutorial/?ref=footer
2. https://www.javatpoint.com/php-full-form
3. https://www.w3schools.com/php/php_mysql_intro.asp
4. https://youtube.com/playlist?list=PLEiEAq2VkUUIjP-
   QLfvICa1TvqTLFvn1b&si=K2Mfo7THF4LpUR6Y
1. https://trainings.internshala.com/web-development-course/?tracking_source=trainings-
   dropdown-programming

Elective- 1

Course Title :Data Mining	Total Hours :75 Hours
Course Code : U24CAE52	Total Credits : 4

Course Outcomes:

COs	CO Statement
CO1	Understand the functionality of the various datamining and data warehousing components.
CO2	Appreciate the strengths and limitations of variousdata mining and data warehousing models.
CO3	Explain the analysing techniques of various data.
CO4	Describe different methodologies used in datamining and data ware housing.
CO5	Compare different approaches of data warehousing and data mining with various technologies.

Unit I   **15 Hours**

Data Warehousing –Introduction; Data Warehouse Architecture; Dimensional Modelling; Categorization of Hierarchies; Aggregate Function; Fact-Dimension Relationship; OLAP Operations; Lattice of Cuboids; OLAP Server; ROLAP; MOLAP.

Unit II   **15 Hours**

Data Mining –Introduction; What is Data Mining; Data Mining: Definitions; KDD vs. Data Mining; DBMS vs. DM; Other Related Areas; DM Techniques; Other Mining Problems; Issues and Challenges in DM.

Association Rules –Introduction; What is an Association Rule; Methods to Discover Association Rules; Apriori Algorithm; Partition Algorithm; Border Algorithm.

Unit III   **15 Hours**

Clustering Techniques –Introduction; Clustering Paradigms; Partitioning Algorithms; K-Medoid Algorithms; CLARA; CLARANS; Hierarchical Clustering; DBSCAN; BIRCH; CURE; Categorical Clustering Algorithms; STIRR.

Decision Trees –Introduction; What is a Decision Tree; Tree Construction Principle; Best Split; Splitting Indices; Splitting Criteria; Decision Tree Construction Algorithms; CART; ID3.

Unit IV   **15 Hours**

Genetic Algorithm – Introduction; Basic Steps of GA.

Other Techniques – Introduction; What is a Neural Network; Learning in NN; Unsupervised Learning; Support Vector Machines.

Unit V   **15 Hours**

Web Mining – Introduction; Web Mining; Web Content Mining; Web Structure Mining; Web Usage Mining; Text Mining; Hierarchy of Categories; Text Clustering.

Temporal and Spatial Data Mining - Introduction; What is Temporal Data Mining; Temporal Association Rules; Sequence Mining; Spatial Mining; Spatial Mining Tasks; Spatial Clustering.

Text Book:

> Arun K Pujari, "***Data Mining Techniques***", Universities Press (India) Private Limited, Third Edition, 2015.
> > Unit I   Chapter 2 (2.1 - 2.5,2.7 - 2.12)
> > Unit II Chapter 3 (3.1 -3.9)Chapter 4 (4.1 -4.5, 4.13)
> > Unit IIIChapter 5 (5.1 -5.12)Chapter 6 (6.1 - 6.9)
> > Unit IVChapter 8 (8.1, 8.2)Chapter 9 (9.1 – 9.4, 9.6)
> > Unit VChapter 10(10.1 - 10.6, 10.9, 10.10),
> > Chapter 11(11.1- 11.4, 11.12 – 11.14)

Reference Books:

1. K.P.Soman, ShyamDiwakar, V.Ajay, "Insight into Data Mining Theory and Practice", PHI Learning Private Limited, 5[th]Edition, 2010.

e- Resources:

1. https://onlinecourses.nptel.ac.in/noc21_cs06/preview
2. https://www.geeksforgeeks.org/java/

3. https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/31
4. https://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf
5. https://hanj.cs.illinois.edu/bk3/bk3_slidesindex.htm

Elective- 1

Course Title :TCP/IP	Total Hours :75 Hours
Course Code : U24CAE53	Total Credits : 4

Course Outcomes:

COs	CO Statement
CO1	To understand networking and its basics.
CO2	To understand about addressing and the media used for data transfer.
CO3	To gain knowledge about Internet Protocol.
CO4	To gain knowledge about User Datagram Protocol.
CO5	To gain knowledge about Transmission Control Protocol.

Unit I   **15 Hours**
Introduction:-A Brief History - Protocols and Standards – Standards Organizations – Internet Standards - Internet Administration –– **The OSI Model and the TCP/IP Protocol Suite:-** Protocol Layers - The OSI Model – TCP/IP Protocol Suite – Addressing. **Underlying Technologies:-** Connecting Devices.

Unit II   **15 Hours**
Introduction to Network Layer:-Introduction -Switching – Packet Switching at Network Layer – Network Layer Services – Other Network Layer Issues. **IPv4 Addresses:-** Introduction - Classful Addressing – Classless Addressing – Special Addresses – NAT.

Unit III   **15 Hours**
Internet Protocol Version 4(IPv4):- Introduction - Datagrams – Fragmentation – Options – Checksum – IP over ATM – Security – IP Package.

Unit IV   **15 Hours**
User Datagram Protocol (UDP):- Introduction – User Datagram – UDP Services – UDP Applications – UDP Package.

Unit V   **15 Hours**

Transmission Control Protocol (TCP):- TCP Services – TCP Features - Segment – A TCP Connection – State Transition Diagram – Windows in TCP – Flow Control – Error Control – Congestion Control – TCP Timers – Options – TCP Package.

Text Book:

Behrouz A. Forouzan, *"TCP/IP Protocol Suite",* Tata McGraw Hill Education (India) Private Limited, 2010.

Unit I: Chapter 1, 2, 3.5
Unit II: Chapter 4, 5
Unit III: Chapter 7
Unit IV: Chapter 14
Unit V: Chapter 15

Reference Books:

1. Behrouz A. Forouzan, **"TCP/IP Protocol Suite"**, Tata McGraw Hill Education (India) Private Limited, 2000.
2. Larry L.Peterson& Peter S.Daive, **"Computer Networks"**, Second Edition, Harcourt Asia Pvt. Ltd., 2000.
3. William Stallings, **"Data and Computer Communication"**, Sixth Edition, Pearson Education, 2000.

e-Resources:

1. https://www.javatpoint.com/computer-network-tcp-ip-model
2. https://www.geeksforgeeks.org/user-datagram-protocol-udp/
3. https://www.simplilearn.com/tutorials/cyber-security-tutorial/difference-between-ipv4-and-ipv6
4. https://en.wikipedia.org/wiki/Internet_Protocol_version_4
5. https://www.techtarget.com/iotagenda/definition/IPv6-address

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Elective - 2

Course Title : Software Engineering	Total Hours :75 Hours
Course Code : U24CAE54	Total Credits : 4

Course Outcomes:

COs	CO Statement
CO1	Understand the phases in Software Development Process and Organizational Structure
CO2	Understand the size and cost estimation of the software.
CO3	Understand the Software Requirement specification and its needs.

CO4	Understand the Software design and its guidelines.
CO5	Understand the Verification, Validation Techniques and Maintainability of a Software

Unit I   **15 Hours**
Introduction to Software Engineering: Definitions- Size Factors- Quality and Productivity factors.
Planning a Software Project: Defining the Problem- Developing Solution Strategy--Planning the Development Process- Planning an Organizational Structure.

Unit II   **15 Hours**
Software Cost estimation: Software Cost Factors- Cost Estimations Techniques- Staffing Level Estimation- Estimating and Maintenance cost.

Unit III   **15 Hours**
Software Requirements Definition: Software Requirement Specification- Formal Specification Techniques- Languages and Processors for Requirements Specification.

Unit IV   **15 Hours**
Software Design: Fundamental Design Concepts- Modules and Modularization Criteria- Design Notations- Design Techniques- Test Plans- Milestones, Walkthroughs and Inspections- Design Guidelines.

Unit V   **15 Hours**
Verification and Validation Techniques: Quality Assurance- Walkthroughs and Inspections- Static Analysis- Symbolic Execution- Unit testing and Debugging- System Testing.
Software Maintenance: Enhancing Maintainability during Development- Managerial Aspects of Software Maintenance- Configuration Management- Source-Code Metrics- Other Maintenance Tools and Techniques.

Text Book:

Richard Fairley, *Software Engineering Concepts*,McGraw-Hill Education, 45th Reprint 2016.

Unit I   : Chapters –1 (1.1 to 1.3), 2 (2.1 to 2.4)
Unit II   : Chapter – 3
Unit III   : Chapter – 4
Unit IV   : Chapters –5 (5.1 to 5.4, 5.7 – 5.9)
Unit V   : Chapters –8 (8.1 to 8.6), 9

Reference Books:

1. Roger S. Pressman,***Software Engineering,*** McGraw-Hill International Edition,7th Edition, 2010.

2. RajibMall,***Fundamentals of Software Engineering,*** Prentice Hall of India Pvt. Ltd., New Delhi-2003.

e-Resources:

1. https://www.geeksforgeeks.org/software-engineering/
2. https://www.tutorialsduniya.com/notes/software-engineering-notes/#google_vignette
3.https://www.tutorialspoint.com/software_engineering/software_engineering_tutorial.pdf
4.https://fmcet.in/CSE/CS6403_uw.pdf

Elective- 2

Course Title : Mobile Application Development	Total Hours :75 Hours
Course Code : U24CAE55	Total Credits : 4

Course Outcomes:

COs	CO Statement
CO1	Understand the Architecture, Devices and Applications of Android.
CO2	Understand the Android Activity Life Cycle and User Interface.
CO3	Develop Interactive android Applications using Concepts such as Intents and Fragments.
CO4	Develop android applications to manage user data using Databases, File Storage and Preferences.
CO5	Able to Export an Application to Android Play store and reach globally.

Unit I   **15 Hours**
Getting started with Android programming -What is Android; Obtaining the Required Tools; Creating your First Android Application; Anatomy an Android Application.
Designing your user interface with views -Using basic views; Using Picker views; Using List views to display long lists.

Unit II   **15Hours**
Activities, Fragments and intents -Understanding Activities**;** Linking Activities using intents; Fragments; Calling Built-in Applications using intents; Displaying notifications.

Unit III   **15 Hours**
Getting to know the Android user interface -Understanding the Components of a screen; utilizing the action bar; creating the user interface programmatically; listening for UI notifications.

Data Persistence -Saving and Loading user preferences; Persisting Data to Files.

Unit IV	15 Hours

Displaying Pictures and Menus with Views -Using Image Views to Display Pictures; Using Menus with Views; Some Additional Views.
Messaging -SMS Messaging; Sending E-mail.

Unit V	15Hours

Location Based Services -Displaying Maps; Getting Location Data; Monitoring a Location; Project: Building a Location Tracker.
Publishing Android Applications -Preparing for publications; Deploying APK Files.

Text Book:

Wei-Meng-Lee, *Beginning Android 4 Application Development*, Wiley India Edition, 2013.

Unit I   Chapter 1, 2 (Page No: 159-201)
Unit II   Chapter 2
Unit III   Chapter 3 (Page No: 105-122), 6 (Page No: 251-271)
Unit IV   Chapter 5, 8
Unit V   Chapter 9,12

Reference Book:

1. Pradeep Kothari, Android Application Development, Dreamtech Press, 2017.

e- Resources:

1. https://www.geeksforgeeks.org/introduction-to-android-development/
2. https://trainings.internshala.com/android-course/?tracking_source=trainings-dropdown-programming
3. https://www.udemy.com/course/learn-android-application-development-y/
4. https://www.youtube.com/playlist?list=PLuC2HflhhpLEgT-GlRhpX0DQe5VDCs109

Elective - 2

Course Title : Mobile Computing	Total Hours :75 Hours
Course Code : U24CAE56	Total Credits : 4

Course Outcomes:

COs	CO Statement
CO1	To understand the basic concepts of mobile computing.
CO2	Understand the working principles of Wireless Networking.
CO3	Familiarize the concepts of Mobile IP and TCP.

CO4	Describe how mobile databases work.
CO5	To explain how Wireless Sensor Networks and routing protocols work.
CO6	Understand the steps involved in mobile commerce.

Unit I   **15 Hours**

Basics of Communication Technologies: Mobile Handsets, Wireless Communications and Server Applications - Cell Phone System – Types of Telecommunication Networks – Computer Networks – Traditional LAN – LAN Architecture – Components of Wireless Communication System – Architecture of Mobile Telecommunication System – Wireless Networking Standards – Wireless Local Area Networks – Bluetooth Technology.

Unit II   **15 Hours**

Introduction to Mobile Computing and Wireless Networking: What is Mobile Computing – Mobile Computing Vs Wireless Networking – Mobile Computing Applications – Characteristics of Mobile Computing – Structure of Mobile Computing Application – Cellular Mobile Communication – Global System for Mobile Communications (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).

Unit III   **15 Hours**

Mobile Internet Protocol: Mobile IP – Packet Delivery – Overview of Mobile IP – Desirable Features of Mobile IP – Key Mechanism Used in Mobile IP – Route Optimization – Dynamic Host Configuration Protocol (DHCP).

Mobile Transport Layer: Overview of TCP/IP – Terminologies of TCP/IP – Architecture of TCP/IP – An Overview of the Operation of TCP – Application Layer Protocols of TCP – TCP/IP versus ISO/OSI Model – Adaptation of TCP Window.

Unit IV   **15 Hours**

Mobile Databases: Issues in Transaction Processing – Transaction Processing Environment – Data Dissemination – Transaction Processing in Mobile Environment – Data Replication – Mobile Transaction Models – Rollback Process – Two Phase commit Protocol – Query Processing - Recovery.

Unit V   **15 Hours**

Wireless Sensor Networks: WSN vs. MANET – Applications – Architecture of the Sensor Node – Challenges in the Design of an Effective WSN – Characteristics of Sensor Networks – WSN Routing Protocols.

Mobile Commerce: Applications of Mobile Commerce – Business-to-Business (B2B) Applications – Structure of Mobile Commerce – Pros and Cons of M-Commerce.

Text Book:

Prasant Kumar Pattnaik, Rajib Mall .*Fundamentals of Mobile Computing*, Second Edition - 2015, PHI Learning Private Limited.

      Unit I: Chapter 1
      Unit II: Chapter 2 (2.1 to 2.9)
      Unit III: Chapter 4, 5 (5.1 to 5.7)
      Unit IV : Chapter 6
      Unit V: Chapter 8 (8.1 to 8.6), 11 (11.1 to 11.4)

Reference Books:

1. Asoke.K.Talukder, Hasan Ahmed, Roopa.R.Yavagal, "Mobile Computing", McGraw Hill Education India Pvt Ltd, Second Edition, 2018.
2. KumkumGarg, "Mobile Computing Theory and Practice", Pearson Education, 2010.
3. SipraDasbit, Biplab K. Sikdar, "Mobile computing", PHI Learning, 2009.

e- Resources :

1. https://www.tutorialspoint.com/mobile_computing/mobile_computing_overview.htm/
2. https://annamalaiuniversity.ac.in/studport/download/sci/cis/resources/MCA-Second%20Year-Mobile%20Computing-MCAC403.pdf
3. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/mobile-computing
4. http://gecnilokheri.ac.in/GPContent/MOBILE%20COMPUTING%20UNIT-II%206th%20Sem%20CSE-converted.pdf
5. https://www.cet.edu.in/noticefiles/270_Lecture%20note%20@%20MC.pdf

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NME

Course Title : Basics of Computer	Total Hours :30 Hours
Course Code : U3CAN51/ **U24CAN51**	Total Credits :2

Course Outcomes:

COs	CO Statement
CO1	To understand the basic components of computer.
CO2	To know about the programming languages and operating systems.
CO3	To be aware of the generations of computer.
CO4	To identify the components of computer network.
CO5	To grasp about multimedia and future of computer.

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Unit I   6 Hours

Computer Basics: A simple model of a computer – Characteristics of Computers.
Input / Output Units: Traditional computer Input/Output units – Other input technologies - Computer output devices.
Computer Memory: Memory cell - Memory organization – Magnetic hard disk.

Unit II   8 Hours

Programming Languages: Programming language - Assembly language -Higher Level programming languages – Compiling a high level language program - Some high level languages.
Operating Systems: Why do we Need an operating system - Batch operating system - Multiprogramming operating system - Time sharing operating system - On-line and Real-Time systems - Other facilities provided by operating systems- Personal computer operating system.

Unit III   6 Hours

Computer Generations and Classification: First Generation of Computers – Secondgeneration – Third generation – Fourth generation – Fifth generation – Classification ofcomputers.
Computer Networks: Need for computer communication networks – Communications protocols – Local area networks – Interconnecting networks - Internet and the world wide web – Internet security.

Unit IV   4 Hours

Voice and Data Communications: Characteristics of communication channel – Allocation of communication channel - Physical communication media – Cellular communications system.

Unit V   6 Hours

Advanced Input/Output interfaces: Graphical user interface – Vector graphics – Rastergraphics – Accelerated graphics with GPU- Stereo display units – Other visual displays – Input devices for interaction – Speech and audio interface – Tactile interfaces.

Text Book:

V.Rajaraman, NeeharikaAdabala*, Fundamentals of Computers*. PHI Learning Pvt. Ltd., New Delhi, 6th Edition, 2015

Unit I	Chapter 1 (1.2,1.3) Chapter 3, Chapter 4(4.1,4.2,4.6)
Unit II	Chapter 9, Chapter 10 (10.1 to 10.7)
Unit III	Chapter 12(12.1 to 12.5, 12.7) Chapter 13(13.1 to 13.3,13.5 to 13.7)
Unit IV	Chapter 14 (14.1 to 14.3, 14.8)

Unit V   Chapter 15

References Books:

1. Anita Goel, Computer Fundamentals. Pearson India Publication, 2010.
2. P.K. Singh, Computer Fundamentals. VK Global Publications, 2015.

e-Resources:

1. https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_introduction.htm
2. https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html
3. https://www.javatpoint.com/computer-fundamentals-tutorial

EMPLOYABILITY SKILLS

Course Title : Employability Skills	Total Hours : 30 Hours
Course Code : U24PS51	Total Credits : 1

COURSE OUTCOMES:
On completing this course, students can/are able to

Cos	CO STATEMENT
CO1:	enhance their skills in solving quantitative aptitude problems
CO2:	expertise themselves in solving verbal and non-verbal reasoning problems.
CO3:	prepare for various public and private sector exams and placement drives.
CO4:	interpret the concepts of LOGICAL REASONING Skills.
CO5:	analyze the problems logically and approach the problems in a different manner

Unit I: Quantitative Aptitude – I   **6 Hours**

H.C.F. and L.C.M. of Numbers - Average - Percentage - Profit and Loss - Ratio and Proportion - Time and Work - Time and Distance - Train Speed.

Unit II: Quantitative Aptitude – II   **6 Hours**

Area related problems - Problems on Ages - Boat and Stream - Simple Interest - Compound Interest – True discount – Calendar – Clocks - Data Interpretation - Bar Graphs - Pie Chart.

Unit III: Verbal Reasoning – I   **6 Hours**

Analogy - Classification – Series - Coding & Decoding - Coded inequality - Blood relations - Direction sense test.

Unit IV: Verbal Reasoning – II   **6 Hours**

Number Test - Ranking and Time Sequence Test - Seating arrangements - Alphabet Test - Logical Venn Diagram.

Unit V: General Knowledge   **6 Hours**

Abbreviations & Acronyms - Famous Personalities - Important Days (National & International) - Capital Cities and Currencies – Current affairs - Sports – RBI & Banking Terms – Basics of Computers and Internet.

Reference Books:

1. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S Chand Publishing company; Revised edition (21 February 2017).

2. R.S.Agarwal, A modern approach to logical reasoning, S Chand Publishing company; August 2022.

3. R.S.Agarwal, A Modern Approach To Verbal Reasoning (Old Edition), S Chand Publishing company.

4. R.S.Agarwal, Advanced objective general knowledge revised edition, S Chand Publishing company, 2017.

e-Resources:

1. https://www.cuemath.com/numbers/hcf-and-lcm/

2. https://www.geeksforgeeks.org/speed-time-distance-formula-and-aptitude-questions/

3. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://cdn1.byjus.com/wp-content/uploads/2020/06/Boat-Stream-Sample-Questions.pdf

4. https://www.hitbullseye.com/Simple-Interest-and-Compound-Interest.php

5. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://examsdaily.in/wp-content/uploads/2018/09/br.pdf

6. https://testbook.com/objective-questions/mcq-on-direction-and-distance--5eea6a0e39140f30f369e42a

7. https://unacademy.com/content/cat/study-material/data-interpretation-and-logical-reasoning/ranking-and-time-sequence/

8. https://www.toppr.com/guides/computer-aptitude-and-knowledge/basics-of-computers/basic-computer-terminology/

Core- 16

Course Title :Software Testing	Total Hours :60 Hours
Course Code : U24CAC61	Total Credits :3

Course Outcomes:

COs	CO Statement
CO1	List a different software development lifecycle model and understand the importance of testing.
CO2	Apply white box and black box testing strategies to test the software.
CO3	Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible.
CO4	Discuss about the acceptance and system testing methods
CO5	Demonstrate various issues for regression and usability testing.

Unit I 12 Hours

Software Development Life Cycle Models–Phases of Software Project; Quality, Quality Assurance, and Quality Control; Testing, Verification, and Validation; Process Model to Represent Different Phases; Life Cycle Models.
White Box Testing – What is White Box Testing; Static Testing; Structural Testing; Challenges in White Box Testing.

Unit II 12 Hours

Black Box Testing–What is Black Box Testing ; Why Black Box Testing ; When to do Black Box Testing?; How to do Black Box Testing?.
Integration Testing – What is Integration Testing; Integration Testing as a Type of Testing; Integration Testing as a Phase of Testing; Scenario Testing; Defect Bash.

Unit III 12 Hours

System and Acceptance Testing–System Testing Overview; Why is System Testing Done; Functional Versus Non-Functional Testing; Functional System Testing; Non-Functional Testing; Acceptance Testing.

Unit IV 12 Hours

Performance Testing–Introduction; Factors Governing Performance Testing; Methodology for Performance Testing; Tools for Performance Testing.
Regression Testing –What is Regression Testing?; Types of Regression Testing; When to do Regression Testing?.

Unit V 12 Hours

Usability and Accessibility Testing–What is Usability Testing; Approach to Usability; When to do Usability Testing; How to Achieve Usability; Quality Factors for Usability; Aesthetics

Testing; Accessibility Testing; Tools for Usability; Usability Lab Setup; Test Roles for Usability.

Text Book:

Srinivasan Desikan, Gopalswamy Ramesh, *Software Testing Principles and Practices,* Pearson India Education Services Pvt Ltd, 2016.

Unit I	Chapter 2, (2.1 - 2.5), Chapter 3 (3.1 - 3.4)
Unit II	Chapter 4 (4.1 - 4.4), Chapter 5 (5.1 - 5.5)
Unit III	Chapter 6 (6.1 - 6.6)
Unit IV	Chapter 7 (7.1 - 7.4), Chapter 8 (8.1 - 8.3)
Unit V	Chapter 12 (12.1 - 12.10)

Reference Book:

1. Boris Beizer, Software Testing Techniques, Dreamtech Press, 2nd Edition, 2017.

e- Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs61/preview
2. https://www.browserstack.com/guide/what-is-software-testing
3. https://www.ibm.com/topics/software-testing
4. https://www.geeksforgeeks.org/software-testing-basics/
5. https://www.javatpoint.com/software-testing-tutorial
6. https://www.softwaretestingmaterial.com/software-testing/

Core- 17

Course Title :Cryptography	Total Hours :60 Hours
Course Code : U24CAC62	Total Credits :3

Course Outcomes:

COs	CO Statement
CO1	Understand the fundamentals of Cryptography terms.
CO2	Acquire knowledge on standardalgorithms used to provide confidentiality, integrityand authenticity.
CO3	Understand the various key distribution and management schemes.
CO4	understand how to deploy encryption techniques to secure data in transit across datanetworks.
CO5	Design security applications in the field of Information technology.

Unit I   **12 Hours**

Introduction to the concepts of Security–Introduction; The Need for Security; Security Approaches; Principles of Security; Types of Attacks.

Cryptography Techniques – Introduction; Plain Text and Cipher Text; Substitution Techniques; Transposition Techniques; Encryption and Decryption; Symmetric and Asymmetric Key Cryptography; Possible Types of Attacks.

Unit II   **12 Hours**

Computer-based Symmetric Key Cryptographic Algorithms–Introduction; Algorithm Types and Modes; An Overview of Symmetric Key Cryptography; Data Encryption Standard (DES); International Data Encryption Standard (IDEA); Advanced Encryption Standard (AES).

Unit III   **12 Hours**

Computer-based Asymmetric Key Cryptographic Algorithms–Introduction; Brief History of Asymmetric Key Cryptography – An Overview of Asymmetric Key Cryptography; The RSA Algorithm; ElGamal Cryptography; Symmetric and Asymmetric Key Cryptography; Digital Signatures; Knapsack Algorithm; ElGamal Digital Signature; Attacks on Digital Signatures.

Unit IV   **12 Hours**

Public Key Infrastructure–Introduction; Digital Certificates.

Internet Security Protocols –Introduction; Secure Socket Layer (SSL); Secure Electronic Transaction (SET); SSL versus SET; Email Security.

Unit V   **12 Hours**

User Authentication Mechanisms–Introduction; Authentication Basics; Passwords; Certificate Based Authentication; Biometric Authentication.

Network Security, Firewalls and Virtual Private Networks (VPN) – Firewalls.

Text Book:

AtulKahate, *Cryptography and Network Security,* McGraw Hill Education Pvt Ltd, Eighth Reprint, 2017, Third Edition.

Unit I	Chapter 1 & 2 (2.1 - 2.6, 2.9)
Unit II	Chapter 3 (3.1 -3.5, 3.9)
Unit III	Chapter 4 (4.1 –4.10)
Unit IV	Chapter 5 (5.1, 5.2) & 6 (6.1, 6.3, 6.6, 6.7, 6.9)
Unit V	Chapter 7 (7.1 - 7.3, 7.5, 7.6) & 9 (9.3)

Reference Book:

William Stallings, Cryptography and Network Security, PHI,2008.

e- Resources:

1.   https://onlinecourses.nptel.ac.in/noc22_cs90/preview

2. https://www.geeksforgeeks.org/cryptography-and-network-security-principles/
3. https://www.youtube.com/playlist?list=PLePkp1QLoDXShgX1LeoL8H3VlIy4Z-bQq
4. https://www.youtube.com/playlist?list=PLBlnK6fEyqRgJU3EsOYDTW7m6SUmW6kII
5. https://www.codingninjas.com/studio/library/cryptography-and-network-security

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Core 18

Course Title : LAB: Dot Net Programming	Total Hours :60 Hours
Course Code : U24CACP61	Total Credits :2

Course Outcomes:

COs	CO Statement
CO1	Basic Programming in Dot NET Environment.
CO2	To develop Windows based applications in Dot NET using VB and C#.
CO3	Proficient to develop Web applications using ASP.NET

VB.NET
Console Applications:
1. Write a program in VB.Net to perform Matrix Manipulations.
2. Write a program in VB.Net to perform ArrayList Operations.

Windows Applications:
1. Write a program in VB.Net to perform File Operations using Streams.
2. Write a program in VB.Net to design a Calculator.
3. Create Inventory Management System using Database.

C# :
Console Applications:
1. Write a program in C#.Net to demonstrate Error Handling.
2. Write a C#.Net program to implement Multi Level Inheritance.

Windows Applications:
3. Write a C#.Net program to design book store management.

ASP.NET
1. Write an ASP.Net program to find the Factorial of a given number by using Function
2. Write an ASP.Net program to generate a Fibonacci series by using Subroutine
3. Write an ASP.Net program to generate a Multiplication Table
4. Write a program containing the following controls:
   • A ListBox
   • A Button
   • An Image
   • A Label

The listbox is used to list items available in a store. When the user clicks on an item in the listbox, its image is displayed in the image control. When the user clicks the button, the cost of the selected item is displayed in the control.

5. Create Course Registration Application using Validation Controls.
6. Create college student registration as web page in online using Visual Basic.
7. Create a web page for employee details of an organization using C#.

e-Resources:

1. https://learn.microsoft.com/en-us/dotnet/core/introduction
2. https://www.geeksforgeeks.org/introduction-to-net-framework/
3. https://www.javatpoint.com/vb-net-dot-net-framework-introduction
4. https://www.tutorialspoint.com/asp.net/asp.net_introduction.htm
5. https://www.youtube.com/watch?v=nelyq4LD-KY

Core-19

Course Title : LAB: Software Testing	Total Hours :60 Hours
Course Code : U24CACP62	Total Credits :2

Course Outcomes:

COs	CO Statement
CO1	Apply various testing techniques to test the software.
CO2	Create test cases for different scenario.
CO3	Analyze the output on the outcome of testing.
CO4	Apply the Automated testing tools for specific testing methods.
CO5	Understand the testing tools to be used for the application.

1. Write a Java program based on JUnit to do Unit testing.
2. Do the functional Test the applications using Selenium script.
3. Write a Selenium based script to perform Database testing.
4. Write the script using JMeter to perform Performance testing.
5. Write the Selenium script using Python to perform web testing.
6. Write the necessary code for API testing using Postman tool.
7. Write the script for JUnit test suite.
8. Write Selenium Python code to count number of check boxes on the page checked and unchecked.
9. Write the test script for Mobile testing using Appium tool.
10. Write the PHP script for PHP Unit testing

e-Resources:

1. https://www.javatpoint.com/software-testing-tutorial
2. http://www.scce.ac.in/noticeboard/10152_21082014Software_Testing_Lab.pdf
3. https://mrcet.com/pdf/Lab%20Manuals/CSE/SOFTWARE%20TESTING%20METHODOLOGIES%20LAB.pdf
4. https://www.studocu.com/in/document/vidarbha-institute-of-technology/computer-science-and-engineering/software-testing-lab-manual/44321560
5. https://www.youtube.com/playlist?list=PLRT69Hh5pPAoGmY3a7wR9HkiLyHJIG5Vc

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Elective 3

Course Title : Embedded Systems	Total Hours :75 Hours
Course Code : U24CAE61	Total Credits :4

Course Outcomes:

COs	CO Statement
CO1	Learn and obtain the basic concept of embedded systems
CO2	Learn to apply and analyse the applications in various processors, Input/output interfacing and Bus Communication
CO3	Learn interrupt service mechanisms and device driver concepts
CO4	Learn the process of memory management and basic design of real time operating system
CO5	Learn to write the programs for microcontroller and obtain basic knowledge of Embedded Software Development tools

Unit I   **15 Hours**

Introduction to Embedded Systems: Embedded Systems – Processor Embedded into a System – Embedded Hardware units and Devices in a System – Embedded Software in a System – Examples of Embedded System – Embedded System on-chip (Soc) and Use of VLSI Circuit design Technology – Complex systems design and processors – Design process in Embedded System – Formalization of System design – Design process and Design Examples – Classification of Embedded Systems.

Unit II   **15 Hours**

8051 and Advanced Processor Architectures, Memory Organizations and Real-world Interfacing: 8051 Architecture – Real world Interfacing – Processor and Memory organizations – Memory-Types, Memory-Maps and Addresses.

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Design and Communication Buses for Devices Network: IO Types and Examples – Serial Communication Devices – Parallel Device Ports – Timer and Counting Devices – Serial Bus Communication Protocols.

Unit III   15 Hours

Device Drivers and Interrupts Service Mechanism: Programmed-I/O Busy-wait Approach without Interrupt Service Mechanism – ISR Concept – Interrupt Sources – Interrupt Servicing Mechanism – Multiple Interrupts – Context and the Periods for Context Switching, Interrupt Latency and Deadline – Classification of Processors Interrupt Service Mechanism from Context-saving Angle – Direct Memory Access – Device Driver Programming.

Unit IV   15 Hours

Real-Time Operating Systems: OS Services – Process Management – Timer Functions – Event Functions – Memory Management – Device, File and IO Subsystems Management – Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls – Real-time Operating Systems – Basic Design using RTOS – RTOS Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Metrics – OS Security Issues.

Unit V   15 Hours

Programming Concepts: Software Programming in Assembly Language (ALP) and in High-Level Language "C" - C Program Elements - Header and Source Files and Preprocessor Directives – Program Elements - Macros and Functions - Program Elements - Data Types – Data Structures, Modifiers, Statements, Loops and Pointers.

Embedded Software Development Process and Tools: Introduction to Embedded Software Development Process and tools – Host and Target machines – Linking and Locating Software – Getting Embedded Software into the Target System – Issues in Hardware-Software Design and Co-Design.

Text Book:

Raj Kamal, *Embedded Systems Architecture, Programming and Design*, 2nd Edition, Tata McGraw Hill Education Private Limited, New Delhi, 2013.

Unit I   : Chapter 1 [1.1 to 1.11]
Unit II : Chapter 2 [2.1, 2.2, 2.4, 2.7] & 3[3.1 to 3.3, 3.6, 3.10]
Unit III: Chapter 4
Unit IV: Chapter 8
Unit V : Chapter 5 [5.1-5.4] & 13

Reference Book:

David E.Simson, *An Embedded Software Primer*, Pearson Education, Eighth Impression, 2009.

e – Resources:

1. https://archive.nptel.ac.in/courses/106/105/106105193/
2. https://mrcet.com/downloads/digital_notes/ECE/IV%20Year/EMBEDDED%20SYSTE
   MS%20DESIGN.pdf
3. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SEC1320.pdf
4. https://vemu.org/uploads/lecture_notes/30_12_2019_922020001.pdf
5. https://www.scribd.com/document/328586500/embedded-systems-by-rajkamal-2nd-pdf

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Elective 3

Course Title : Computer Algorithms	Total Hours :75 Hours
Course Code : U24CAE62	Total Credits :4

Course Outcomes:

COs	CO Statement
CO1	Learn the concept of designing an algorithm to solve real world problems
CO2	Learn greedy method, advanced tree and graph applications to select a proper pattern matching algorithm for given problem
CO3	Learn and familiarize with basic paradigms and data structures to solve algorithmic problems.
CO4	Learn different classes of problems with reference to their computation difficulties
CO5	Learn major algorithms, design paradigms and methods of analysis in algorithm design

Unit I   **15 Hours**
Introduction: An Algorithm-Performance Analysis - Space Complexity-Time Complexity – Asymptotic Notation.
Divide and Conquer: General Method – Binary Search – Finding the Maximum and Minimum – Merge Sort - Quick Sort- Performance Measurement – Selection - A Worst-Case Optimal Algorithm.

Unit II   **15 Hours**
The Greedy Method: General Method - Container Loading – Knapsack Problem – Tree Vertex Splitting – Job Sequencing with Deadlines – Minimum-Cost Spanning Trees – Optimal Storage on Tapes –Optimal Merge Patterns – Single source Shortest Paths.

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Unit III   **15 Hours**

Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-Source shortest Paths – String Editing – 0/1 Knapsack – Reliability Design – The Traveling Salesperson Problem – Flow Shop Scheduling.

Unit IV   **15 Hours**

Basic Traversal and Search Techniques: Techniques for Binary Trees – Techniques for Graphs – Connected Components and Spanning Trees – Biconnected Components and DFS

Unit V   **15 Hours**

Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles –Knapsack Problem.

Text Book:

Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms*, 2nd Edition, Universities Press Pvt. Ltd., 2008.

Unit I : Chapter 1 (1.1, 1.3.1, 1.3.2, 1.3.4), 3 (3.1, 3.3 to 3.5, 3.6.1, 3.7.1)
Unit II : Chapter 4
Unit III: Chapter 5 (5.1 to 5.4, 5.6 to 5.10)
Unit IV: Chapter 6
Unit V : Chapter 7

Reference Books:

1. AnanyLevitin, *Introduction to the Design & Analysis of Algorithms,* 2nd Edition, Pearson Education, New Delhi, 2008.

2. Berman and Paul, *Algorithms*,Cenage Learning India Edition, New Delhi, 2008.

e-Resources:

1. https://kailash392.files.wordpress.com/2019/02/fundamentalsof-computer-algorithms-by-ellis-horowitz.pdf

2. https://www.acsce.edu.in/acsce/wp-content/uploads/2020/03/Module1_DAA.pdf

3. https://www.geeksforgeeks.org/introduction-to-algorithms/

Elective 3

Course Title : Cloud Computing	Total Hours :75 Hours
Course Code : U24CAE63	Total Credits :4

Course Outcomes:

COs	CO Statement
CO1	To understanding cloud computing terminology.
CO2	To implement virtualization in cloud.
CO3	To gain knowledge about how to migrate our applications to the cloud.
CO4	To know the applications and standards of cloud
CO5	To know the future of cloud computing through mobile and micro services

Unit I   **15 Hours**

Cloud Computing – An Overview: Introduction – History of Cloud Computing – Characteristics of Cloud – Cloud Computing Model. Issues and challenges of Cloud Computing – Advantages, Disadvantages of Cloud computing – Security, Privacy and Trust – Virtualization – Threats to Cloud Computing – Next Generation of Cloud Computing.

Cloud Computing Architecture: Introduction – Cloud Architecture - Cloud Computing models – Comparison of Service models – Deployment Models – Identity as a Service.

Unit II   **15 Hours**

Virtualization in Cloud: Introduction – Virtualization – Implementation of Virtualization - Virtualization support at the OS level – Middleware Support for Virtualization - Advantages of Virtualization - Application Virtualization - Virtualization Implementations Techniques – Hardware Virtualization - Types of Virtualization – Load balancing in Cloud Computing - Logical Cloud Computing Model – Virtualization for Data Centre.

Security Management: Security Issues in Cloud Computing – Classification of Security Issues – Types of Attackers – Security risks in Cloud Computing – Security Threats against cloud Computing.

Unit III   **15 Hours**

Virtualization System Specific Attacks: Attacks in Cloud Computing Environment – Attacks on Hypervisor – Security Challenges – Virtualization Security Solutions.

Web Services: Introduction – Amazon Web Services – Microsoft Azure.

Migrating Applications to the Cloud Computing: Motivations for Migration – Issues in Migrating the Applications to the Cloud – Challenges in Migrating the Applications to the Cloud – Solutions for the Challenges in Migration of Applications to Cloud – Types of Migration – Planning for Migrating the Application to Cloud – Migration Roadmap – Cloud Bursting.

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Unit IV   **15 Hours**

Cloud Computing Applications: Introduction – Business Applications – Finance and Banking Application – Cloud Computing in Education.

Standards in Cloud Computing: Standardization Activities – Challenges – Fields of Standardization – Role of Standards in Cloud Computing Environments-Standardization Organisations in Cloud Computing.

Unit V   **15 Hours**

Mobile Cloud Computing: Introduction – Need of Mobile Cloud Computing – Mobile Computing Architecture – Technologies of MCC – MCC Applications – Issues in MCC – Challenges in Building Applications – Platforms.

Microservices: Introduction – Need of Microservices – Microservice Architecture – Benefits of Microservices – Drawbacks of Microservices – Communication Mechanisms – Decentralized Data Management – Essential Checklists for Migration from Monolithic to Microservices.

Text Book:

V.K.Pachghare, *Cloud Computing*, PHI Learning Private Limited, 2016

        Unit I   : Chapter 1, 2.

        Unit II   : Chapter 3, 5 (5.3 to 5.7)

        Unit III   : Chapter 6(6.2 to 6.5), 7 (7.1 to 7.3), 10

        Unit IV   : Chapter 11, 12.

        Unit V   : Chapter 13, 14 (14.1 – 14.8)

Reference Books:

1. Cloud Computing by A Practical Approach by Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw-Hill Education Private Limited, New Delhi, 2010 Edition, Fifth Reprint 2011.
2. Cloud Computing Bible by Barrie Sosinsky, Wiley India Private Limited, Reprint 2011

e – Resources:

1. https://nptel.ac.in/courses/106105167
2. https://www.iare.ac.in/sites/default/files/lecture_notes/CC%20LECTURE%20NOTES.pdf
3. https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/(R17A0527)%20Cloud%20 Computing%20Digital%20Notes.pdf
4. https://krishnamoorthymca99.wordpress.com/cloud-computing/
5. https://annamalaiuniversity.ac.in/studport/download/engg/CSE_Engg/resources/B.E._CS E_4Y_8SEM_CLOUD%20COMPUTING%2006oE8021.pdf

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SBE – 6

Course Title : Internet of Things	Total Hours :30 Hours
Course Code : U24CAS61	Total Credits :2

Course Outcomes:

COs	CO Statement
CO1	To understand the basics of IoT and Machine to Machine Communication
CO2	To gain knowledge about the protocols used for Communication.
CO3	To gain knowledge about processing of data acquired from IoT.
CO4	To understand the working principles of Sensors.
CO5	To understand the basics of Embedded Devices.

Unit I   **6 Hours**

Internet of Things: An Overview: Internet of Things – IoT Conceptual Framework – IoT Architectural View – Technology behind IoT - Sources of IoT – M2M Communication - Examples of IoT.

Unit II   **6 Hours**

Internet Connectivity Principles: Introduction – Internet Connectivity - Internet-Based Communication – IP Addressing in the IoT - Media Access Control - Application Layer - Protocols: HTTP, HTTPS, FTP, Telnet and Others.

Unit III   **6 Hours**

Data Acquiring, Organising, Processing and Analytics: Introduction - Data Acquiring and Storage – Organising the Data - Transactions, Business Processes, Integration and Enterprise Systems.

Unit IV   **6 Hours**
Sensors, Participatory Sensing, RFID and Wireless Sensor Networks: Introduction –Sensor Technology – Participatory Sensing, Industrial IoT and Automotive IoT – Actuator.

Unit V   **6 Hours**
Prototyping the Embedded Devices for IoT and M2M: Introduction – Embedded Computing basics – Embedded Platforms for Prototyping - Things always connected to theInternet/Cloud.

Text Book:

Raj Kamal, *Internet of ThingsArchitecture and Design Principles*, McGraw Hill Education (India) Private Limited, 2017.

Unit I : Chapter 1
Unit II : Chapter 4
Unit III: Chapter 5 (5.1 to 5.4)
Unit IV: Chapter 7 (7.1 to 7.4)
Unit V : Chapter 8

Reference Book:

* Arshdeep Bahga and Vijay Madisetti, *Internet of Things A Hands-on Approach*, University Press (India) Private Limited, 2018

e-Resources:

1.https://en.wikipedia.org/wiki/World_Wide_Web

2. https://www.javatpoint.com/multiple-access-protocols

3.https://www.geeksforgeeks.org/http-full-form/

4. https://managerplus.iofficecorp.com/blog/sensors-actuators

5. https://students.iitk.ac.in/roboclub/assets/docs/Sensors-and-Actuators-1.pdf

6. https://www.coursera.org/articles/embedded-systems

7. https://www.guru99.com/embedded-systems-tutorial.html

NME

Course Title : Internet and Web Technology	Total Hours :30 Hours
Course Code : U24CAN61	Total Credits :2

Course Outcomes:

COs	CO Statement
CO1	To understand basics of networks
CO2	To know basics of internet
CO3	To identify web servers, browsers and data security
CO4	To be aware of basics in HTML
CO5	To grasp graphics, table hyper linking and frames

Unit I 4 Hours
Computer Networks: Basics of Networks – Topologies of Networks – Layers in Networking – Bridges, Routers and Gateways – Types of Networks.

Unit II 5 Hours
The Internet: Basics of Internet – E-mails – World Wide Web – File Transfer – The Telnet – The Usenet –Gopher, Wais, Archie and Veronica – Internet Chat.

Unit III   **4 Hours**
Web Servers, Browsers, and Security: The Web Server – The Proxy Server – The Fast Ready Connections on the Web – Web Browsers – Microsoft Internet Explorer – The Virus Menace in the Internet – Firewalls – Data Security.

Unit IV   **10 Hours**
Introduction to HTML: Hyper Text Markup Language – Commonly used HTML commands-Titles and Footer – Text Formatting – Emphasizing materials in a web page – Text styles – Other text effects.
Lists: Types of lists.
Adding Graphics to HTML Documents: Using the Border attribute – Using the Width and Height Attributes – Using the Align Attribute - Using the Alt Attribute.

Unit V   **7 Hours**
Tables: Introduction – Using the width and Border Attribute - Using the Cell padding Attribute - Using the Cell spacing Attribute - Using the Background-color Attribute - Using the Colspan and Rowspan Attributes.
Linking Documents: Links – Images as Hyperlinks.
Frames: Introduction to Frames.
Text Books:

1. Raj Kamal, ***Internet and Web Technologies***, 14th Reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
   - Unit I   : Chapter 1(1.1 to 1.3, 1.5,1.6).
   - Unit II   : Chapter 2 (2.1, 2.5 to 2.9)
   - Unit III   : Chapter 3 (3.1 to 3.4, 3.6 to 3.9)
2. Ivan Bayross, ***HTML, Javascript, DHTML and PHP,*** 4th Revised Edition, BPB Publications, New Delhi, 2013.
   - Unit IV   : Chapter 2, 3, 4
   - Unit V   : Chapter 5, 6, 7

Reference Books:
1. Computer Fundamentals, Anita Goel, Pearson India Publication, 2010.
2. Computer Fundamentals, P.K. Singh, VK Global Publications, 2015.

e-Resources:
1. https://baou.edu.in/assets/pdf/MSCIT_103_slm.pdf
2. https://www.geeksforgeeks.org/the-internet-and-the-web/
3. https://kp.kiit.ac.in/pdf_files/06/5th-Sem_Cse__Internet-Web-Technology_SM.pdf
4. https://www.w3schools.com/html/

Course Title : Project and Viva-Voce	Total Hours :75 Hours
Course Code : U1CA6PR/ **U24CA6PR**	Total Credits :5

Course Outcome:

COs	CO Statement
CO1	Designed to help students develop practical ability and knowledge about practical tools techniques in order to solve real life problems related to the industry, academic institutions and computer science research.
CO2	Involves practical work for understanding and solving problems in the field of computing.
CO3	Students will select individually Commercial or Technical Project based on Application Development Technologies.
CO4	With the known technologies they can develop the software.