



CHARUSAT[®]
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

STUDENT INFORMATION BOOKLET

VOLUME – 2:

Master of Computer Applications

Smt. Chandaben Mohanbhai Patel Institute of
Computer Applications

CHARUSAT UNIVERSITY
Off. Nadiad-Petlad Highway, Changa - 388 421
Anand, Gujarat, India

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PREAMBLE

The Handbook (Student's Information Booklet) for Students, printed in two volumes contain General Information Respectively about the CHARUSAT University and detailed information about Smt. Chandaben Mohanbhai Patel Institute of Computer Applications.

Handbook Volume-I contains information about general rules to be followed by the students on campus. It gives information about the general facilities and support available for the students on campus. It gives insight about the discipline and conduct rules of the University.

This Handbook (Student's Information Booklet) is for the purpose of providing information to the students about the University and its programmes and is not a Regulation book of the University. Hence, no claim can be made based on the information given in the book.

The University / Institute reserves the right to amend the rules and regulations mentioned in the Handbook without any prior notice. The decision of the University shall be final on all matters. For any clarification, the Student Section may be contacted. Handbook Volume-II (Student's Information Booklet) contains academic information about the Institute, which includes the Academic Rules and Regulations regarding academic requirements and academic conduct of the students at the University including different policies and forms. Besides, it includes important information on registration, grading system, academic standards, attendance norms, discipline and the like. The students shall abide by these rules and shall, at all times, conduct in a manner so as to bring credit to the University and enhance its prestige in the society.

It is prime responsibility of the students to get familiar (themselves) with the rules and regulations.

ABOUT INSTITUTE

Smt. Chandaben Mohanbhai Patel Institute of Computer Applications (CMPICA) is a constituent institute of CHARUSAT. It is offering a MCA, M.Sc. (IT), BCA, B.Sc.(IT), Online BCA, Online MCA and Ph. D. programmes. The vision of the institute is to become one of the leading institutions in the country by imparting state-of-the-art education to the students in the field of computer applications and by contributing in the nation's efforts of computerizing public systems for the benefit of the masses. It is committed to excel in both teaching and research. Institute is reacting rapidly to the changing technological landscape by adapting quickly. The Institute is also committed to adapt industry practices.

The institute has received numerous prestigious awards from various organizations, including AICTE, the Government of India, and the Government of Gujarat. Additionally, it has been awarded a five-star rating in the Gujarat State Institutional Rating Framework (GSIRF) by the Government of Gujarat.

ACADEMIC REGULATIONS

&

SYLLABUS 2024 -25

Faculty of Computer Science & Applications

Smt. Chandaben Mohanbhai Patel Institute of Computer Applications

Master of Computer Applications (M.C.A.) Programme

(as per CHOICE BASED CREDIT SYSTEM- (CBCS))



Charotar University of Science and Technology (CHARUSAT)
CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad, District: Anand
Phone: 02697-247500, Fax: 02697-247100, Email: info.ac.in
www.charusat.ac.in

ACADEMIC RULES

To ensure uniform system of education, duration of post graduate programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

1. System of Education

The Semester system of education should be followed across the Charotar University of Science and Technology (CHARUSAT) at Master's levels. Each semester will be at least 90 working days duration. Every enrolled student will be required to take a specified load of course work in the chosen course of specialization and also complete a project/dissertation if any.

2. Duration of Programme

Postgraduate Programme	Master of Computer Applications(MCA)
Minimum	4 Semesters (2 Academic years)
Maximum	6 Semesters (3 Academic years)

3. Eligibility & Mode of Admissions

Eligibility of a candidate and mode of admission to the programme will be according to the regulations for admission committee decided by Government of Gujarat from time to time.

4. Programme structure and Credits

A student admitted to a program should study the course and earn credits specified in the course structure.

5. Attendance

5.1 All activities prescribed under these regulations and listed by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student from attendance except on account of serious personal illness or accident or family calamity that

may genuinely prevent a student from attending a particular session or a few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Dean/Principal.

5.2 Student attendance in a course should be 80%.

6. Course Evaluation

6.1 The performance of every student in each course will be evaluated as follows:

- 6.1.1 Internal evaluation by the course faculty member(s) based on continuous assessment, for 50% of the marks for the course.
- 6.1.2 Final examination by the University through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these, for 50% of the marks for the course.

6.2 University Examination

- 6.2.1 The final examination by the University for 50% of the evaluation for the course will be through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these.
- 6.2.2 In order to earn the credit in a course a student has to obtain grade other than FF.
- 6.2.3 Performance at Internal & University Examination will be done on the relative grading system.

7. Grading

The student's performance in any semester will be assessed by the Semester Grade Point Average (SGPA). Similarly, his performance at the end of two or more consecutive semesters will be denoted by the Cumulative Grade Point Average (CGPA). The SGPA and CGPA are defined as follows:

Grading Scheme	96.0-100	86.0-95.9	76.0-85.9	66.0-75.9	56.0-65.9	46.0 – 55.9	36.0 – 45.9	Below 36.0	Absent
Letter Grade	O (Outstanding)	A+ (Excellent)	A (Very Good)	B+ (Good)	B (Above Average)	C (Average)	P (Pass)	F (Fail)	Ab (Absent)
Grade Point	10	9	8	7	6	5	4	0	0

SGPA = $\sum C_i G_i / \sum C_i$ where C_i is the number of credits of course i

G_i is the Grade Point for the course i

and $i = 1$ to n , n = number of courses in the semester

CGPA = $\sum C_i G_i / \sum C_i$ where C_i is the number of credits of course i

G_i is the Grade Point for the course i

and $i = 1$ to n , n = number of courses of all semesters up to which CGPA is computed.

8. Detention Rule

A student will be promoted to next year only if he/she has cleared all the courses of the year he/she is studying in.

Awards of Degree: Every student of the programme who fulfils the following criteria will be eligible for the award of the degree:

8.1.1 He should have earned at least minimum required credits as prescribed in course structure.

8.1.2 He should have cleared all evaluation components in every course.

9. Award of Class

The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:

Distinction:	CGPA ≥ 7 & ≤ 10
First class:	CGPA ≥ 6.0 & < 7
Second Class:	CGPA ≥ 5.0 & < 6.0
Pass Class:	CGPA < 5.0

10. Transcript

The transcript issued to the student at the time of leaving the University will contain a consolidated record of all the courses taken, credits earned, grades obtained, SGPA, CGPA, class obtained, etc.

CHOICE BASED CREDIT SYSTEM

The choice based credit system provides flexibility in designing curriculum and assigning credits based on the course content and hour of teaching. The choice based credit system provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective and open elective courses. The CBCS provides a cafeteria type approach in which the students can take courses of their choice and adopt an interdisciplinary approach to learning. The courses shall be evaluated on the grading system, which is considered to be better than the conventional marks system.

CBCS – Conceptual Definitions / Key Terms (Terminologies)

Types of Courses: The Programme Structure consist of 3 types of courses:

Foundation Courses, Core Courses and Elective Courses.

Foundation Course

These courses are offered by the institute in order to prepare students for studying courses to be offered at higher levels.

Core Courses

A Course which shall compulsorily be studied by a candidate to complete the requirements of a degree / diploma in a said programme of study is defined as a core course. Following core courses are incorporated in CBCS structure:

A. University Core Courses(UC):

University core courses are compulsory courses which are offered across university and must be completed in order to meet the requirements of programme.

B. Programme Core Courses(PC):

Programme core courses are compulsory courses offered by respective programme owners, which must be completed in order to meet the requirements of programme.

Elective Courses

Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline of study or which provides an extended scope or which enables an exposure to some other discipline / domain or nurtures the candidates proficiency / skill is called an elective course. Following elective courses are incorporated in CBCS structure:

A. University Elective Courses(UE):

The pool of elective courses offered across all faculties / programmes.

B. Institute Elective Course (IE)

Institute elective courses are those courses which any students of the University/Institute of a Particular Level (PG/UG) will choose as offered or decided by the University/Institute from time-to-time irrespective of their Programme /Specialization.

C. Programme Elective Courses(PE):

The programme specific pool of elective courses offered by respective programme.

Vision, Mission, PEOs, POs and PSOs

Vision

To become a leading institution in the field of computer applications and contribute in national efforts of computerizing public systems.

Mission

To produce competent computer professionals with the ability to face future challenges.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates will:

PEO1: Be able to understand the requirement of computing problem and implement an effective solution.

PEO2: Be able to successfully take up various available career options.

PEO3: Be able to continuously learn in their preferred domains.

PEO4: Be able to acquit themselves in ethical and professional manner while demonstrating effective skills.

PROGRAM OUTCOMES (POs)

The Graduate of Computer Science and Applications will be able to:

PO1. Computational Knowledge: Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.

PO2. Problem Analysis: Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.

PO3. Design / Development of Solutions: Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies

PO4. Conduct Investigations of Complex Computing Problems: Ability to devise and conduct experiments, interpret data and provide well informed conclusions.

PO5. Modern Tool Usage: Ability to select modern computing tools, skills and techniques necessary for innovative software solutions

PO6. Professional Ethics: Ability to apply and commit professional ethics and cyber regulations in a global economic environment.

PO7. Life-long Learning: Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.

PO8. Project Management and Finance: Ability to understand, management and computing principles with computing knowledge to manage projects in multidisciplinary environments.

PO9. Communication Efficacy: Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.

PO10. Societal & Environmental Concern: Ability to recognize economical, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.

PO11. Individual & Team Work: Ability to work as a member or leader in diverse teams in multidisciplinary environment.

PO12. Innovation and Entrepreneurship: Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.

PROGRAM SPECIFIC OUTCOMES (PSOs)

At the end of the programme, the student should be able to

PSO1: Analyse, design and develop effective software applications for solving contemporary challenges.

PSO2: Harness the necessary skills with spirit of research and entrepreneurship.

Total Credits of Programme (4 Semesters): 108

TEACHING SCHEME AND EXAMINATION SCHEME

FOR

MCA PROGRAMME

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

Teaching & Examination Scheme
Master of Computer Applications (M.C.A.) Programme
(Choice Based Credit System)
Effective from Year 2024 - 25
Semester - I

Course Code	Course Title	Teaching Scheme				Examination Scheme						
		Contact Hours			Credit	Theory		Practical		Total		
		Theory	Practical	Total		CCE	SEE	CCE	SEE			
CAUE501 - CAUE504 - CAME501 - CAME502	Elective-I	3	-	3	3	50	50	-	-	100		
CAUC505	Web Development using Open Source Technologies	2	3	5	5	50	50	50	50	200		
CAUC506	Enterprise Computing using Java EE	3	3	6	6	50	50	50	50	200		
CAUC507	Programming with .NET Architecture	2	3	5	5	50	50	50	50	200		
CAUC508	Database Technologies	3	3	6	6	50	50	50	50	200		
HSUS502	Foreign Languages	-	2	2	2	-	-	25	25	50		
HSUS501	Academic Speaking and Presentation Skills											
		13	14	27	27	500		450		950		
*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.) *SEE- Semester -End- Evaluation												

Elective-I	
Course Code	Course Title
CAUE501	Cloud Computing
CAUE502	Cryptography & Network Security
CAUE503	Block Chain Technology
CAUE504	Quantum Computing
CAME501	Ethical Hacking
CAME502	Cyber Security and Privacy

Teaching & Examination Scheme
Master of Computer Applications (M.C.A.) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25
Semester-II

Course Code	Course Title	Teaching Scheme			Examination Scheme					
		Contact Hours			Credit	Theory		Practical		Total
		Theory	Practical	Total		CCE	SEE	CCE	SEE	
CAUE509 CAUE512	Elective-II	3	3	6	6	50	50	50	50	200
CAUC513	Advanced Mobile Programming	3	3	6	6	50	50	50	50	200
CAUC514	Full-Stack Web Development	3	3	6	6	50	50	50	50	200
CAUC515	Software Engineering with Agile and DevOps	3	-	3	3	50	50	-	-	100
HSUA501	Academic Writing	-	2	2	2	-	-	25	25	50
	University Elective-I **	-	2	2	2	-	-	50	50	100
		12	13	25	25	400		450		850

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.) *SEE- Semester -End- Evaluation

Student will take any university elective offered by different institutions of university. CMPICA has decided to offer **CAUD516-Internet and Web Designing and CAUD517-Mobile Application Development course for others.

Elective-II	
Course Code	Course Title
CAUE509	Game Development using Unity
CAUE510	Python Web framework
CAUE511	Framework and Applications
CAUE512	HTTP Web Service for Enterprise Application

University Elective-I

Sr. No.	Course Code	Course Name	Department/Faculty
1	FTUD501	Project Management	Engineering
2	PTOD501	Fitness & Nutrition	Physiotherapy
3	MBUD557	Software based Statistical Analysis	Management
4	NROD555	First Aid & Life Support	Nursing
5	CHUD558	Introduction to Polymer Science	Applied Science
6	FTUD551	Occupational Health &Safety	Engineering
7	PH892.01	Intellectual Property Rights	Pharmacy
8	CAUD516	Internet and Web Designing	Computer Science
9	CAUD517	Mobile Application Development	Computer Science

Teaching & Examination Scheme
Master of Computer Applications (M.C.A.) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25
Semester-III

Course Code	Course Title	Teaching Scheme			Examination Scheme					
		Contact Hours			Credit	Theory		Practical		Total
		Theory	Practical	Total		CCE	SEE	CCE	SEE	
CAUE601 - CAUE604	Elective-III	3	3	6	6	50	50	50	50	200
CAUC605	Software Quality Assurance	3	3	6	6	50	50	50	50	200
CAUC606	Mini Project	-	12	12	12	-	-	200	200	400
CAUC607	Green Computing		2	2	2	-	-	50	50	100
		06	20	26	26	200		700		900
*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.) *SEE- Semester -End- Evaluation										

Elective-III	
Course Code	Course Title
CAUE601	Digital Image Processing
CAUE602	Object Oriented Programming for Smart Contracts
CAUE603	Data Analytics
CAUE604	Internet of Things

Teaching & Examination Scheme
Master of Computer Applications (M.C.A.) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25
Semester-IV

Course Code	Course Title	Teaching Scheme			CCE	SEE		Total		
		Contact Hours		Credit		Continuous Evaluation	Report			
		Inst.	Industry							
CAUC6 08	Dissertation / Project Work	2	28	30	30	400	200	200	800	

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.) *SEE- Semester -End- Evaluation

DETAILED SYLLABUS

Faculty of Computer Science & Applications

Smt. Chandaben Mohanbai Patel Institute of Computer
Applications

MCA PROGRAMME
EFFECTIVE FROM



TEACHING SCHEME & DETAILED SYLLABUS

FOR

**MCA PROGRAMME
(Semester-1)**

EFFECTIVE FROM

Teaching & Examination Scheme

Master of Computer Applications (M.C.A.) Programme

(Choice Based Credit System)

Effective from Year 2024 - 25

Semester - I

Course Code	Course Title	Teaching Scheme			Credit	Examination Scheme					
		Contact Hours				Theory		Practical		Total	
		Theory	Practical	Total		CCE	SEE	CCE	SEE		
CAUE501 - CAUE504 CAME501 - CAME502	Elective-I	3	-	3	3	50	50	-	-	100	
CAUC505	Web Development using Open Source Technologies	2	3	5	5	50	50	50	50	200	
CAUC506	Enterprise Computing using Java EE	3	3	6	6	50	50	50	50	200	
CAUC507	Programming with .NET Architecture	2	3	5	5	50	50	50	50	200	
CAUC508	Database Technologies	3	3	6	6	50	50	50	50	200	
HSUS502	Foreign Languages	-	2	2	2	-	-	25	25	50	
HSUS501	Academic Speaking and Presentation Skills										
		13	14	27	27	500		450		950	

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.) *SEE- Semester -End- Evaluation

Elective-I	
Course Code	Course Title
CAUE501	Cloud Computing
CAUE502	Cryptography & Network Security
CAUE503	Block Chain Technology
CAUE504	Quantum Computing
CAME501	Ethical Hacking
CAME502	Cyber Security and Privacy

CAUE501 - Cloud Computing

(100 Marks)

Contact Hours: 03

Pre-requisite: Operating System Concepts and Network Technology

Methodology & Pedagogy: During theory lectures the emphasis will be given on the fundamentals of cloud computing. Students will be introduced basic types, architecture, service providers, mechanism, security issues and some hidden aspects of cloud computing. Students will give practical exposure in form of case study and by showing cloud infrastructure of university.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Evolution of Cloud Computing	04
2	Understanding Cloud Computing and basic types	07
3	Fundamentals of Cloud Architecture and Service Providers	07
4	Cloud Computing Mechanisms	07
5	Cloud Computing Security and Business Use	06
6	Intensive analysis of Cloud Computing with case studies	05

Total Hours (Theory): 36

Total Hours:36

Detail Syllabus:**Unit I : Evolution of Cloud Computing Hours 04**

Introduction of Cloud Computing, Growth of technology, Paradigm Shift in Computing, distributed nature of service Provisioning, Support entrepreneurship using Cloud Computing.

Unit II : Understanding Cloud Computing and basic types Hours 07

Advantages and drawbacks of Cloud Computing, Essential component for Cloud contract, Major outage of Cloud Computing and Enhancers for Cloud Computing. Introduction to SaaS, PaaS, IaaS. Introduction to Public Cloud, Private Cloud, Hybrid Cloud and Community Cloud, Storage Services for Cloud Computing.

Unit III : Fundamentals of Cloud Architecture and Service Providers Hours 07

Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture. Introduction to major Cloud Service Provider: Amazon Web Services, Google Cloud. Microsoft Windows Azure and Office 365, Hp Cloud, RackSpace, CSC Corp, Verizon Terrimark, DropBox.

Unit IV : Cloud Computing Mechanisms Hours 07

Introduction to Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud Storage Levels, Network Storage Interfaces, Object Storage Interfaces, Database Storage Interfaces, Relational Data Storage, on-Relational Data Storage, Cloud Usage Monitor, Monitoring Agent, Resource Agent, Polling Agent, Resource Replication. Introduction to Cloud Management Mechanisms: Remote Administration System, Resource Management System, SLA Management System, Billing Management System.

Unit V : Cloud Computing Security and Business Use Hours 06

Introduction to Encryption, Symmetric Encryption, Asymmetric Encryption, Hashing, Digital Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single SignOn (SSO), Cloud-Based Security Groups. Overview of Compliance and Certification, Access Control, Organizational Control. Benefits of Business using Cloud Computing, Risk of Cloud Computing, Cost factor in Cloud Computing.

Unit VI : Intensive analysis of Cloud Computing with case studies Hours 05

Overview of Cloud services, Designing Solutions for the Cloud, Implement & Integrate Solutions, Emerging Markets and the Cloud

Core Books:

1. Kevin L. Jackson, Scott Goessling: Architecting Cloud Computing Solutions: Packt Publication: 2018
2. Thomas Erl, Zaigham Mahmood and Ricardo Puttini: Cloud Computing Concepts, Technology & Architecture, PHI, 2013.
3. S. Srinivasan: Cloud Computing Basics, Springer, 2014.

Reference Books:

1. Derrick Rountree, Ileana Castrillo : The Basics of Cloud Computing, Syngress, 2013.
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski: Cloud Computing- Principles and Paradigms, John Wiley & Sons, 2011.

Web References:

1. http://whatisCloud.com/basic_concepts_and_terminology/Cloud [For basic terminology of Cloud Computing]
2. http://www.tutorialspoint.com/Cloud_Computing/ [For cloud computing lecture notes]
3. <http://www.intel.in/content/dam/www/public/us/en/documents/guides/cloudcomputingvirtualization-building-private-iaas-guide.pdf> [For cloud computing virtualization]
4. www.cs.purdue.edu/.../Anya-Kim-Bhargava-MCCWorkshop.ppt [Security issues PPTs]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will learn basics of cloud computing
CO2 :	The students will be familiar with various cloud architectures and services.
CO3 :	They will get the knowledge of various network mechanics.
CO4 :	Students will get various business aspects of cloud computing with security aspects
CO5 :	They will be able to design and deploy Cloud Infrastructure

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Evolution of Cloud Computing	√				
2	Understanding Cloud Computing and basic types		√			
3	Fundamentals of Cloud Architecture and Service Providers		√			
4	Cloud Computing Mechanisms			√		
5	Cloud Computing Security and Business Use				√	
6	Hidden Aspects of Cloud Computing					√

Course Articulation Matrix:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02
CO1	3	1	-	-	1	-	3	1	2	2	-	-	1	-
CO2	3	1	1	1	1	1	3	1	2	2	1	3	2	-
CO3	3	2	1	2	1	3	3	2	2	2	-	3	2	-
CO4	3	3	2	3	1	3	3	2	2	2	3	-	1	-
CO5	3	3	3	3	1	3	3	3	2	2	2	-	3	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE502 - Cryptography & Network Security (100 Marks)

Contact Hours: 03

Pre-requisite: Basic concepts of computer network and digital communication

Methodology & Pedagogy: During the lectures the students will learn about basic cryptographic concepts. The teacher will also present applications of cryptography with focus on network security. Further the teacher will also introduce system level security issues and their solutions.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to network security	05
2	Symmetric and public key cryptography systems and related concepts	08
3	Key distribution	07
4	Transport level security	05
5	Wireless and Internet security	06
6	Advanced Security Concepts	05

Total Hours (Theory): 36

Total Hours: 36

Detail Syllabus:

Unit I: Introduction to network security	Hours 05
Network security concepts, OSI security architecture, security attacks, security services, security mechanism, network security standards.	
Unit II: Symmetric and public key cryptography systems and related concepts	Hours 08
Symmetric encryption system and algorithm, concepts of random and pseudo numbers, operations on stream ciphers and block ciphers. Message authentication concepts, secure hash function, message authentication codes, public key cryptography, and digital signature.	
Unit III: Key distribution	Hours 07
Basics of key distribution, symmetric key distribution, Kerberos algorithm, asymmetric key distribution, public key infrastructure, federated identity management.	
Unit IV: Transport level security	Hours 05
World Wide Web security, secure socket layer and transport layer security, Secure HTTP (HTTPS), Secure Shell (SSH).	
Unit V: Wireless and Internet security	Hours 06
Wireless security: IEEE 802.11 standard, wireless LAN security, wireless application protocol (WAP), transport layer security in wireless network, WAP end-to-end security.	
Internet security: pretty-good-privacy, multipurpose internet mail system (MIME), domain key based mail identification. IP security policy, integrated security features in IP packet, internet key exchange (IKE), cryptographic suits.	
Unit VI: Advanced security concepts	Hours 05
Intrusion detection, password management, and malicious software: viruses, worms, need for firewall, characteristics of firewall, and types of firewall, firewall location and configuration.	

Core Books:

1. William Stallings: Network Security Essentials: 4th Edition, Pearson Publication: 2018.
2. Bruce Schneier: Applied cryptography: 3rd Edition, Wiley Publication: 2016
3. William Stallings: Cryptography and network security: 6th Edition, Pearson Publication: 2019

Reference Books:

1. Alphred J. Menezes: Handbook of applied cryptography: 3rd Edition:CRC Press : 2010.
2. David Pointcheval: Applied cryptography and network security: 1st Edition: Springer: 2012
3. W. Chen, H.-W.LI et al.; Applied Cryptography and Network Security, 1st Edition, Magnum Publication, 2016.

Web References:

1. <https://www.edureka.co/blog/what-is-network-security/> [Introduction to Network Security]
2. <https://sectigostore.com/blog/5-differences-between-symmetric-vs-asymmetric-encryption/> [Symmetric and Asymmetric Key Difference]
3. <https://www.cloudflare.com/en-in/learning/ssl/transport-layer-security-tls/> [Transport Level Security]
4. <https://www.checkpoint.com/cyber-hub/network-security/what-is-firewall/> [Firewall]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Be able to understand Network security
CO2 :	Be familiar with Symmetric and Public key cryptography and key distribution
CO3 :	Understand Transport level security
CO4 :	Be familiar with wireless and Internet security
CO5 :	Be able to understand Advanced security concepts

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to network security	√				√
2	Symmetric and public key cryptography systems and related concepts		√	√		
3	Key distribution		√			
4	Transport level security			√	√	√
5	Wireless and Internet security	√		√		√
6	Advanced security concepts		√		√	√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	3	1	2	2	3	2	3	2	3	3
CO2	3	2	3	3	3	2	3	3	2	3	2	3	2	3
CO3	2	2	3	3	3	2	2	2	3	2	3	3	3	3
CO4	2	3	3	2	3	1	2	3	2	3	2	3	3	2
CO5	3	3	3	3	3	2	3	3	2	2	3	2	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE503 - Blockchain Technology (100 Marks)

Contact Hours: 03

Pre-requisite: None

Methodology & Pedagogy: During the lecture sessions, the students will learn about various sub systems that work in integrated manner to make blockchain work. The teacher will introduce students to concepts of bitcoin, ethereum and hyperledger technologies. The students will also understand about application domains where blockchain can be applied.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Blockchain	05
2	Functioning of Blockchain	06
3	Bitcoin and related concepts	06
4	Ethereum and related concepts	07
5	Hyperledger and related concepts	07
6	Applications of blockchain	05

Total Hours (Theory): 36
Total Hours:36

Detail Syllabus:

Unit I : Introduction to blockchain	Hours 05
History of blockchain, Centralized, decentralized and distributed systems, Layers of blockchain, Importance of Blockchain.	
Unit II : Functioning of blockchain	Hours 06
Cryptographic concepts- Symmetric key cryptography, Cryptographic hash function, MAC and HMAC, Asymmetric key cryptography, Diffie-Hellman key exchange, Byzantine general's problem, Merkle tree, Structure of block.	
Unit III : Bitcoin and related concepts	Hours 06
What is bitcoin, Working with bitcoin, Bitcoin network, Bitcoin script, Bitcoin mining, Bitcoin wallets, Types of blockchain networks, Consensus algorithms	
Unit IV : Ethereum and related concepts	Hours 07
Design of ethereum, Ethereum blockchain, Smart contracts in ethereum, Ethereum virtual machine, Ethereum eco system.	
Unit V : Hyperledger and related concepts	Hours 07
Introduction to hyperledger and hyperledger fabric, hyperledger fabric transaction flow, membership and identity management, fabric network setup, hyperledger fabric demo, hyperledger composer demo.	
Unit VI : Applications of blockchain	Hours 05
Applications of blockchain in domains – Finance, Healthcare, Insurance, Supply chain management, Internet of things.	

Core Books:

1. Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda: Beginning Blockchain - A Beginner's Guide to Building Blockchain Solutions: 1st Edition: APress Publication: 2018.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder: Bitcoin and Cryptocurrency Technologies - A Comprehensive Introduction: 1st Edition: Princeton University Press: 2016.
3. Tiana Laurence: Introduction to blockchain technology – the many faces of blockchain technology in the 21st century: 1st Edition: Van Heren Publishing: 2019

Reference Books:

1. S. Ashraf, S. Adarsh: Decentralized Computing Using Blockchain Technologies and Smart Contracts - merging Research and Opportunities: 1st Edition: IGI Global, 2017
2. Fabian Schar, Aleksander Berentsen: Bitcoin, Blockchain, and Cryptoassets: 1st Edition: MIT Press: 2020

Web References:

1. <https://andersbrownworth.com/cms/460/blockchain/demo> [Blockchain Demo]
2. <https://ethdocs.org/en/latest/introduction/what-is-ethereum.html> [Ethereum Introduction]
3. https://www.hyperledger.org/wp-content/uploads/2018/07/HL_Whitepaper_IntroductiontoHyperledger.pdf [Hyperledger Introduction]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	The students will learn about underlying technologies of blockchain and various applications of blockchain technology.
CO2 :	The students will understand working of blockchain in detail.
CO3 :	The students will learn about how the blockchain is used to power bitcoin.
CO4 :	The students will see how ethereum utilizes blockchain.
CO5 :	The students will recognize the role of blockchain in hyperledger platform.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to blockchain	√				
2	Functioning of blockchain		√			
3	Bitcoin and related concepts			√		
4	Ethereum and related concepts				√	
5	Hyperledger and related concepts					√
6	Applications of blockchain	√				

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	-	1	-	-	3	-	-	-	-	1	1	-
CO2	-	1	2	1	1	-	3	-	-	-	-	1	1	-
CO3	2	2	3	-	3	-	-	-	-	-	-	3	2	1
CO4	3	2	3	-	3	-	-	-	-	-	-	3	2	1
CO5	3	1	3	1	3	-	-	-	-	-	-	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE504 - Quantum Computing

(100 Marks)

Contact Hours: 03

Pre-requisite: Basics of Physics, Mathematics with a focus on abstract linear algebra and basics of computer science knowledge

Methodology & Pedagogy: During theory lectures the emphasis will be given on the basics of Quantum Computing and quantum mechanics with mathematics and physics. The Agile software development concepts will be introduced during lectures. As part of modeling with UML students will be given exposure to model real-life software projects.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Fundamentals of Quantum Computing	05
2	Introduction to Quantum Mechanics	06
3	Quantum Computation and Quantum Fourier Transform	06
4	Quantum Computers	07
5	Quantum Information	07
6	Quantum Error Correction	05

Total Hours (Theory):36
Total Hours:36

Detail Syllabus:**Unit I : Fundamentals of Quantum Computing Hours 05**

Brief history about Quantum Computing with Turing Machines, Quantum bits, Bloch sphere representation of a qubit, multiple qubits. Global Perspectives, Quantum Bits, Introduction to Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

Unit II : Introduction to Quantum Mechanics Hours 06

Linear algebra, tensor products, postulates of QM, The EPR Paradox and Bell's inequality theorem, Reversible computation.

Unit III : Quantum Computation and Quantum Fourier Transform Hours 06

Quantum algorithms, Single qubits operations, controlled operations, States and measurements, Universal quantum gates, Quantum Fourier Transform and its application, phase estimation, order-finding and factoring. Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.

Unit IV : Quantum Computers Hours 07

Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance.

Unit V : Quantum Information Hours 07

Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.

Unit VI : Quantum Error Correction Hours 05

Introduction, Classical Error Correction, Theory of quantum error-correction, constructing quantum codes, Stabilizer Codes, Fault Tolerant Quantum Computation.

Core Books:

1. Micheal A. Nielsen. & Issac L. Chiang, "Quantum Computation and Quantum Information", Cambridge University Press, First South Asian edition, 2002.
2. Eleanor G. Rieffel , Wolfgang H. Polak , "Quantum Computing - A Gentle Introduction" (Scientific and Engineering Computation) Paperback – Import, 3 Oct 2014
3. Computer Science: An Introduction by N. David Mermin 5. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.
4. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press.

Reference Books:

1. Computer Science: An Introduction by N. David Mermin
2. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists

Web References:

1. <https://www.springer.com/gp/campaigns/quantum-science-and-quantum-technology>
2. <https://link.springer.com/book/10.1007/978-1-4612-1390-1>
3. https://www.worldscientific.com/doi/pdf/10.1142/9789812385253_fmatter
4. Kitaev A.Y., Shen A.H., Vyalyi M.N. Classical and quantum computation (GSM047, AMS, 2002)(ISBN 9780821832295)(O)(274s) PQm.pdf [EBook]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Distinguish problems of different computational complexity describe the architecture of a quantum system.
CO2 :	comprehend the principles of mathematics and physics of quantum computation
CO3 :	identify applications of quantum computing
CO4 :	Produce documentation that is comprehensible to a group of different programmers and present the theoretical background
CO5 :	apply various security measures for quantum communication and error detection and correction

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Fundamentals of Quantum Computing	√				
2	Introduction to Quantum Mechanics		√			
3	Quantum Computation and Quantum Fourier Transform			√		
4	Quantum Computers			√		
5	Quantum Information				√	
6	Quantum Error Correction					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	-	-	-	-
CO2	3	-	-	1	-	2	-	-	-	-	-	-	-	2
CO3	2	3	2	-	1	1	3	-	3	-	-	-	3	-
CO4	-	3	3	-	2	-	-	-	-	-	-	2	2	-
CO5	-	2	3	3	1	-	2	2	1	1	-	-	1	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAME501 Ethical Hacking

Description:

Credit and Week:

Teaching Scheme	Week	Marks	Credit
	12	100	3

About the course:

Ethical hacking is a subject that has become very important in present-day context, and can help individuals and organizations to adopt safe practices and usage of their IT infrastructure. Starting from the basic topics like networking, network security and cryptography, the course will cover various attacks and vulnerabilities and ways to secure them. There will be hands-on demonstrations that will be helpful to the participants. The participants are encouraged to try and replicate the demonstration experiments that will be discussed as part of the course.

Pre-requisites:

Basic concepts in programming and networking

Industry support:

TCS, Wipro, CTS, Google, Microsoft, Qualcomm

Course layout:

Week 1: Introduction to ethical hacking. Fundamentals of computer networking. TCP/IP protocol stack.

Week 2: IP addressing and routing. TCP and UDP. IP subnets.

Week 3: Routing protocols. IP version 6.

Week 4: Installation of attacker and victim system. Information gathering using advanced google search, archive.org, net craft, whois, host, dig, dnsenum and NMAP tool.

Week 5: Vulnerability scanning using NMAP and Nessus. Creating a secure hacking environment. System Hacking: password cracking, privilege escalation, application execution. Malware and Virus. ARP spoofing and MAC attack.

Week 6: Introduction to cryptography, private-key encryption, public-key encryption.

Week 7: Cryptographic hash functions, digital signature and certificate, applications.

Week 8: Steganography, biometric authentication, network-based attacks, DNS and Email security.

Week 9: Packet sniffing using Wireshark and burp suite, password attack using burp suite.
Social engineering attacks and Denial of service attacks.

Week 10: Elements of hardware security: side-channel attacks, physical inclinable functions, hardware Trojans.

Week 11: Different types of attacks using Metasploit framework: password cracking, privilege escalation, remote code execution, etc. Attack on web servers: password attack, SQL injection, cross site scripting.

Week 12: Case studies: various attacks scenarios and their remedies.

Books and references

Text Books / Basic Material

1. Data and Computer Communications – W. Stallings.
2. Data Communication and Networking – B. A. Forouzan
3. TCP/IP Protocol Suite – B. A. Forouzan
4. UNIX Network Programming – W. R. Stallings
5. Introduction to Computer Networks and Cybersecurity – C-H. Wu and J. D. Irwin
6. Cryptography and Network Security: Principles and Practice – W. Stallings

Criteria to get a certificate:

Average assignment score = 25% of average of best 8 assignments out of the total 12 assignments given in the course.

Exam score = 75% of the proctored certification exam score out of 100

Final score = Average assignment score + Exam score

YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE >=10/25 AND EXAM SCORE >= 30/75. If one of the 2 criteria is not met, you will not get the certificate even if the Final score >= 40/100.

CAME502 Cyber Security and Privacy

Description:

Credit and Week:

Teaching Scheme	Week	Marks	Credit
	12	100	3

About the course:

This course introduces to management students the concepts, technologies, practices and challenges associated with cybersecurity as applied in organizations. Protection as well as disclosure of information pose unique challenges and also allude to economic and technological implications. The course takes a broad view of cyber security along with information privacy by analysing relevant organizational, human, legal and policy issues. Through this course, students will explore cyber security along with information privacy with a managerial focus. Students are expected to develop a wholesome understanding about cyber security and privacy risks to businesses covering governance, compliance and risk mitigation and closely study certain business domains.

Pre-requisites:

A core course on Management Information Systems desirable (not mandatory).

Industry support:

IT services industry, AI/Block chain start ups, Industry 4.0, autonomous vehicles industry.

Week 1 : Foundations, cyber security, information security and related concepts, Principles of information security management, Confidentiality, Integrity, Availability and related concepts.

Week 2 : Security management, Governance, Risk and Compliance (GRC) , Contingency planning, incidence response, disaster recovery and business continuity.

Week 3 : Understanding security policy, security behavior , Risk management: Risk identification, threat modeling, strategies.

Week 4 : Control strategies and protection mechanisms (Guest lecture), Cryptography for security.

Week 5 : Information security and privacy, Regulatory landscape: Fair information practices, US regulatory frameworks .

Week 6 : Regulatory landscape: EU's GDPR and its implications and other privacy and cyber security regulations, Cyber security and privacy in the Indian context, evolution and issues.

Week 7 : Economics of privacy, privacy calculus and trade-offs, privacy paradox, Managing stakeholders, making choices on security and privacy Course layout:

Books and references

- Michael E. Whitman, Herbert J. Mattord, (2018). Principles of Information Security, 6th edition, Cenage Learning, N. Delhi.
- Darktrace, "Technology" <https://www.darktrace.com/en/technology/#machine-learning>, accessed November 2018.
- Van Kessel, P. Is cyber security about more than protection? EY Global Information Security Survey 2018-2019.
- Johnston, A.C. and Warkentin, M. Fear appeals and information security behaviors: An empirical study. MIS Quarterly, 2010.
- Arce I. et al. Avoiding the top 10 software security design flaws. IEEE Computer Society Center for Secure Design (CSD), 2014.
- Smith, H. J., Dinev, T., & Xu, H. Information privacy research: an interdisciplinary review. MIS Quarterly, 2011.
- Subramanian R. Security, privacy and politics in India: a historical review. Journal of Information Systems Security (JISSec), 2010.
- Acquisti, A., John, L. K., & Loewenstein, G. **What** is privacy worth? The Journal of Legal Studies, 2013
- Xu H., Luo X.R., Carroll J.M., Rosson M.B. The personalization privacy paradox: An exploratory study of decision making process for location-aware marketing. Decision Support Systems, 2011.

Criteria to get a certificate:

Average assignment score = 25% of average of best 8 assignments out of the total 12 assignments given in the course.

Exam score = 75% of the proctored certification exam score out of 100

Final score = Average assignment score + Exam score

YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE >=10/25 AND EXAM SCORE >= 30/75. If one of the 2 criteria is not met, you will not get the certificate even if the Final score >= 40/100.

CAUC505 - Web Development using Open Source Technology (200 Marks)

Contact Hours: 05

Pre-requisite: Basic understanding of HTML and MySQL.

Methodology & Pedagogy: During theory and practical sessions, students able to install & configure PHP and prerequisite software. Also, student will be emphasized to develop dynamic web applications and Create web API in PHP.

Outline of the course:

Unit No.	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Basics of HTML and JavaScript.	04	36
2	Basics of PHP.	03	
3	Handling Form Data and Database Connectivity with MYSQL	04	
4	PHP Utilities.	05	
5	PHP API client.	03	
6	AJAX With DATABASE.	05	

Total Hours (Theory): 24

Total Hours (Lab): 36

Total Hours: 60

Detail Syllabus:**Unit I: Basics of HTML and Java Script Hours: 03**

Basics of HTML, Introduction of JavaScript, Variables, Overview of operators, Control statements and looping statement, Overview of DOM, function declaration and calling with event.

Unit II: Basics of PHP Hours: 05

Introduction to PHP, PHP Apache Web server, Understanding of PHP.INI file Understanding of PHP .htaccess file, PHP Variable, Static & global variable, PHP Operator, Conditional Structure & Looping Structure, Array, User Defined Functions: argument function default argument, variable function, return function.

Unit III: Handling Form Data and Database Connectivity with MYSQL Hours: 05

HTML Form element & its attributes, Send Form data using GET Method & POST Method, Receive Form data using \$_GET, \$_POST & \$_REQUEST variables, PHP form validations, OOPs Concepts, PHP Data Objects (PDO), CRUD operations, Handling Errors, State Management Techniques: Concept of Session, starting session, modifying session variables, Un registering and deleting session variable, Concept of Cookies.

Unit IV: PHP utilities Hours: 04

File Uploading: Upload Single and Multiple file using PHP script, Understanding HTTP requests, Exploring and modifying HTTP responses, getting information from web server, Sending mails

Unit V: PHP API client - Hours: 04

Basic API call from PHP, HTTP basics: requests, responses and using cURL, Response codes: get the HTTP status code.

Unit VI: AJAX With DATABASE Hours: 03

Basics of AJAX, PHP with AJAX, MySql with AJAX, What is JQuery AJAX, JQuery AJAX with PHP.

Core Books:

1. Vikram Vaswani, PHP: A Beginner's Guide: Indian Edition, First Edition, McGraw Hill, 2009
2. Matt Doyle , Beginning PHP 5.3 , Wrox , 2010

- Ballard and Moncur, Teach Yourself Javascript in 24 Hours, Sams Publishing, 2015

Reference Books:

- Timothy Boronczyk , Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stoltz, Michael K. Glass): Beginning PHP6, Apache, MySQL Web Development: Wrox , 2009.
- Lynn Beighley and Michael Morrison, Head First PHP & MySQL, First Edition, O'Reilly Publication, 2009.

Web References:

- <https://github.com/PHPMailer/PHPMailer> [PHP Mailer Code]
- <https://www.php.net/> [Official website of PHP]
- <https://www.geeksforgeeks.org/php-tutorials/> [Lecture notes of PHP]
- <https://www.w3schools.com/php/default.asp> [Lecture notes of PHP]

Course Outcomes: Upon successful completion of the course, students will be,

C01 :	Gain understanding of HTML and Java Script.
C02 :	To utilize knowledge and skills for basics of PHP and functions of PHP
C03 :	Acquire the knowledge of array and OOP in PHP
C04 :	Learn Form handling and utilities in PHP.
C05 :	Be able to develop dynamic web based application using PHP and MySQL with Ajax Call.

Course Outcomes Mapping: -

Unit No.	Unit Name	Course Outcomes				
		C01	C02	C03	C04	C05
1	Basics of HTML and Java Script	✓				
2	Introduction to Open Source Software and PHP, Basics of PHP		✓			
3	Control Structure, Function, Array and Overview of OOP in PHP			✓		
4	Form Handling Using PHP				✓	
5	PHP Utilities				✓	
6	Relational Database Using PHP					✓

Course Articulation Matrix: -

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02
CO1	3	3	2	3	-	1	-	1	2	-	-	2	-	3
CO2	3	3	3	3	-	1	-	1	1	-	-	3	-	3
CO3	3	3	3	3	-	1	-	1	1	-	-	3	-	3
CO4	3	3	3	3	-	1	-	1	1	-	-	3	-	3
CO5	3	3	3	3	2	1	1	1	2	1	1	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC506 - Enterprise Computing using Java EE

(200 Marks)

Contact Hours: 06

Pre-requisite: Fundamental Knowledge of Core Java (Java SE) concepts.

Methodology & Pedagogy: Advanced Java fundamentals like JDBC, Servlet, JSP and Hibernate provides capabilities and features for developing web application which is essential for developer in order to understand entire web application development life cycle. During the theory sessions of the syllabus, fundamentals of the mentioned technologies will be explained in detail with real time examples. Moreover, practical session will provide hands-on exposure about JDBC, Servlet, JSP and Hibernate with variety of practical assignment. Also, MVC architecture using these technologies will be covered during theory as well as practical sessions.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Fundamentals Object Oriented Concepts	06	36
2	JDBC Programming	06	
3	Web Application Components Fundamentals	05	
4	Servlet API	08	
5	Java Server Pages	06	
6	Basics of Hibernate 4.0	05	

Total Hours (Theory): 36

Total Hours (Lab) : 36

Total Hours: 72

Detail Syllabus:

Unit I : Fundamentals Object Oriented Concepts	Hours 06
Object Oriented programming concepts, Classes & Objects, Structure of Java Program, Constructors, Inheritance, Abstract Class, Interface, Exception Handling, Packages, Multithreading, Fundamentals of Collections.	
Unit II : Introduction to JDBC Programming	Hours 06
The JDBC Connectivity Model, Database Programming: Connecting to the Database, creating a SQL Query, Executing SQL Queries, Updating Database Data, JDBC Types, Error Checking and the SQLException Class, the SQLWarning class, Statement Interface, PreparedStatement, Callable Statement, Result Set Interface, Updatable Result sets, Result SetMetaData, Transaction Management.	
Unit III : Fundamentals of Web Application Components	Hours 05
Basics of web application development and web components, Introduction of MVC design pattern, Fundamentals of: Containers, Packaging Web Applications, Web Application Structure, JAR Files, WAR Files, HTTP, HTTP request methods, HTML Form Processing, HTTP request response cycle.	
Unit IV : Servlet API	Hours 08
Servlet Model: Overview of Servlet, Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor ServletContext and ServletConfig interface, Attributes in Servlet.	
Request Dispatcher interface, The Filter API: Filter, FilterChain and Filter Config, Cookies and Session Management: Understanding state and session.	
Understanding Session Tracking Techniques, Hidden Form Fields, URL Rewriting, Session & Cookies.	
Unit V : Java Server Pages	Hours 06
JSP Overview: The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, JSP Directives, JSP Action.	
JSP Implicit Objects JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking, JSP Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing.	
Unit VI : Basics of Hibernate 4.0	Hours 05
Overview of Hibernate, Hibernate Architecture, Hibernate Mapping Types, Hibernate O/R Mapping, Hibernate Annotation, Hibernate Query Language.	

Core Books:

1. Cay S Horstmann, Gary Cornell: Core Java, Volume II – Advanced Features, 8th Edition, Pearson Education.
2. Marty Hall, Larry Brown: Core Servlets and JavaServer Pages, Volume 2, Advanced Technologies, 2nd Edition, Pearson Education, 2008.
3. Jeff Linwood and Dave Minter: Hibernate 2nd edition Beginning Après publication

Reference Books:

1. Bryan Basham, Kathy Sierra and Bert Bates: Head First Servlet and JSP, O'Reilly Publication, 1st Edition
2. James Keogh: Complete Reference J2EE, McGraw publication

Web References:

1. <http://courses.coreservlets.com/Course-Materials/csajsp2.html> [Servlet Basics]
2. <http://www.ceit.es/asignaturas/InteInfo/Recursos/Servlets/JavaServlets.pdf> [Servlet Tutorial PDF]
3. <http://www.msuniv.ac.in/AdvancedJavaProgrammingwithDatabaseApplication.pdf> [JDBC Tutorial]
4. www.doc.ic.ac.uk/~rcheung/teaching/2720/ppt/lecture12.ppt [JSP Tutorial Slides]

Course Outcomes: Upon successful completion of the course, students will:

CO1 :	To make understand the fundamental Concepts of Java
CO2 :	Able to connect Java application with various RDBMS using JDBC
CO3 :	To make understand web application architecture and terminologies
CO4 :	Able to develop real time web application using Servlet and JSP technologies
CO5 :	Able to use Object Relation Mapping using Hibernate to build database.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Fundamental Concepts of Java	√				
2	JDBC Programming	√	√			
3	Web Application Components Fundamentals	√	√	√		
4	Servlet API			√	√	
5	Java Server Pages			√	√	
6	Basics of Hibernate 4.0					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	1	-	2	2	-	1	2	2	3	2
CO2	3	2	3	3	-	-	1	-	-	-	2	1	2	2
CO3	3	2	3	2	2	-	-	-	-	2	2	3	3	3
CO4	3	2	3	2	2	2	-	-	1	-	2	1	3	2
CO5	2	2	3	3	2	-	1	1	-	2	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC507 - Programming with .NET Architecture (200 Marks)

Contact Hours: 05

Pre-requisite: Familiarity with basic concepts of object-oriented programming

Methodology & Pedagogy:

In the lectures students will learn about basics of .NET framework, ASP.NET and other advanced concepts related to programming with .NET framework for Web Development. In the lab sessions the student will learn about solving real world problems with ASP .NET framework and related technologies to gain experience on Web Development.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to .NET framework and ASP.NET	02	36
2	ASP .NET Web Forms	05	
3	ADO .NET (Database Connectivity)	08	
4	Introduction to MVC Architecture	02	
5	Application Development using MVC	05	
6	Introduction to Web Services	02	

Total Hours (Theory): 24

Total Hours (Lab):36

Total Hours: 60

Detail Syllabus:

Unit I: Introduction to .NET framework and ASP.NET	Hours 02
Introduction to .NET framework, Introduction to Web Programming, Introduction to ASP and ASP.NET.	
Unit II: ASP .NET Web Forms	Hours 05
Web Forms: “ASPX Page, Code behind File, WebConfig”, ASP.NET Page Life Cycle, developing a web form, Working with master pages, State management techniques.	
Unit III: ADO .NET (Database Connectivity)	Hours 08
Introduction to ADO and ADO.NET, ADO.NET architecture, Connection Oriented and Connection Less architecture, working with Models, Introduction to Three Tier architecture, Working on Data Tier.	
Unit IV: Introduction to MVC Architecture	Hours 02
Introduction to MVC Architecture, ASP.NET MVC, CRUD operation using ASP .NET MVC architecture, working with web controls in ASP .NET MVC architecture.	
Unit V: Application Development using MVC.	Hours 05
Execution of ASP .NET MVC Application, Routing in MVC, HTTP Request and Response, Filters, Layout Pages, View Start File.	
Unit VI: Introduction to Web Services	Hours 02
Introduction to Web Services and RESTful API, Applications of Web API, Understanding AJAX and JSON.	

Core Books:

1. Cogent Solutions Inc.: ASP.Net 4.5 Black book, Dreamtech press, 2019
2. Mridila Parihar, Essam Ahmed: ASP .Net Bible, Wiley, 2017
3. Stephon Walther: ASP.Net Unleashed, BPB publication, 2018

Reference Books:

1. Mesbah Ahmed, Chris Garrett, Jeremy Faircloth, Chris Payne: ASP.Net Programming. Developer's Guide, Dreamtech, 2016.
2. Greg Buczek: ASP.Net Tips & Techniques, Tata McGraw Hill Edition, 2016.
3. Bolton, Justin Langford, Glenn Berry, Gavin Payne, Amit Banerjee, Rob Farley: Professional SQL Server 2019 internals and troubleshooting, Wiley India publication, October, 2019.

Web References:

1. <http://msdn.microsoft.com/en-us/aa336522.aspx> [For software download]
2. <https://docs.microsoft.com/en-us/aspnet/overview> [For ASP.NET technical documentation]
3. https://www.tutorialspoint.com/dotnet_core/dotnet_core_overview.htm [for .NET Core]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will be able to understand .NET framework, ASP.NET technologies and develop simple applications using the framework.
CO2 :	Students will be able to develop ASP .NET Web Form based application and get exposure to "How the web works?"
CO3 :	Students will be able to learn back-end Database Technology and how it can be integrated to Web Application or any Software.
CO4 :	Students will learn ASP .NET MVC framework for MVC Architecture.
CO5 :	Students will learn concepts of Routing, Filtering, Error Handling and will be able to develop MVC based Web Applications.
CO6 :	Students will be able to understand Web API implementation and its applications in real life scenario.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes					
		CO1	CO2	CO3	CO4	CO5	CO6
1	Introduction to .NET framework and ASP.NET	√					
2	ASP .NET Web Forms		√				
3	ADO .NET (Database Connectivity)			√			
4	Introduction to MVC Architecture				√		
5	Application Development using MVC					√	
6	Introduction to Web Services						√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-	2	1	-	-	2	-	-	2	1
CO2	2	3	2	2	-	2	1	-	-	2	2	1	3	1
CO3	1	2	2	-	-	-	-	-	-	-	2	1	3	2
CO4	2	3	3	-	2	-	-	-	-	-	2	1	3	2
CO5	3	2	3	2	-	-	3	-	-	-	-	2	3	3
CO6	3	2	3	-	-	-	2	-	-	-	-	1	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC508 - Database Technologies

(200 Marks)

Contact Hours: 06

Pre-requisite: Basics of Database Management Systems and Data Structure

Methodology & Pedagogy: During theory lectures student will understand the essential concepts that act as the building blocks for many of the NoSQL products. It starts from the fundamentals of NoSQL and graduates to advanced concepts of architecture, storage internals and indexing. During Practical sessions, students will be required to design the applications using NoSQL Databases.

Outline of the course:

Unit Number	Title of the unit	Minimum number of hours	
		Theory	Practical
1	Introduction to Database System	05	36
2	Advanced Database Systems	07	
3	Introduction to NoSQL	06	
4	NoSQL Stores Data Models	06	
5	Storage Architecture	05	
6	Working and Querying (CRUD operation) with Data using MongoDB	07	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:

Unit I: Introduction to Database System

Hours 05

Basic Concepts: data, information, file, database, database systems, database management system
Purpose and advantages of Database management system (over file systems), Applications of DBMS
Various data models ER Model and Relational Model, Three level architecture, Structure of DBMS,
Database actors and workers, Codd Rules

Unit II: Advanced Database Systems

Hours 07

Basics of PL/SQL block, Usage of conditional statements and looping structures, Implicit and explicit cursor, User defined function and procedure, Introduction to row level and statement level triggers

Unit III: Introduction to NoSQL

Hours 06

Introduction to SQL Relational Model, Overview and History of NoSQL Databases, Taxonomies by Data Model, Overview of No-SQL Storage: Key Value, Document-Oriented, Column-Family and Graphstorage. Techniques and Pattern: CAP Theorem, ACID Vs. BASE properties and Comparison of relational databases to new NoSQL stores.

Unit IV: NoSQL Stores Data Models

Hours 06

Introduction, use and applications of: MongoDB, Cassandra, HBASE, Neo4j, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases, Replication and Sharding, Overview of MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

Unit V: Storage Architecture

Hours 05

Working with Document Databases, contrasting document databases with RDBMS, features of MongoDB, advantages of MongoDB over RDBMS, working with Column-Oriented Databases, Contrasting Column Databases with RDBMS, HBase Distributed Storage Architecture.

Unit VI: Working and Querying (CRUD operation) with Data

using MongoDB

Hours 07

Installing and running MongoDB on your System, use of JavaScript's shell in MongoDB, navigating your databases, viewing available data and collections, inserting data, querying data, using sort, limit and skip functions, retrieving single document, using aggregation commands, working with condition, updating data, upsert and save command, rename a collection

Core Books:

1. Ivan Bayross : SQL, PL/SQL The programming Language Oracle.
2. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Author: Sadalage, P. & Fowler, Publication: Pearson Education.

Reference Books:

1. Silberschatz, Korth, Sudarshan : Database System Concepts, 5th Edition, McGraw Hill.
2. Scoot Urban : Oracle 9i, PL/SQL Programming, Oracle Press.
3. S. K. Singh : Database Systems: Concepts, Design and Applications, Pearson Education
4. Definite Guide to MongoDB by Eelco Plugge, Peter Membrey and Tim Hawkins, Apress.
5. Getting started with NOSQL by Gaurav Vaish, PACKT.
6. Name: Redmond, E. & Wilson, Author: Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement Edition: 1st Edition.
7. NOSQL theory and Examples by Piotr fulmanski, Simple introduction series: e-book.
8. Guy Harrison, Next Generation Database: NoSQL and big data, Apress.

Web References:

1. <http://docs.oracle.com/>
2. <http://plsql-tutorial.com/> [For PL/SQL]
3. https://www.tutorialspoint.com/mongodb_for_absolute_beginners/index.asp [MongoDB For Absolute Beginners - Tutorialspoint]
4. https://www.tutorialspoint.com/neo4j/neo4j_data_model.htm [Neo4j - Data Model (tutorialspoint.com)]

Course Outcomes: Upon successful completion of the course, students will be,

CO1	Understand basic concepts regarding data, database systems and various data models.
CO2	Enhance the knowledge of the processes of Database Development and Administration using SQL and PL/SQL
CO3	Able to understand different types of NoSQL Databases
CO4	Architectures and common features of the basic types of NoSQL databases
CO5	Able to design Schema and implement CRUD operations, distributed data operations, and implement various column store internals

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Database System	✓				
2	Advanced Database Systems		✓			
3	Introduction to NoSQL			✓		
4	NoSQL Stores Data Models			✓		
5	Storage Architecture				✓	
6	Working and Querying (CRUD operation) with Data using MongoDB				✓	✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	1	-	3	-	3	-	-	-	3	-
CO2	3	3	3	3	3	3	3	3	1	-	3	3	3	2
CO3	3	2	-	1	1	-	3	-	3	-	-	-	2	-
CO4	3	1	2	1	3	-	3	2	3	-	-	-	2	1
CO5	3	3	3	3	3	3	3	3	2	-	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

TEACHING SCHEME & DETAILED SYLLABUS

FOR

**MCA PROGRAMME
(Semester-II)**

EFFECTIVE FROM

Teaching & Examination Scheme
Master of Computer Applications (M.C.A.) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25
Semester-II

Course Code	Course Title	Teaching Scheme			Examination Scheme					
		Contact Hours			Credit	Theory		Practical		
		Theory	Practical	Total		Termwork	External	Termwork	External	
CAUE509 - CAUE512	Elective-II	3	3	6	6	50	50	50	50	200
CAUC513	Advanced Mobile Programming	3	3	6	6	50	50	50	50	200
CAUC514	Full-Stack Web Development	3	3	6	6	50	50	50	50	200
CAUC515	Software Engineering with Agile and DevOps	3	-	3	3	50	50	-	-	100
HSUA501	Academic Writing	-	2	2	2	-	-	25	25	50
	University Elective-I **	-	2	2	2	-	-	50	50	100
		12	13	25	25	400		450		850

Student will take any university elective offered by different institutions of university. CMPICA has decided to offer **CAUD516-Internet and Web Designing and **CAUD517-Mobile Application Development** course for others.

Elective-II

Course Code	Course Title
CAUE509	Game Development using Unity
CAUE510	Python Web framework
CAUE511	Framework and Applications
CAUE512	HTTP Web Service for Enterprise Application

University Elective-I

Sr. No.	Course Code	Course Name	Department/Faculty
1	FTUD501	Project Management	Engineering
2	PTOD501	Fitness & Nutrition	Physiotherapy
3	MBUD557	Software based Statistical Analysis	Management
4	NROD555	First Aid & Life Support	Nursing
5	CHUD558	Introduction to Polymer Science	Applied Science
6	FTUD551	Occupational Health &Safety	Engineering
7	PH892.01	Intellectual Property Rights	Pharmacy
8	CAUD516	Internet and Web Designing	Computer Science
9	CAUD517	Mobile Application Development	Computer Science

CAUE509 - Game Development using Unity

(200 Marks)

Contact Hours: 06

Pre-requisite: Basics of Animation, C# Language, Mathematics and Physics concepts

Methodology & Pedagogy: During theory lectures illustrations Graphics, animation and various concepts regarding Game Development. Emphasize will be given on some mathematical and physics concepts, Fundamental of Graphics and objects creation, 3D graphics, Collision detections, Fundamental of Game programming, Game loop, Game Engine and many more.

During Practical sessions, students will develop 3D games using Unity.

Outline of the Course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Basics of Game Development in Unity	07	36
2	Game Development Tools and Resources	07	
3	Game Scene Designing	06	
4	Game Interface Designing	05	
5	Game Rendering and Walkthrough	06	
6	Game Testing and Deployment	05	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:

Unit I: Basics of Game Development in Unity	Hours 07
Getting started with 3D, Coordinates, Local space versus World space, Vectors, Cameras, Polygons, edges, vertices, and meshes, Materials, textures, Shaders, Rigid Body physics, Collision detection. Essential Unity concepts, Introduction to Assets, Scenes, Game Objects, Components, Scripts, Prefabs. The Interface: Scene window and Hierarchy, Inspector, Project and Game window.	
Unit II: Game Development Tools and Resources	Hours 07
The terrain editor: menu features, importing and exporting height maps, Terrain Toolset: Raise, plain and smooth the height, Paint texture, place trees, and terrain settings, creating island: use of Sun, Sea and Sand. Importing Model package. Player characters: working with inspector, Tags, Layers, Prefabs and the Inspector, Deconstructing the First Person Controller object, Parent-child issues, First Person Controller objects. Scripting basics: Variables, Functions, If Else, comments and major syntax. The FPS walker script	
Unit III: Game Scene Designing	Hours 06
Discovering Collisions, ray casting, Adding the outpost, Opening the outpost, Collision detection and creating new assets, attaching a script. Ray casting with disabling collision detection. Prefab. Collection and HUD: Creating the battery prefab. Download, import, and place, Tagging the battery, Scale, collider, and rotation, scattering batteries, Displaying the battery GUI, Creating the GUI Texture object, Positioning the GUI Texture, Scripting for GUI change, Battery collection with triggers, Restricting outpost access, Restricting access Hints for the player, Creating the fire particle systems	
Unit IV: Game Interface Designing	Hours 05
Interfaces and menus, Making the main menu, Adding the play button, Disabling Game Objects, Writing an OnGUI() script for a simple menu, Flexible positioning for GUIs, Adding UnityGUI buttons, Opening scenes with custom functions, GUI skin settings. Decision time .	
Unit V: Game Rendering and Walkthrough	Hours 06
Downloading assets, Making the smoke material, Particle system settings, Ellipsoid Particle Emitter settings, Particle Animator settings, Adding audio to the volcano, Volcano testing, Coconut trails, Editing the Prefab, Trail Renderer component, Updating the prefab, Performance tweaks, Camera Clip Planes and fog, Ambient lighting Instructions scene, Adding screen text, Text Animation using Linear Interpolation (Lerp), Menu return, Island level fade-in, UnityGUI texture rendering, Game win notification.	
Unit VI: Game Testing and Deployment	Hours 05
Build Settings, Web Player, Player Settings, Web Player Streamed, OS X Dashboard Widget, OS X/Windows, Standalone, Building the game, adapting for web build, Texture compression and debug	

stripping, building standalone 266Indie versus Pro, building for the Web, adapting web player builds, Quality Settings, Player Input settings, sharing your work, Testing and finalizing: Public testing.

Core Books:

1. Will Goldstone: Unity Game Development Essentials: Edition 2nd: Packt Publication: 2009.
2. Greg Lukosek, "Learning C# by Developing Games with Unity 5.x", 2nd Edition, Packt Publishing, 2016
3. Ashley Godbold, Simon Jackson, "Mastering Unity 2D Game Development", 2nd Edition, Packt Publishing, 2016.
4. Joe Hocking, "Unity in Action: Multiplatform game development in C#", 2nd Edition, Manning Publications, 2018
5. Sue Blackman, "Beginning 3D Game Development with Unity 4: All-in-one, multi-platform game development", 2nd Edition, Apress, 2013

Reference Books:

1. Nicolas Alejandro Borromeo: Hands-On Unity 2021, Game Development: Edition 2nd: Packt Publication: 2021.
2. Ben Tristem, Mike Geig, "Unity Game Development in 24 Hours- Sams Teach Yourself" ,2nd Edition, Paperback, December 19, 2015
3. Michelle Menard, "Game Development with Unity", Course Technology, 2013.
4. Matt Smith, Chico Queiroz, "Unity 5.x Cookbook", Packt Publishing, October 5, 2015
5. Francesco Sapiro, "Unity UI Cookbook", Packt Publishing, 2015
6. P Patrick Felicia, "Unity 5 from Zero to Proficiency: A step-by-step guide to creating your first game", CreateSpace Independent Publishing Platform, February 25, 2016
7. Matt Smith, "Unity 2018 Cookbook", 3rd Edition, Packt Publishing, August 31, 2018 8. Alan Thorn, "Mastering Unity Scripting", Packt Publishing, January 29, 2015

Web References:

1. <https://subscription.packtpub.com/search?query=unity>
2. <https://itsourcecode.com/free-projects/python-projects/mario-game-in-python-with-sourcecode/>
3. <http://learn.unity.com>
4. <https://unity3d.com/learn/tutorials/topics/developer-advice/how-start-your-gamedevelopment> [Game Tutorial]
5. <https://www.studytonight.com/game-development-in-2D/> [Game Tutorial]
6. <https://msdn.microsoft.com/en-us/magazine/dn759441.aspx> [Game Tutorial]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	able to gain a basic understanding of game development using Unity 3D
CO2 :	able to learn concepts such as manipulating objects, scripting, and compiling
CO3 :	able to learn graphics and visuals in game development
CO4 :	able to develop script writing for any problem and solution as game
CO5 :	able to develop full 3D game

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Basics of Game Development in Unity	√				
2	Game Development Tools and Resources		√			
3	Game Scene Designing		√			
4	Game Interface Designing			√		
5	Game Rendering and Walkthrough				√	
6	Game Testing and Deployment					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	1	2	-	2	1	1	-	1	1	2	3
CO2	3	2	-	2	2	-	2	1	1	-	1	1	2	1
CO3	3	1	1	3	2	-	2	1	1	-	2	2	2	1
CO4	3	2	2	2	2	1	2	3	1	2	3	3	3	2
CO5	3	3	3	2	2	1	2	3	1	3	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE510 - Python Web framework

(200 Marks)

Contact Hours: 06

Pre-requisite: Basics of Python Programming.

Methodology & Pedagogy: Theory sessions are required to address computational power of python through framework like Django. The application of the topics taught in theory sessions is demonstrated in practical sessions. The case study will assist students in developing one working module in any paradigm using Python. The practical session should include actual application examples as well as MVT pattern integration.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to Django	5	36
2	Django URL Patterns and Views	7	
3	Model and Database Setup for Django App	7	
4	Django Forms, Django & REST APIs	6	
5	Unit Testing with Django	6	
6	Admin, Security, Performance & Optimization	5	

Total Hours (Theory): 36

Total Hours (Lab) :36

Total Hours:72

Detail Syllabus:**Unit I: Introduction to Django** **Hours 05**

Overview of Django, Python in context of Django, Features of Django, Model, View and Template pattern for Web Programming using Django, Installation guide for Django, First Application in Django.

Unit II: Django URL Patterns and Views **Hours 07**

Designing a good URL scheme. URLconfTricks, Streamlining Function, Imports, Using Multiple View Prefixes, Special-Casing URLs in Debug Mode, Using Named Groups, Understanding the Matching/Grouping Algorithm, Passing Extra Options to View Functions Using Default View Arguments, Special-Casing Views, Capturing Text in URLs, Determining What the URLconf Searches Against, Including Other URLconfs, How Captured Parameters Work with include(), How Extra URLconf Options Work with include().

Unit III: Model and Database Setup for Django App **Hours 07**

Defining Model using ORM approach, Relationship between Models, Model Inheritance, Meta inner model, Setting up database. Django with PostgreSQL, SQLite3, MySQL. Django without Database. Django Project with Development Server, Creating and Updating database using manage.py .

Unit IV: Django Forms, Django & REST APIs **Hours 06**

Form classes, Validation, Authentication, Advanced Forms processing techniques: Search forms, Creating Feedback form, Submission process of the form, Custom validation rules, Custom look and feel, Creating forms for models. REST APIs and its implementation. Django REST framework.

Unit V: Unit Testing with Django **Hours 06**

Overview / Refresher on Unit Testing and why it's good, Using Python's unittest2 library, Test, Test Databases, Doctests, Debugging Best Practices.

Unit VI: Admin, Security, Performance & Optimization **Hours 05**

Admin characterization in Django, Security facility in Django, Performance issues Django and Optimization in Django framework.

Core Books:

1. Adrian Holovaty, Jacob K. Moss: The Definitive Guide to Django:Web Development Done Right
2. Jeff Forcier, Paul Bissex, Wesley Chun: Python Web Development with Django, Pearson Education,2008.
3. Dusty Philips: Python 3 Object oriented Programming , PACKT publishing, 2010.

Reference Books:

1. Adrian Holovaty, Jacob Kaplan-Moss, et al.: The Django Book, 2013
2. Nathan Yergler: Effective Django, 2015
3. Steve Holden: Python Web Programming, 1st edition,2002.

Web References:

1. <https://www.djangoproject.com/start/> [For Django Projects]
2. <https://djangoforbeginners.com/initial-setup/> [For Django Setups]
3. <https://docs.djangoproject.com/en/2.1/intro/tutorial01/> [For Django app]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Understand Django fundamentals and use its concepts to build and deploy robust web applications and apps.
CO2 :	Learn about Django URL patterns and views and deploy Django applications.
CO3 :	Learn how to configure Django for powerful databases and create the Django admin interface.
CO4 :	Learn about Django's security implications and how to create safe web applications with it.
CO5 :	To get some idea about unit testing concepts and its implementation through Django.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Django	√				
2	Django URL Patterns and Views		√			
3	Model and Database Setup for Django App			√		
4	Django Forms, Django & REST APIs				√	
5	Unit Testing with Django				√	
6	Admin, Security, Performance & Optimization					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	2	3	2	1	1	1	1	3	2
CO2	2	3	3	3	3	2	3	2	1	1	1	1	3	2
CO3	2	3	3	3	3	2	3	3	2	1	2	1	3	2
CO4	3	3	3	3	3	3	3	3	2	2	3	2	3	2
CO5	3	3	3	3	3	3	3	3	1	2	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE511 - Frameworks and Applications

(200 Marks)

Contact Hours: 06

Pre-requisite: Java Enterprise Computing.

Methodology & Pedagogy: During theory sessions the students shall be introduced to various frameworks. Details of Spring and Hibernate frameworks will be discussed and their integration to develop real world applications will be demonstrated. During practical sessions students will be trained to develop various standalone and web applications using the studied frameworks.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to Spring	04	36
2	Beans and Containers	07	
3	Spring Annotations	05	
4	Aspect-Oriented Programming	06	
5	Spring and Persistence	07	
6	Spring Web MVC and Spring Boot	07	

Total Hours (Theory): 36

Total Hours (Lab) : 36

Total Hours: 72

Detailed Syllabus:**Unit I : Introduction to Spring****Hours 04**

Introduction of Framework, Characteristics of framework, Types of framework (Existing frameworks), Spring introduction, architecture of spring framework, spring framework modules overview, configuring spring framework, introduction of factory pattern, comparison between normal Java application and spring framework application.

Unit II : Beans and Containers**Hours 07**

What is inversion of control? Spring inversion of control overview, Spring Containers, Spring Configuration File, Spring Beans, Using the Container, The BeanFactory Interface, Singleton vs. Prototype, Bean Naming, Dependency Injection, Setter Injection, Constructor Injection

Unit III : Spring Annotations**Hours 05**

Annotations overview, default component names, inversion of control with annotations, setter and constructor injections with annotations, method and field injections with annotations, bean scope annotations, spring configuration with java code.

Unit - IV: Aspect-Oriented Programming**Hours: 06**

AOP Concepts, Join Points, Point Cuts, Advice, Configuration of Aspects - Types of Advice,AOPExample.

Unit V : Spring and Persistence**Hours 07**

Working with the HSQLDB Database, Integration with JDBC, Use of Jdbc Template Class, Exception Translation, updating with the Jdbc Template Queries using the Jdbc Template, Mapping Results to Java Objects. Introduction to Object Relational Mapping, What is Hibernate?, The Hibernate Template class, Hibernate Configuration Files, Mapping Classes and Fields for Hibernate, Creating and Saving a New Entity, Locating an Existing Entity, Updating an Existing Entity, Hibernate Sessions, Hibernate Query Language, Executing Queries, Hibernate annotation.

Unit VI : Spring MVC and Spring Boot**Hours 07**

What is Spring Web MVC?, Setting Dispatchers, Loading Configuration Files, Writing a Controller, Types of Controller, Configuring the Controller, Setting of Handler Mapping, Handler Mapping Options, Handling a Form, Integrating Hibernate with Spring MVC – Accessing Database, Storing Form Values and Retrieving Data from Database.

Introduction to Spring Boot - Spring Boot Features, Spring Boot Application.

Core Books:

1. Craig Walls, Ryan Breidnbach: Spring in Action, 3rd Edition.
2. Rod Johnson, Juergen Hoeller, Alef Arendsen, Thomas Risberg, Colin Sampaleanu:
3. Professional Java Development with the Spring Framework.

Reference Books:

1. Rod Johnson: J2EE Applications Without EJB, Wiley Publication.
2. API Documentation (<http://www.springsource.org/spring-framework#documentation>).

Web References:

1. <https://www.udemy.com/course/spring-hibernate-tutorial/>
2. <http://netbeans.org/kb/docs/web/quickstart-webapps-spring.html> [Spring Web MVC]
3. <https://www.javatpoint.com/spring-boot-tutorial> [Introduction to Spring Boot].

Course Outcomes: Upon successful completion of the course, students will:

CO1 :	Be familiar with basics of Frameworks and advantages of frameworks
CO2 :	Be able to work with Dependency Injection and IOC
CO3 :	Be able to use Application Context to achieve DI.
CO4 :	Be familiar with AOP fundamental.
CO5 :	Be able to integrate NoSQL database with MVC based web application

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Spring	✓				
2	Beans and Containers		✓			
3	Spring Annotations			✓		
4	Aspect-Oriented Programming				✓	
5	Spring and Persistence					✓
6	Spring Web MVC and Spring Boot				✓	✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	1	1	-	-	-	-	-	-	2	2
CO2	3	2	3	2	-	-	-	-	-	2	1	2	2	2
CO3	3	2	3	2	2	1	-	-	-	2	2	3	3	3
CO4	3	2	3	2	2	2	-	-	1	-	2	1	3	1
CO5	2	2	3	3	2	-	1	1	-	2	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE512 - HTTP Web Service for Enterprise Application

(200 Marks)

Contact Hours: 06

Pre-requisite: Work experience with C#, ASP.NET MVC, MSSQL, HTML, CSS, JavaScript and have some understanding of JQuery.

Methodology & Pedagogy: During theory lectures, illustrations emphasizing the need for advance features of WEB API and ASP.NET will be covered. During Practical sessions, students will require to develop Web API using concepts of .NET framework and other pre-requisite technologies, discussed during class.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	ASP.NET Web API - Introduction	4	36
2	MVC and Web API Controller and Entity Framework	8	
3	Web API – Routing	4	
4	Web API – Action Formatter and Filters	4	
5	Backend Validation and Exception Handling	8	
6	JQuery and AJAX	8	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:**Unit I: ASP.NET Web API - Introduction****Hours 04**

Introduction to RESTful WEB API, Characteristics of ASP.NET WEB API, versions of Web API, Difference among web service, Window Communication Foundation and WEB API, Test Web API Fiddler and Postman

Unit II: MVC and Web API Controller and Entity Framework**Hours 08**

Use of Web API Controller in Controller class of Web API, Functionality of Web API Controller, Difference between Web API controller and MVC controller, Action Method Naming Conventions, Action Result, MVC with WEB API, CRUD operation with Entity Framework in Web API.

Unit III: Web API – Routing**Hours 04**

Routing in Web API, Routing: Convention-based Routing and Attribute based Routing, Routing and Action Execution.

Unit IV: Web API – Action Formatter and Filters**Hours 04**

Data Formatter, Media Type Formatter, Web API Filter, Exception Filters: HttpResponseMessage, Exception Filters, Registering Exception Filters, HttpStatus

Unit V: Backend Validation and Exception Handling**Hours 08**

Model Validation with annotation, Custom Exception, recognizing need of custom Exceptions, Backend validation using Custom Exception for robustness and Data Integrity.

Unit VI: JQuery and AJAX**Hours 08**

Consume RESTful Web API through GET, POST, PUT and DELETE. Understanding JQuery and JavaScript. JQuery usage and AJAX Request configuration and parameters understanding.

Core Books:

1. Mithun Pattankar, Malendra Hurbans, Mastering ASP.NET Web API: Build powerful HTTP services and make the most of the ASP.NET Core Web API platform 1st Edition. – 2017.

Reference Books:

1. Jamie Kurtz, Brian Wortman, ASP.NET Web API 2: Building a REST Service from Start to Finish. - 2014

Web References:

1. https://www.tutorialspoint.com/asp.net_mvc/asp.net_mvc_web_api.htm

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Be familiar with RESTful API and ASP .NET Web API
CO2 :	Be able to implement ASP .NET Web API Controller and configure its Routing and implementing Entity Framework.
CO3 :	Be able to Configure actions in API Controllers, Filters and Formatters
CO4 :	Be able to provide Data Integrity with validations with Exceptions..
CO5 :	Be able to call API through testing applications and AJAX calls from 3 rd Party Applications.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	ASP.NET Web API - Introduction	√				
2	MVC and Web API Controller and Entity Framework		√			
3	Web API – Routing		√			
4	Web API – Action Formatter and Filters			√		
5	Backend Validation and Exception Handling				√	
6	JQuery and AJAX					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	3	1	3	-	-	2	2	2	2	2	2	2
CO2	2	1	2	2	3	2	2	3	-	3	2	2	3	3
CO3	2	2	2	2	3	2	2	2	-	1	2	2	3	2
CO4	3	3	3	3	2	3	2	2	-	2	3	2	3	2
CO5	2	3	3	1	3	2	2	3	2	2	3	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC513 - Advanced Mobile Programming

(200 Marks)

Contact Hours: 06

Pre-requisite: Object Oriented Programming concepts

Methodology & Pedagogy: During theory lectures illustrations emphasizing the need for basic features of Mobile Computing and Cross Platform- the Mobile Application Development platform will be given. During Practical sessions, students will be required to develop Mobile Application using Dart language in Flutter. Student shall also develop applications with elegant user interface that deal with data storage using Firebase and state management.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to cross-platform development with Flutter and Dart	05	36
2	Creating UI with Flutter	07	
3	Building Apps with state	05	
4	Leveraging Flutter packages and structuring Flutter applications	08	
5	Incorporating backend data with Flutter application	05	
6	Integrating Flutter Application with Firebase and State Management	06	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:

Unit I: Introduction to cross-platform development with Flutter and Dart

Hours 05

Set up a new Flutter project using Android Studio. Introduction to Dart programming language: Libraries & imports, Built-in types, variables, operators, keywords, comments, Control Flow, Functions and parameters, Object-oriented programming in Dart.

Widget tree, Interface design: pre-made Flutter Widgets. Image and Text Widgets. App Icons for iOS and Android. Add and load image assets to Flutter projects. Run Flutter apps on iOS Simulator, Android Emulator and physical devices. Use the TextField Widget to take user input.

Unit II: Creating UI with Flutter

Hours 07

Hot Reload and Hot Restart, Use of pubspec.yaml file, custom assets and fonts. An introduction to the Widget build(), layout widgets: Columns, Rows, Containers and Cards. Material icons, Icons class. Theme widgets. Refactoring widgets. Dart annotations and modifiers. Immutability of Stateless and Stateful Widgets. Update screen with the build(). Custom Flutter Widgets. Difference between final and const in Dart. Maps, enums and the ternary operator. Functions and arguments in Dart. Multi-screen Flutter apps, routes and the Navigator widget. Flutter favours composition vs. inheritance (customizing widgets).

Unit III: Building Apps with state

Hours 05

About Stateful and Stateless Widgets, callbacks. Declarative style of UI programming, Flutter widgets react to state changes. Import Dart libraries. Variables, data types and functions in Dart. Build flexible layouts. Understand the relationship between setState(), State objects and Stateful Widgets.

Unit IV: Leveraging Flutter packages and structuring Flutter applications

Hours 08

Dart package manager, Flutter compatible packages. The structure of the pubspec.yaml file. Incorporate the audio players package to play sound. Functions in Dart and arrow syntax. Refactor widgets, Flutter's philosophy of UI as code. The lists and conditionals in Dart. Classes and objects. Understand Object Oriented Dart. Dart Constructors for Flutter widgets. Design patterns to structure Flutter apps. Structuring and organizing Flutter apps.

Unit V: Incorporating backend data with Flutter application	Hours 05
Asynchronous programming in Dart and use of <code>async/await</code> . Stateful Widget lifecycle methods, Handling exceptions in dart. Null aware operators. Location data from both iOS and Android. Http package and live data from open APIs. Parse JSON data using the <code>dart:convert</code> library. State objects via the Stateful Widget. Use the <code>TextField</code> Widget to take user input. Pass data backwards using the <code>Navigator</code> widget.	

Unit VI: Integrating Flutter Application with Firebase and State Management	Hours 06
Hero animations in Flutter apps. Animation controller, custom animations. The use of Dart mixins. Firebase Cloud Firestore into your Flutter apps. Authentication with Firebase Auth package. A scrolling <code>ListView</code> , reusable elements. Dart Streams: listen data changes. <code>StreamBuild</code> . Manage state across the widget tree. Declarative vs. imperative programming. <code>setState</code> , prop drilling and lifting state up. todo list app. The <code>BottomSheet</code> , <code>ListViewBuilder</code> . The Flutter app architecture design patterns. Manage state with the Google recommended <code>Provider</code> package.	

Core Books:

1. Marco L. Napoli: Beginning Flutter: A Hands On Guide to App Development: Wrox publication: 2019.

Reference Books:

1. Eric Windmill: Flutter in Action: Edition: Manning Publication: January 2020.
2. Alessandro Biessek: Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2: Packt publication: September 2019

Web References:

1. <https://docs.flutter.dev/reference/tutorials>
2. <https://www.tutorialspoint.com/flutter/index.htm>
3. <https://www.javatpoint.com/flutter>
4. <https://fluttern/tutorial.in/>

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	able to clear all object oriented programming and cross platform concepts
CO2 :	able to learn Flutter and Dart step by step
CO3 :	able to learn the reduce the code through native app performance, animated UI with material design and least testing
CO4 :	able to use Firebase to authenticate the users and use the remote database.
CO5 :	able to build engaging native mobile apps for both Android and iOS .

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to cross-platform development with Flutter and Dart	√				
2	Creating UI with Flutter	√	√			
3	Building Apps with state			√		
4	Leveraging Flutter packages and structuring Flutter applications			√		
5	Incorporating backend data with Flutter application					√
6	Integrating Flutter Application with Firebase and State Management				√	√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	3	2	1	3	-	1	-	1	-	-	1
CO2	3	1	3	2	3	1	2	1	1	-	1	1	1	2
CO3	3	-	3	1	3	1	1	2	1	-	1	1	1	2
CO4	3	3	3	3	3	1	1	3	1	-	2	2	3	1
CO5	3	3	3	1	3	1	1	3	1	1	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC514 - Full-Stack Web Development (200 Marks)

Contact Hours: 06

Pre-requisite: Working knowledge of HTML and JavaScript

Methodology & Pedagogy: During the theory sessions students will understand the various JavaScript frameworks and its architecture, also able to comprehend MEAN stack application concepts. During the practical sessions students will learn how to reduce the amount of code you write to build rich user interface applications, Modularizing code, retrieving data from back-end- server and manipulate it.

Outline of the course:

Unit No	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to JavaScript and JavaScript Frameworks.	04	36
2	Directives in AngularJS	07	
3	MVV-The AngularJS way	06	
4	Introduction to NodeJS	07	
5	Introduction to ExpressJS Framework	06	
6	Working with Database	06	

Total Hours (Theory): 36

Total Hours (Lab) :36

Total Hours:72

Detail Syllabus:

Unit I: Introduction to JavaScript Frameworks.	Hours 04
Introduction JavaScript and its DOM concepts, Arrow function, JSON Objects, JavaScript Frameworks & Libraries, MEAN.JS introduction, Architecture of MEAN.JS.	
Unit II: Introduction to AngularJS.	Hours 07
Introduction to AngularJS, Features of AngularJS, Data Binding in angularJS, working with Expressions in angularJS, Introduction to Directives, Directive Lifecycle, Using Angular JS built-in directives, creating a custom directive, Working with \$scope, \$rootScope, Lifecycle of \$scope.	
Unit III: MVW-The Angular JS way.	Hours 06
MVW Architecture: Model-View-Controller and Model-View-View-Model Architecture, Introduction to AngularJS Modules – Application module & Controller modules, Attaching Properties and functions to scope, Controller in external files, AngularJS Filters, working with Angular Forms, Form events, validating Angular forms.	
Unit IV : Introduction to NodeJS	Hours 07
Introduction to NodeJS, Features of NodeJS, Traditional web Server Model, Node.js process Model, Installation of NodeJS, working with Node Package Manager, Command Line options, NodeJS modules – Core Modules, Creating Local modules & Exporting Local modules, Third-party modules, Creating NodeJS web server.	
Unit V : Introduction to ExpressJS Framework.	Hours 06
Introduction to ExpressJS, Installing ExpressJS using NPM, Advantages of ExpressJS, Installing Express.js, building web server, configure routes, ExpressJS middleware's, Serve Static Resources using Express.js, working with HTTP methods of ExpressJS, ExpressJS routing, Creating RESTful API.	
Unit VI : Working with Database.	Hours 06
Introduction to Mongo DB, Installation of MongoDB – MongoDB Server & MongoDB Shell, MongoDB Compass, MongoDB Database, Collections, and documents, Basic operations using MongoDB – Create, Insert, Update and Delete, Access MongoDB in Node.js, setting up	

mongoose, Connecting MongoDB, Insert, update and delete document.

Core Books:

1. Jeffry Houser : "Learn With: Angular 5, Bootstrap, and NodeJS", Kindle Edition,
2. Shyam Seshadri Brad Green: "AngularJS – Up and Running, Brad Green", Second Edition, O'REILLY
3. Basarat Ali Syed: "Beginning Node.js", Apress Publication.
4. Greg Lim : "Beginning MEAN Stack (MongoDB, Express, Angular, Node.js)", kindle Edition.

Reference Books:

1. Agus Kurniawan: "AngularJS Programming by Example 2017 Edition", Kindle Edition.
2. Adam Freeman: " Pro AngularJS 2017 Edition", Apress.
3. Krasimir Tsonev: "Node.js By Example", Packt Publishing
4. Ethan Brown: "Web Development with Node and Express", O'REILLY

Web References:

1. <http://www.w3schools.com/angular/default.asp> [Tutorial link for AngularJS]
2. <http://www.tutorialspoint.com/angularjs/> [Tutorial link for AngularJS]
3. https://www.tutorialspoint.com/angularjs/angularjs_tutorial.pdf [E-book for AngularJS]
4. <http://www.tutorialsteacher.com/nodejs/nodejs-modules> [Tutorial link for NodeJS]
5. <https://www.javatpoint.com/mean-stack-tutorial> [MEAN stack development]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Familiar with JavaScript and JavaScript frameworks.
CO2 :	Able to understand basic fundamental of AngularJS and implement Model-View-View-Model Architecture.
CO3 :	Able to create NodeJS and ExpressJS applications.
CO4 :	Able to create Restful API to access data from MongoDB.
CO5 :	Able to create Single page application and MEAN stack application.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to JavaScript and JavaScript Frameworks	√				√
2	Introduction to AngularJS		√			√
3	MVW-The Angular JS way		√			√
4	Introduction to NodeJS			√	√	√
5	Introduction to ExpressJS Framework			√	√	√
6	Working with Database				√	√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	2	-	1	-	-	-	-	1	-	-
CO2	1	2	2	1	2	-	1	1	-	1	1	2	1	2
CO3	1	-	3	1	3	-	2	1	-	-	1	2	1	1
CO4	2	2	3	2	3	2	2	3	-	2	2	3	3	3
CO5	2	3	3	2	3	2	2	3	2	2	3	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation

CAUC515 - Software Engineering with Agile and DevOps

(100 Marks)

Contact Hours: 03

Pre-requisite: Analysis and design of Information Systems, Fundamental concepts of Object Oriented Programming.

Methodology & Pedagogy:

During theory sessions, the focus will be given on different concepts of software engineering and related aspects such as Project management and Agile software development. The emphasis will be given on the basics of software engineering concepts and UML. Students will get exposure to various concepts of DevOps, as well as Process Improvement and Reengineering.

Outline of the course:

Unit No	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Software and Software Engineering	5
2	Requirement analysis and specification	6
3	Requirement Modelling using UML	6
4	Essence of Agile Development	7
5	Role of DevOps in SE	7
6	Software maintenance and risk management	5

Total Hours (Theory): 36

Total Hours:36

Detail Syllabus:**Unit I: Introduction to Software and Software Engineering Hours 05**

The Role of Software in today's era, Software Engineering: A Layered Technology/software process layers, Software Process Models, The Linear Sequential Model, The Prototyping Model, Evolutionary Process Models.

Introduction to software process: Generic process framework activities, Umbrella activities.

Unit II: Requirement analysis and specification Hours 06

Understanding to System and Software Requirement, types of software requirements, Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation, Requirement Engineering. Introduction to the basic concepts of Project Management Plan and Project Scheduling, Project scheduling principles, relationships and effort distribution, Process Definition and Tailoring, Process Database and Process Capability Baseline, Effort Estimation and Scheduling, Configuration Management.

Unit III: Requirement Modelling using UML Hours 06

Introduction to UML, Structure modelling: Class Diagram and Behavioural Modelling. Under Behavioural Modelling: Use case Diagram, Interaction Diagram, Activity Diagram.

Unit IV: Essence of Agile Development Hours 07

Introduction to Agile Software Development, Characteristics of Agile Process, Agile methods, Principles of Agile methods, Agile Process models: XP, ASD, DSDM, Scrum, Crystal, FDD, AM.

Unit V: Role of DevOps in SE Hours 07

Overview, Problem Case Definition, Benefits of Fixing Application Development Challenges, DevOps Adoption Approach through Assessment, Solution Dimensions, What is DevOps?, DevOps Importance and Benefits, DevOps Principles and Practices, 7 C's of DevOps Lifecycle for Business Agility, DevOps and Continuous Testing, How to Choose Right DevOps Tools, Challenges with DevOps Implementation, Must Do Things for DevOps, Mapping My App to DevOps Assessment, Definition, Implementation, Measure and Feedback.

Unit VI: Software maintenance and risk management**Hours 05**

Software risks, risk identification, risk projection, risk mitigation, monitoring and management. Introduction to software maintenance, types of maintenance.

Concept of software reengineering, Business Process Reengineering(BPR), BPR life cycle, reverse engineering, Applications of Software Engineering.

Core Books:

1. Roger S.Pressman, Software Engineering- A practitioner's Approach, McGraw-Hill International Editions
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modelling Language User
3. Rajib Mall, Fundamentals of software Engineering, Prentice Hall of India.

Reference Books:

1. Ian Sommerville, Software engineering, Pearson education Asia
2. Pankaj Jalote, Software Engineering – A Precise Approach Wiley
3. Merlin Dorfman (Editor), Richard H. Thayer (Editor), Software Engineering
4. Robert C. "Uncle Bob" Martin, Clean Architecture: A Craftsman's Guide to Software Structure and Design
5. Deepak Gaikwad, Viral Thakkar, DevOps Tools from Practitioner's ViewPoint, Wiley

Web References:

1. https://en.wikibooks.org/wiki/Introduction_to_Software_Engineering/Process/Methodology [Introduction to Software Engineering/Process/Methodology]
2. <https://www.uml-diagrams.org/> [UMLUnits]
3. <https://nptel.ac.in/courses/106/101/106101061/> [Agile Software Development and Extreme Programming and Overview of DevOps]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Understanding Software Engineering Process Models
CO2 :	Able to analyze requirements and manage project
CO3 :	Get familiar with the concepts of Unified Modeling Language
CO4 :	Understanding of the Agile software development concepts
CO5 :	Able to apply DevOps concepts and understand risk management

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Software Engineering	√				
2	Requirement analysis and project management		√			
3	Understanding UML			√		
4	Agile Development				√	
5	DevOps					√
6	Software maintenance and risk management					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2	3	2	2	3	3	2	2	2	1	2	3	3
C02	3	2	2	2	2	3	3	3	3	2	3	2	3	3
C03	2	2	3	2	2	2	2	2	2	1	1	2	3	2
C04	3	3	3	2	2	2	2	1	1	1	3	2	3	2
C05	2	2	3	2	1	3	2	1	1	1	2	1	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

TEACHING SCHEME & DETAILED SYLLABUS

FOR

**MCA PROGRAMME
(Semester-III)**

EFFECTIVE FROM

Teaching & Examination Scheme
Master of Computer Applications (M.C.A.) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25
Semester-III

Course Code	Course Title	Teaching Scheme			Examination Scheme					Total	
		Contact Hours			Credit	Theory		Practical			
		Theory	Practical	Total		Termwork	External	Termwork	External		
CAUE601 - CAUE604	Elective-III	3	3	6	6	50	50	50	50	200	
CAUC605	Software Quality Assurance	3	3	6	6	50	50	50	50	200	
CAUC606	Mini Project	-	12	12	12	-	-	200	200	400	
CAUC607	Green Computing		2	2	2	-	-	50	50	100	
		06	20	26	26	200		700		900	

Elective-III	
Course Code	Course Title
CAUE601	Digital Image Processing
CAUE602	Object Oriented Programming for Smart Contracts
CAUE603	Data Analytics
CAUE604	Internet of Things

CAUE601 - Digital Image Processing (200 Marks)

Contact Hours: 06

Pre-requisite: Basic knowledge of programming

Methodology & Pedagogy: The fundamental concepts of digital image processing should be covered in the beginning lectures. Various image enhancement and colour image processing techniques should be explained in details. The methods of image segmentation, representation and compressions should be taught in-depth.

Outline of the course:

Unit No	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Digital Image Fundamentals	05	36
2	Color Image Processing	07	
3	Image Enhancement	05	
4	Image Segmentation	07	
5	Image Representations and Recognition	06	
6	Image Compressions	06	

Total Hours (Theory): 36

Total Hours (Lab) : 36

Total Hours: 72

Detail Syllabus:

Unit I: Digital Image Fundamentals	Hours 05
Introduction, Origin, Component of image processing system, Human visual system, Image as a 2D data, Image representation, Gray scale and Colour images, image sampling and quantization, Basic Relationships between Pixels.	
Unit II: Colour Image Processing	Hours 07
Colour fundamentals, Colour models, Colour transformation, Smoothing and Sharpening, Colour segmentation, Noise Models, Noise Reduction, Inverse Filtering.	
Unit III: Image Enhancement	Hours 05
Basic gray level Transformations, Histogram Processing, Spatial Filtering, Preliminary Concepts, Extension to functions of two variables, Image Smoothing, Image Sharpening, Frequency domain filtering, Homomorphic filtering	
Unit IV: Image Segmentation	Hours 07
Edge based segmentation, Region based segmentation, Region split and merge techniques, Region growing by pixel aggregation, optimal thresholding, Hough Transform, boundary detection.	
Unit V: Image Representation and Recognition	Hours 06
Boundary representation, Chain code, Polygonal Approximation, Signature, Boundary segments, Boundary description, Shape Number, Regional Descriptors, Topological Feature, Texture, Pattern and Patterns classes, Recognition Based on matching	
Unit VI: Image Compression	Hours 06
Introduction, Image compression model, Error free compression, Variable length coding, Bit plan coding, Lossless predictive coding, Lossy compression, Compression standards.	

Core Books:

1. Rafael C. Gonzalez, Richard E. Woods: Digital Image Processing, Fourth edition, Pearson education, 2017
2. Anil K. Jain: Fundamentals of Digital Image Processing, First Edition, Pearson Education, 2015

Reference Books:

1. Burger, Wilhelm, Burge, Mark J: Principles of Digital Image Processing, Springer, 2009.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle: Image Processing, Analysis, and Machine Vision, CL Engineering, 2007

Web References:

1. <https://www.tutorialspoint.com/dip/> [Basics of Image Processing]
2. <https://sisu.ut.ee/imageprocessing/book/1> [All concepts of digital image processing]
3. <https://www.cs.auckland.ac.nz/courses/compsci773s1c/lectures/ImageProcessing-html/topic3.htm> [Image segmentation]
4. <http://www.eletei.p.lodz.pl/mstrzei/imageproc/enhancement1.PDF> [Image enhancement]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Understand the concept of Explain various types of images and analyze various techniques for intensity transformation and spatial filtering with applications.
CO2 :	Understand the concepts of colour image processing and noise models.
CO3 :	Understand the concepts of image enhancement and its techniques.
CO4 :	Learn various image segmentation techniques.
CO5 :	Be able to represent and recognize images using various pattern recognition methods its compression techniques.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Digital Image Fundamentals	✓				
2	Colour Image Processing		✓			
3	Image Enhancement			✓		
4	Image Segmentation				✓	
5	Image Representations and Recognition					✓
6	Image Compressions					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3	3	3	2	1	1	1	1	-	1	1	3	2	3
CO2	3	3	3	2	1	1	1	1	-	1	1	3	2	3
CO3	3	3	3	2	1	1	1	1	-	1	1	3	2	3
CO4	3	3	3	2	1	1	1	1	-	1	1	3	2	3
CO5	3	3	3	2	1	1	1	1	-	1	1	3	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE602 - Object Oriented Programming for Smart Contracts (200 Marks)

Contact Hours: 06

Pre-requisite: CAUE503: Blockchain Technology

Methodology & Pedagogy: During the lecture sessions, the students will learn about fundamental of smart contracts and related applications. Practical session will provide hands-on in order to implement smart contracts using Solidity programming language. Practical sessions will cover basics of Solidity, Expression and Control Statements, Object Oriented constructs and Testing, Debugging and Deployment. Through case study approach, students will explore smart contracts in real applications.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to Smart Contracts	6	36
2	Basics of Solidity	7	
3	Expression & Control Statements	7	
4	OOPs Construct in Solidity	7	
5	Testing, Debugging and Deployment	5	
6	Smart contracts in Real World	4	

Total Hours (Theory): 36

Total Hours (Lab) : 36

Total Hours: 72

Detail Syllabus:

Unit I : Introduction to Smart Contracts Hours 06

An overview to the history of smart contracts, An intro to the life-cycle of a smart contract, Ethereum's smart contract languages, Interfacing with Ethereum Networks (overview of Ethereum Networks, Clients, Wallets, Transactions etc.), The Solidity Programming Language, Development Environments.

Unit II : Basics of Solidity Hours 07

Overview of Solidity, Solidity-Environment Setup, Basic Syntax, Smart contract layout, the structure of .sol source file, First Application, Understanding the different compiler versions and pragmas, Authoring smart contracts, Contract definitions, Basic data types, Variables, Variable Scope, Operators, Structs and Enums, Mapping and Arrays, Build-in Functions, User Functions.

Unit III : Expression & Control Statements Hours 07

Expressions and Control Structures, Valid expressions of the language, Conditional logic, Implementation of loops, Exception Handling, Events and Logging.

Unit IV : OOPs Construct in Solidity Hours 07

Contract constructor and self-destruct, Function Modifiers and Fallback functions, calling other contracts, Inheritance and Multiple Inheritance, Declaring Abstract Classes and Interfaces, Implementation of Abstract interfaces, Function Overloading .

Unit V : Testing, Debugging and Deployment Hours 05

Smart Contract testing, Basics of using Truffle for testing, types of testing in smart contract, Importance of testing in smart contracts, Debugging, Smart Contract Security – overview of attacks on Ethereum smart contracts Deployment.

Unit VI : Smart contracts in Real World Hours 04

Smart contracts in trading, investing, gaming, healthcare and real estate

Core Books:

1. Antonopoulos, Andreas M., and Gavin Wood: Mastering ethereum: building smart contracts and dapps : Edition (1st, 2nd, etc.) : O'Reilly Media: 2018.

Reference Books:

1. Ritesh Modi: Solidity Programming Essentials: A guide to building smart contracts and tokens using the widely used Solidity language: Edition (2nd) : Kindle Edition : Year of Publication.
2. Wei-Meng Lee: Beginning Ethereum Smart Contracts Programming: With Examples in Python, Solidity, and JavaScript: Apress: 2019

Web References:

1. <https://www.blockchain-council.org/blockchain/smart-contracts-works/> [Smart Contracts Introduction]
2. <https://101blockchains.com/solidity-tutorial/> [Solidity Introduction]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Able to understand the fundaments of Smart Contracts.
CO2 :	Able to learn basics and object oriented construct of Solidity programming language.
CO3 :	Able to implement smart contracts using Solidity programming language.
CO4 :	Able to test, debug and deploy smart contract.
CO5 :	Able to understand use cases of smart contract in real world.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Smart Contracts	√				
2	Basics of Solidity		√	√		
3	Expression & Control Statements		√	√		
4	OOPs Construct in Solidity		√	√		
5	Testing, Debugging and Deployment				√	
6	Smart contracts in Real World					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	2	-	1	3	-	-	-	-	2	1	3
CO2	3	1	2	1	3	-	3	-	-	-	-	2	2	3
CO3	3	1	2	1	3	-	3	-	-	-	-	2	2	3
CO4	3	1	3	2	3	-	3	-	-	-	-	2	3	3
CO5	1	1	1	2	1	-	3	-	-	2	2	2	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE603 - Data Analytics (200 Marks)

Contact Hours: 06

Pre-requisite: CAUC508: Database Technologies

Methodology & Pedagogy: During theory lectures the emphasis will be given on the basics of data analytics and related tools and techniques. Students will be introduced to the concepts of data science, exploratory data analysis, supervised and unsupervised learning methods. Applications as well as research trends and future direction of data analytics will be discussed with the length. During the practical sessions, students will be introduced to tools of data analytics such as R and Python. Students will be given appropriate case studies of data analytics to get the real time exposure of data analytics.

Outline of the course:

Unit No	Title of the Unit	Minimum Number of Theory Hours	Practical
1	Introduction of Data Analytics	06	
2	Exploratory Data Analysis	06	
3	Supervised & Unsupervised Learning Methods	06	
4	Deep Re-enforcement Learning	06	
5	Data visualization	06	
6	Recent trends and future directions	06	36

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:**Unit I : Introduction of Data Analytics Hours 06**

What is Data Science? ,Big Data and Data Science hype ,Why now? , Datafication , Current landscape of perspectives , Skill sets needed, Data Analysis cycle, Data analysis Vs Data analytics, Life cycle of data.

Unit II : Exploratory Data Analysis Hours 06

Philosophy of EDA - The Data Science Process ,Statistical Inference , Populations and samples , Statistical modeling, probability distributions, fitting a model Introduction to R ,Basic tools (plots, graphs and summary statistics) of EDA, SQL with data life cycle, Python for EDA.

Unit III : Supervised & Unsupervised Learning Methods Hours 06

Supervised methods: Linear Regression , Classification Trees, Random Forest, Clustering, Support Vector Machine, Regularization, Radial Basis, Association Rule Mining, Dimensionality Reduction - Singular Value Decomposition – Principal Component Analysis

Unit IV : Deep Re-enforcement Learning Hours 06

Introduction to Neurons, Activation functions, single and multi-layer perceptron, back propagation, Application, Hyper-parameters and Estimation, Gradient Descent, Curiosity driven learning.

Unit V : Data visualization Hours 06

Introduction of data visualization, Power BI, and Tableau, ggplot+ggplot2, Seaborn.

Unit VI : Recent trends and future directions Hours 06

Data Visualization - Basic principles, ideas and tools for data visualization, Data Science and Ethical Issues - Discussions on privacy, security, ethics , Next-generation data scientists, Basics of Big Data analytics,

Core Books:

1. Cathy O'Neil and Rachel Schutt: Doing Data Science, Straight Talk From The Frontline, O'Reilly. 2014.
2. Jure Leskovec, Anand Rajaraman, and Jeffrey David Ullman, Mining of Massive Datasets Cambridge University Press, 2nd Edition, New York, NY, USA, 2014.
3. Howard B. Demuth, Mark H. Beale, Orlando De Jess, and Martin T. Hagan, Neural Network Design , paperback USA, 2nd Edition, 2014.

Reference Books:

1. Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. , Probability & statistics for engineers & scientists ,9th edition, Prentice Hall, 2012.
2. Haykin, S. S., Haykin, S. S., Haykin, S. S., & Haykin, S. S., Neural networks and learning machines Pearson, Vlolume 3, 2009.
3. Mohammed J. Zaki and Wagner Miera Jr, Data Mining and Analysis: Fundamental Concepts and Algorithms., Cambridge University Press. 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc17_mg24/preview [Online Data Analytics Course]
2. <https://www.itl.nist.gov/div898/handbook/eda/section1/eda11.htm> [Exploratory Data AnalysisMaterial]
3. https://datahoarder.io/Humble%20Bundle%20Books/Humble%20Book%20Bundle_%20Data%20Science%20presented%20by%20O_Reilly/doingdatascience.pdf [Data Science E-Book]
4. http://www.astro.caltech.edu/~george/aybi199/Donalek_Classif.pdf [Supervised and unsupervised methods tutorials]
5. <https://yourstory.com/2017/12/data-analytics-future-trends/> [Future Trends of Data Analytics]
6. http://www.astro.caltech.edu/~george/aybi199/Donalek_Classif.pdf [Supervised and unsupervised methods tutorials]
7. <https://yourstory.com/2017/12/data-analytics-future-trends/> [Future Trends of Data Analytics]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Describe what Data Science and Data Analytics are and the skill sets needed to be a data scientist.
CO2 :	Understand significance of exploratory data analysis in statistical and visualization aspects.
CO3 :	Understand and apply data analytics techniques such as supervised, unsupervised and EDA.
CO4 :	Understand the importance of self-learning environments
CO5 :	Able to understand the recent trends and future directions of data analytics.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction of Data Analytics	✓				
2	Exploratory Data Analysis		✓			
3	Supervised & Unsupervised Learning Methods			✓		
4	Deep Re-enforcement Learning				✓	
5	Data visualization				✓	
6	Recent trends and future directions					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	1	-	-	-	2	3	1
CO2	2	2	1	1	-	1	-	-	-	-	-	2	2	1
CO3	1	3	3	2	-	1	3	-	-	-	-	2	1	1
CO4	2	1	2	2	2	1	2	-	-	-	-	2	1	2
CO5	1	1	2	3	1	-	2	-	-	-	-	3	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE604 - Internet of Things

(200 Marks)

Contact Hours: 06

Pre-requisite: - None

Methodology & Pedagogy: In order to achieve the objectives and goals, students will be taught the basics of IOT with its structure, layers and applications. Fundamentals controllers are introduced which can be used to implement the IOT based projects. Students will also be introduced to interface GPIO with controllers like arduino and Raspberry PI. They can also learn to develop a desktop application and mobile application which can control the device remotely.

Outline of the course:

Unit No	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to Internet of Things	06	36
2	Programming Internet of Things System	08	
3	Sensors and Actuators for Internet of Things System	04	
4	Designing Mobile Application and Webpage for Internet of Things System	06	
5	ESP8266 and ESP32 Microcontroller for IOT	06	
6	Raspberry Pi for IOT Projects	06	

Total Hours (Theory): 36

Total Hours (Lab) :36

Total Hours:72

Detail Syllabus:**Unit I : Introduction to Internet of Things :** **Hours: 06**

Introduction - Overview of Internet of Things (IoT), The building blocks of IoT, Various technologies making up IoT ecosystem, IoT levels, IoT design methodology, The Physical Design and Logical Design of IoT, Functional blocks of IoT and Communication Models, Development Tools used in IoT.

Unit II : Programming Internet of Things System: **Hours: 08**

Arduino / node MCU controller for IOT Programming, Embedded C data types, variables, constants and operators, programming using control statements, loops, string and array, Arduino IDE. Variables and Numbers, Looping Structures, Conditional Statements, Lists, Tuples and Dictionaries, Type Conversions, Function declaration, calling functions and passing values, Function Returning values. Exiting from functions.

Unit III : Sensors and Actuators for Internet of Things System: **Hours: 04**

Interfacing with various sensors like temperature sensor, PIR sensor and ultrasonic sensor. Interfacing with servomotor, DC motor, Gas sensor.

Unit IV : Designing Mobile Application and Webpage for Internet of Things System **Hours: 06**

Basic concepts of mobile application development, designing webpage for IoT user, Connecting App / webpage with cloud and controller as per Internet of Things system levels.

Unit V : ESP8266 and ESP32 Microcontroller for IOT **Hours: 06**

Basics of Wireless Networking, Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi library, Web server- introduction, installation, configuration, Posting sensor(s) data to web server, Introduction to ESP32 microcontroller.

Unit VI : Raspberry Pi for IOT Projects **Hours: 06**

Introduction to Raspberry Pi, Why Raspberry pi, Features of Raspberry pi, Basic set up and first boot configuration, Different uses of Raspberry pi, Different Versions of Raspberry pi, Vision of Raspberry pi, Different components of the Board.

Core Books:

1. Arshdeep Bahga, Vijay Madisetti: Internet of Things: A Hands-On Approach, VPT Publication, 2014.
2. Dr. Simon Monk: Programming the Raspberry Pi: Getting Started with Python, McGraw Hill Publication

Reference Books:

1. M. Richardson, S. Wallace: Getting Started with Raspberry Pi, O'Reilly, 2012
2. Dr. Simon Monk: Programming the Raspberry Pi: Getting Started with Python, McGraw Hill Publication

Web References:

1. <https://www.tutorialspoint.com/arduino/index.htm> [Arduino Fundamentals]
2. www.tinkercad.com [Arduino Simulator]
3. <https://www.youtube.com/watch?v=UUOCh0Cby8> [Raspberry Pi - How to start programming with Python]
4. <https://www.raspberrypi.org/documentation/usage/python/> [Step by Step Programming]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Ability to understand IOT Terminology
CO2 :	Understanding IOT Programming
CO3 :	Understanding use of sensors and actuators
CO4 :	Learning Mobile app for IOT Projects
CO5 :	Designing IOT projects using ESP8266 and ESP32 and Raspberry PI

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Internet of Things	√				
2	Programming Internet of Things System		√			
3	Sensors and Actuators for Internet of Things System			√		
4	Designing Mobile Application and Webpage for Internet of Things System				√	
5	ESP8266 and ESP32 Microcontroller for IOT					√
6	Raspberry Pi for IOT Projects					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	3	1	1	1	1	1	1	-	1	-	-
CO2	3	1	2	3	1	1	1	2	2	-	-	1	1	-
CO3	2	2	2	1	1	1	2	2	2	-	-	2	1	1
CO4	2	2	3	2	1	2	2	2	2	-	-	2	1	1
CO5	1	2	3	2	1	2	3	2	2	-	-	2	1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC605 - Software Quality Assurance (200 marks)

Contact Hours: 06

Pre-requisite: None

Methodology & Pedagogy: The theory sessions will cover the concept of software testing that can be applied to achieve quality of software. The practical sessions will cover the application of testing techniques at various levels of software development using manual and automated testing tools.

Outline of the Course:

Unit No.	Title of the Unit	Minimum Numbers of Hours	
		Theory	Practical
1	Introduction to software quality and testing process	06	36
2	Unit level testing	06	
3	Integration testing	06	
4	System Test Design, Planning & Automation	07	
5	System Test Execution & Acceptance Testing	06	
6	Software Quality Assurance	05	

Total Hours (Theory): 36

Total Hours(Lab): 36

Total Hours: 72

Detailed Syllabus:

Unit - I: Introduction to software quality and testing process Hours: 06

Concept of Software Quality, Role of testing, Design test case: Stateless and State oriented test cases sources of Information for Test Case Selection, verification and validation, types of software testing, smoke testing, sanity testing, regression testing, re-testing, performance testing, security testing, compatibility testing, recovery testing, brief outline of levels of testing.

Unit - II: Unit level testing Hours: 06

White box testing methods, concept of unit level testing, Introduction to Test case design techniques, Static Techniques: Informal Reviews, Walkthroughs, Technical Reviews, Inspection. Introduction to Dynamic Techniques. Control flow testing: Statement Coverage Testing, Branch Coverage Testing, Path Coverage Testing, Conditional Coverage Testing, Finite state machine(FSM) : Handling events and state transitions, Guard conditions, activities state, types of states, test coverage criteria.

Unit - III: Integration testing Hours: 06

Concept of Integration Testing, System Integration Techniques, Software and Hardware Integration, Test Plan for System Integration, Off-the-Shelf Component Integration, System level testing, types of system level tests, Black box testing methods: Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Random Testing, Error Guessing, Category Partition.

Unit - IV: System Test Design, Planning & Automation Hours: 07

Test Design Factors, Requirement Identification, Characteristics of Testable Requirements, Test Design Preparedness Metrics, Test Case Design Effectiveness Structure of a System Test Plan, Introduction and Feature Description, Assumptions, Test Approach, Test Suite Structure, Test Environment, Test Execution Strategy, Test Effort Estimation, Scheduling and Test Milestones, System Test Automation, Evaluation and Selection of Test Automation Tools, Test Selection Guidelines for Automation, Characteristics of Automated Test Cases, Structure of an Automated Test Case, Test Automation Infrastructure, , Entry criteria and exit criteria for system test plan , design in software testing life cycle.

Unit - V: System Test Execution & Acceptance Testing Hours: 06

Preparedness to Start System Testing, Metrics for Tracking System Test, Metrics for Monitoring Test Execution, Beta Testing, First Customer Shipment, System Test Report, Product Sustaining, Measuring Test Effectiveness. Types of Acceptance Testing, Acceptance Criteria, Selection of Acceptance Criteria, Acceptance Test Plan, Acceptance Test Execution, Acceptance Test Report, Acceptance Testing in extreme Programming, Entry criteria and exit criteria for system test execution and test closure in software testing life cycle.

Unit - VI: Software Quality Assurance Hours: 05

Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, Quality Characteristics, Software Quality ISO Standards. Elements of Software Quality Assurance, SQA Task, Goals and Metrics, Formal approaches to SQA, Statistical Software Quality Assurance, Software Reliability, SQA Plan.

Core Books:

1. Sagar Naik, Piyu Tripathy: Software Testing and Quality Assurance, Theory and Practice, Wiley, 2008.
2. Roger S Pressman: Software Engineering – A Practitioner's Approach, 7th Edition, McGRAW HILL International Edition, 2010.
3. Lee Copeland: A Practitioner's Guide to Software Test Design, Artech House Publishers, 2004.

Reference Books:

1. Boris Beizer: Software Testing Techniques: 2nd Edition, Van Nostrand Reinhold, 1990.
2. Daniel Galin: Software Quality Assurance, Pearson Education.
3. Ron Patton: Software Testing, Pearson Education, 2001.

Web References:

1. <https://www.geeksforgeeks.org/software-engineering-white-box-testing/?ref=lbp> [Introduction to Software Testing]
2. <https://www.javatpoint.com/software-development-life-cycle> [Software Development Life Cycle]
3. <https://www.cs.cmu.edu.tw/~naiwei/cs5812/st7.pdf> [Finite State Machine Testing]

Course Outcomes: Upon successful completion of the course, students will be

CO1 :	Able to understand basic concepts of software quality and testing
CO2 :	Familiar with concept of unit testing and methods of white box testing
CO3 :	Able to apply black box testing methods
CO4 :	Familiar with different concepts of software testing techniques
CO5 :	Able to understand various standards of quality

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to software quality and testing process	√				
2	Unit level testing		√			
3	Integration testing			√		
4	System Test Design, Planning & Automation				√	
5	System Test Execution & Acceptance Testing				√	
6	Software Quality Assurance					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	3	3	2	2	2	1	2	3	3
CO2	3	2	2	2	2	3	3	3	3	2	3	2	3	3
CO3	2	2	3	2	2	2	2	2	2	3	1	2	2	2
CO4	3	3	3	2	3	3	3	1	3	3	3	2	2	1
CO5	3	2	3	2	1	3	2	2	2	2	2	1	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC606 - Mini Project

(400 Marks)

Contact Hours: 12

Objective:

The main objective of this mini project is to let the students apply the programming knowledge to a real-world situation/problem and exposed the students with specific programming skills and help in developing a working model in terms of application.

Course Outcomes:

C01:	Student will understand the implementation of concepts of SDLC and Software Engineering.
C02:	The programming concepts they learn during their academics; it will be converted into the actual implementations.
C03:	Students will be exposed to understand the requirement of proposed software and implement these requirements in terms of programming logic and methods.
C04:	Students must understand the difference between a program and professional application/product/software.
C05:	Students will learn different categories of applications like Desktop application, Web applications, etc.

Guidelines:

Mini Project is in house project development. Every student is required to carry out Mini Project work under the supervision of a guide provided by the placement Coordinator. The guide shall monitor progress of the student continuously. A candidate is required to present the progress of the Mini Project work during the semester as per the schedule provided by the placement Coordinator.

Mini Project proposal should be prepared in consultation with project guide. It should clearly state the objectives and environment of proposed Mini Project to be undertaken. Project documentation must be with the respect to the project only. Project report should strictly follow the points suggested in format of project report. Placement coordinator will provide the format of project report. Student has to submit one copy of Mini Project to the institute. Each Student is required to make a copy of Mini Project in CD and submit along with Mini Project report.

Evaluation:

The project must be evaluated in two aspects:

a. Internal (100 Marks):

- i.Reporting to internal project guide
- ii.Incorporation of suggestions by project guide
- iii.Internal Project viva examination

b. External (300 Marks):

- i.Project Report Preparation & Evaluation
- ii.External Project Viva Examination

Course Code	Course Title	Teaching Scheme		Internal	End Semester Examination		Total
		Contact Hours	Credit		Continuous Evaluation	Report	
CAUC606	Mini Project	12	12	100	100	200	400

Web References:

1. <http://techwhirl.com/writing-software-requirements-specifications/> [For effective SRS]
2. http://www.ibm.com/developerworks/websphere/library/techarticles/0306_perks/perks2.html [For best practices of Software Project Development]
3. http://www.uacg.bg/filebank/acadstaff/userfiles/publ_bg_397_SDPActivities_and_steps.pdf [Requirement analysis guidelines]
4. <http://www.cs.wustl.edu/~schmidt/PDF/design-principles4.pdf> [Software Design Principles and Guidelines]
5. <http://www.cse.hcmut.edu.vn/~hiep/KiemthuPhanmem/Tailieuthamkhoa/Effective%20Software%20Testing%20specific%20ways%20to%20improve%20your%20testing.pdf> [For Effective Software Testing]
6. http://www.cs.uics.edu/~jbell/CourseNotes/00_SoftwareEngineering/SE_Project_Report_Template.pdf [For guidelines to prepare software project report]

Course Articulation Matrix:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02
CO1	3	3	3	2	3	3	3	3	3	2	2	2	3	2
CO2	3	3	3	2	3	3	3	3	3	2	2	2	3	2
CO3	3	3	3	2	3	3	3	3	3	2	2	2	3	2
CO4	3	3	3	2	3	3	3	3	3	2	2	2	3	2
CO5	3	3	3	2	3	3	3	3	3	2	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation

CAUC607 - Green Computing (100 Marks)

Contact Hours: 02

Pre-requisite: None

Methodology & Pedagogy: During practical sessions, the basic concepts regarding green computing, green framework and green compliance will be discussed. The core concepts towards green computing will be covered so that students can analyze and understand various aspects related with green computing.

Outline of the course:

Week No	Practical	Description
1 - 2	Carbon footprint of Green Computing	<ul style="list-style-type: none">• Analysis and survey about the carbon footprint of campus.• Measuring the carbon footprint, a small MIDC Company.• Carbon footprint for FMCG companies• CORPORATE CARBON FOOTPRINT AND CARBON NEUTRALITY.• Measures to reduce carbon footprint
3 - 4	Energy Conservation in Green Computing	<ul style="list-style-type: none">• Study on Green Assets (Buildings, Data Centers, Networks, and Devices, Green Information Systems) Design and Development Models.• Plan to Cut Down Your Electricity Bill• Measuring and monitoring use of Power in XXX Company.

		<ul style="list-style-type: none"> • A survey of steps taken to be energy efficient by Malls / Shopping centers • Energy Efficient cooling solutions for homes and offices • Electricity Smart Grids and smart energy systems
5 - 6	Recycling in Green Computing	<ul style="list-style-type: none"> • Recycling of IT waste in Colleges • Recycling vs Reuse • Recycling initiatives taken up by XXX Housing Society: A Case Study • Damage caused by improper recycling of e-waste in developing countries like India or China
7 - 8	Going Paperless and Datacenters in Green Computing	<ul style="list-style-type: none"> • A Case study of a traditional company going paperless with the use of Electronic media • Going paperless in Government Departments • Challenges in going paperless in Indian Context • Economic benefits of going Paperless • Survey of best energy-efficient practices in data centers around the world • Designing a datacentre with use of green technology. • Design considerations of datacentres for efficient cooling • Impact of Datacenters on the environment.

9-10	Review of Green Initiatives in India and abroad	<ul style="list-style-type: none"> • Submitting a small research study on National Mission for a Green India (GIM). • Submitting a small research study on Indian Green Building Council (IGBC). • Submitting a small research study on The Indian Council of Agricultural Research. • Submitting a small research study on LEED INDIA. • Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal. • Initiatives taken by Europe to reduce the toxic effect of e-waste on environment <ul style="list-style-type: none"> • E-waste management rules implemented by Ministry of Electronics & Information Technology by Government of India.
11-12	Creating Prototype model	<ul style="list-style-type: none"> • Build a prototype/Working model of a wind turbine at home. • Build a prototype/Working model of a simple solar equipment's. • Build a prototype/Working model of Water Purification System. • Rain water harvesting model preparation. • Creating greywater recycling system. Paper bag making and distributing.

Total Hours (Practical): 24
Total Hours:24

Core Books:

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

Reference Books:

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

Web References:

1. <https://dataconomy.com/2022/06/what-is-green-computing-definition/>
2. <https://www.techrockstars.com/the-essential-guide/what-is-green-computing/>
3. <https://www.smallbusinesscomputing.com/guides/green-computing/>

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Can understand the fundamentals and Carbon footprint of Green Computing
CO2 :	Can analyze and understand Green assets and its importance
CO3 :	Can analyze the Green computing Grid Framework.
CO4 :	Can understand the issues related with Green compliance.
CO5 :	Can study and develop various applications and case studies.

Course Outcomes Mapping:

Week No.	Practical Title	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1-2	Green IT Fundamentals and Carbon footprint of Green Computing	√				

3-4	Green Assets and Energy Conservation in Green Computing		√			
5-6	Recycling and conservation		√			
7-8	Going Paperless and Datacenters, Green computing frameworks			√		
9-10	Review of Green Initiatives in India and abroad				√	
11-12	Green Modeling, prototype and applications					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	1
CO2	-	2	-	-	-	2	-	-	-	-	2	-	2	2
CO3	-	2	2	2	-	2	2	-	-	2	2	-	-	2
CO4	-	-	-	-	2	3	-	-	-	-	-	-	-	2
CO5	-	-	-	-	-	1	-	-	1	1	2	-	-	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

TEACHING SCHEME & DETAILED SYLLABUS

FOR

**MCA PROGRAMME
(Semester-IV)**

EFFECTIVE FROM

Teaching & Examination Scheme
Master of Computer Applications (M.C.A.) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25
Semester-IV

Course Code	Course Title	Teaching Scheme			Credit	Termwork Continuous Evaluation	End Semester Examination		Total			
		Contact Hours					Report	Presentation & Viva				
		Inst.	Industry	Total								
CAUC60 8	Dissertation / Project Work	2	28	30	30	400	200	200	800			

CAUC608 – Dissertation / Project Work

(800 Marks)

Contact Hours: 30

Objective:

The main objective of this Dissertation is to let the students apply the programming knowledge to a real-world situation/problem and exposed the students with specific programming skills and help in developing a working model in terms of application.

Course Outcomes:

CO1:	Student will understand the implementation of concepts of SDLC and Software Engineering.
CO2:	The programming concepts they learn during their academics; it will be converted in to the actual implementations.
CO3:	Students will be exposed to understand the requirement of proposed software and implement these requirements in terms of programming logic and methods.
CO4:	Students must understand the difference between a program and professional application/product/software.
CO5:	Students will learn different categories of applications like Desktop application, Web applications, etc.

Guidelines:

Dissertation is in house project development. Every student is required to carry out Dissertation work under the supervision of a guide provided by the placement Coordinator. The guide shall monitor progress of the student continuously. A candidate is required to present the progress of the Dissertation work during the semester as per the schedule provided by the placement Coordinator.

Dissertation proposal should be prepared in consultation with project guide. It should clearly state the objectives and environment of proposed Dissertation to be undertaken. Project documentation must be with the respect to the project only. Project report should strictly follow the points suggested in format of project report. Placement coordinator will provide the format of project report. Student has to submit one copy of Dissertation to the institute. Each Student is required to make a copy of Dissertation in CD and submit along with Dissertation report.

Evaluation:

The project must be evaluated in two aspects:

a. Internal (200 Marks):

- i.Reporting to internal project guide
- ii.Incorporation of suggestions by project guide
- iii.Internal Project viva examination

b. External (600 Marks):

- i.Project Report Preparation & Evaluation
- ii.External Project Viva Examination

Course Code	Course Title	Teaching Scheme		Internal	End Semester Examination		Total
		Contact Hours	Credit		Continuous Evaluation	Report	
CAUC608	Dissertation / Project	30	30	200	200	400	800

Web References:

1. <http://techwhirl.com/writing-software-requirements-specifications/> [For effective SRS]
2. http://www.ibm.com/developerworks/websphere/library/techarticles/0306_perks/perks2.html [For best practices of Software Project Development]
3. http://www.uacg.bg/filebank/acadstaff/userfiles/publ_bg_397_SDP_activities_and_steps.pdf [Requirement analysis guidelines]
4. <http://www.cs.wustl.edu/~schmidt/PDF/design-principles4.pdf> [Software Design Principles and Guidelines]
5. <http://www.cse.hcmut.edu.vn/~hiep/KiemthuPhanmem/Tailieuthamkhoa/Effective%20Software%20Testing%202050%20specific%20ways%20to%20improve%20your%20testing.pdf> [ForEffective Software Testing]
6. http://www.cs.uics.edu/~jbell/CourseNotes/00_SoftwareEngineering/SE_Project_Report_Template.pdf [For guidelines to prepare software project report]

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	3	3	3	2	2	2	3	2	-
CO2	3	3	3	2	3	3	3	3	3	2	2	2	3	2	-
CO3	3	3	3	2	3	3	3	3	3	2	2	2	3	2	-
CO4	3	3	3	2	3	3	3	3	3	2	2	2	3	2	-
CO5	3	3	3	2	3	3	3	3	3	2	2	2	3	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY, CHANGA															
Smt. Chandaben Mohanbai Patel Institute of Computer Applications															
FACULTY OF COMPUTER SCIENCE AND APPLICATIONS															
BCA, B Sc(IT), MCA, M Sc (IT) Programmes (ODD Semester)															
Academic Calendar (2024-2025)															
Week No	Month	M	T	W	T	F	S	S	Activity						
1	June	<u>24</u>	25	26	27	28	29	30	Commencement of New Academic Sessions of BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT-III Bridge Course for BCA-I, B.Sc.IT-I (Online Mode)						
2	July-August	<u>1</u>	2	3	4	5	6	7	Teaching Bridge Course for MCA-I, M.Sc.IT-I (Online Mode) Commencement Celebration for BCA-I, B.Sc.IT-I (Offline Mode)						
3		<u>8</u>	9	10	11	12	<u>13</u>	<u>14</u>	Teaching Bridge Course for MCA-I, M.Sc.IT-I(Online Mode) Commencement of Acedemic sessions for BCA-I, B.Sc.IT-I						
4		<u>15</u>	16	<u>17</u>	18	19	20	<u>21</u>	Teaching Commencement Celebration for MCA-I, M.Sc.IT-I(Offline Mode) Muharram						
5		22	23	24	25	26	<u>27</u>	<u>28</u>	Teaching Commencement of Acedemic sessions for MCA-I, M.Sc.IT-I	Expert Session					
6		29	30	<u>31</u>	1	2	3	<u>4</u>	Teaching	Expert Session					
7	August-September	5	<u>6</u>	<u>7</u>	8	<u>9</u>	10	<u>11</u>	Teaching	Workshop on Current Trends	Aarohan Club Activity				
8		<u>12</u>	13	14	<u>15</u>	16	17	<u>18</u>	Teaching	Independence Day	Vastuvit Club Activity				
9		<u>19</u>	20	21	22	<u>23</u>	<u>24</u>	<u>25</u>	Teaching	(Online Mode)	Rakshabandhan	Samarpan Club Activity			
10		<u>26</u>	27	<u>28</u>	29	30	31	<u>1</u>	Teaching	Janmashtami	Samvardhan Club Activity				
11		<u>2</u>	3	4	5	6	<u>7</u>	<u>8</u>	Teaching	Industrial Visit Samvatsari(Ganesh Chaturthi)					
12	September-October	9	<u>10</u>	11	12	<u>13</u>	<u>14</u>	<u>15</u>	Teaching	Expert Session	Tarkmanthan Club Activity				
13		16	17	<u>18</u>	19	<u>20</u>	21	<u>22</u>	Teaching	Expert Session	Vignatma Club Activity				
14		<u>23</u>	24	25	26	27	<u>28</u>	<u>29</u>	Teaching	Aavishkar Club Activity					
15		30	1	<u>2</u>	3	4	5	<u>6</u>	Teaching	Gandhi Jyanti					
16		7	<u>8</u>	<u>9</u>	10	11	<u>12</u>	<u>13</u>	Teaching	Workshop on Current Trends					
17	October-November	<u>14</u>	15	16	17	18	19	<u>20</u>	Teaching	Sessional Examination (BCA-III,V, B.Sc.IT-III,V,MCA-III,M.Sc.IT-III)					
18		<u>21</u>	<u>22</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	DIWALI VACATION						
19		<u>28</u>	<u>29</u>	<u>30</u>	<u>31</u>	<u>1</u>	<u>2</u>	<u>3</u>							
20		<u>4</u>	<u>5</u>	<u>6</u>	7	8	<u>9</u>	<u>10</u>	Teaching (Online Mode)	University Practical Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT- III)					
21	November - December	<u>11</u>	12	13	14	<u>15</u>	16	<u>17</u>	Teaching MCA-I, M.Sc.IT-I	University Practical Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT- III) (Continue) Sessional Examination(BCA-I, B.Sc.IT-I) Guru Nanak Jayanti					
22		18	19	20	21	22	<u>23</u>	<u>24</u>	Teaching MCA-I, M.Sc.IT-I	University Theory Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT- III) Sessional Examination(BCA-I, B.Sc.IT-I)					
23		<u>25</u>	26	27	28	29	30	<u>1</u>	University Theory Examination (BCA-III,V,B.Sc.IT-III,V, M.Sc.IT-III, MCA-III) (Continue) University Practical Examination(BCA-I,B.Sc.IT-I)						
24		<u>2</u>	3	4	5	6	7	<u>8</u>	Sessional Examination(MCA-I, M.Sc.IT-I)						

25	December	9	10	11	12	13	14	15	University Practical Examination(MCA-I,M.Sc.IT-I) University Theory Examination (BCA-I, B.Sc.IT-I) (Continue) icSoftComp2024 International Conference Remedial Examination of BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT-III
26		16	17	18	19	20	21	22	University Theory Examination(MCA-I,M.Sc.IT-I) Teaching Commencement of New Academic Sessions of BCA-IV,VI, B.Sc.IT-IV,VI, MCA-IV,M.Sc.IT-IV Remedial Examination for BCA-III,V, B.Sc.IT-III,B.Sc.IT-V, MCA-III and M.Sc.IT-III (Continue) AGNITIO
27		23	24	25	26	27	28	29	University Theory Examination(MCA-I,M.Sc.IT-I) Christsmas Teaching Commencement of New Academic Sessions of BCA-II, B.Sc.IT-II Remedial Examination for BCA-I, B.Sc.IT-I
28	December-January	30	31	1	2	3	4	5	Commencement of New Academic Sessions of MCA-II,M.Sc.IT-II Teaching Remedial Examination for BCA-I, B.Sc.IT-I (Continue)

SECTION - 2

VARIOUS ADMINISTRATIVE PROCESS

Payment of tuition fees or other charges

Step : 1

- Visit University web-portal click on Pay Fees :
<https://www.charusat.ac.in/student-corner> or visit
<https://charusat.edu.in:912/FeesPaymentApp/>

Step : 2

- Enter your Student ID and Pay your Fees

Step : 3

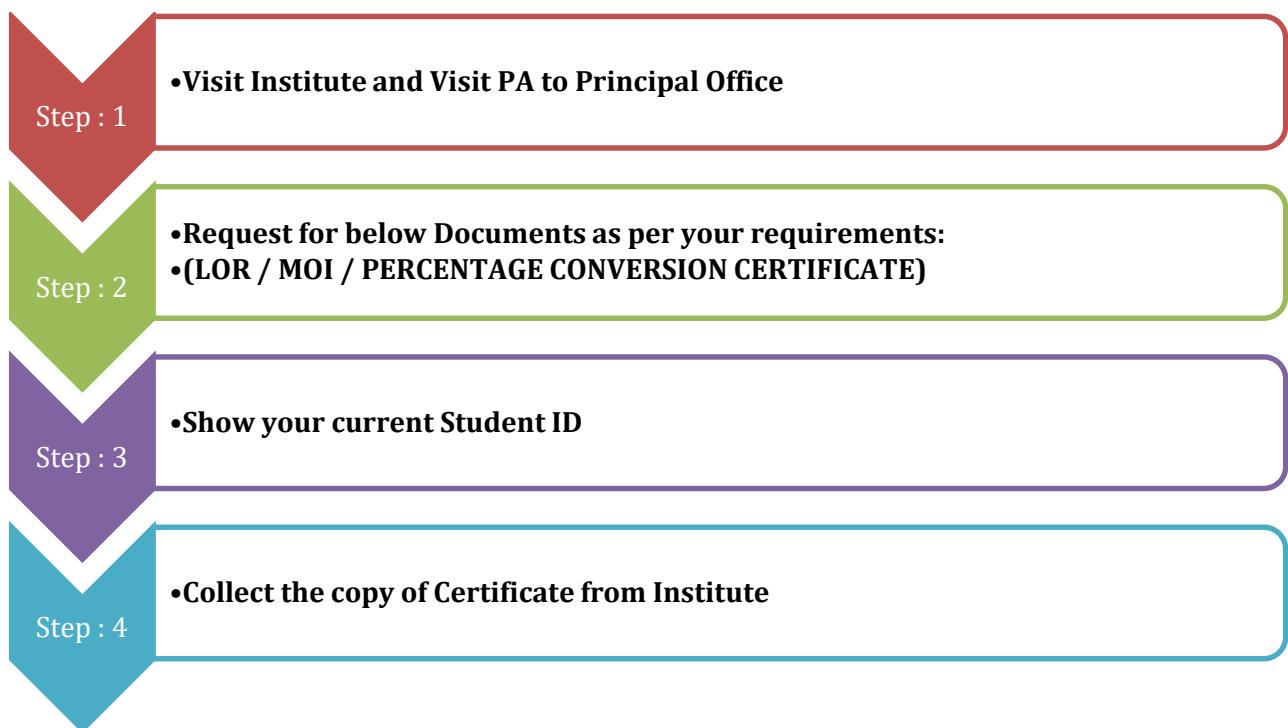
- After Successfull payment download your fees receipt

Process of Acquiring WIFI Access

To access the Wi-Fi on the Charotar University of Science and Technology (CHARUSAT) campus, students can use the following:

- **Wi-Fi enabled campus:** The entire CHARUSAT campus is Wi-Fi enabled.
- **Computers with internet:** All computers on campus have internet access.
- **Dedicated bandwidth:** Students are given a large bandwidth for internet surfing.
- **Ring connectivity:** The campus has ring connectivity to provide uninterrupted network access.

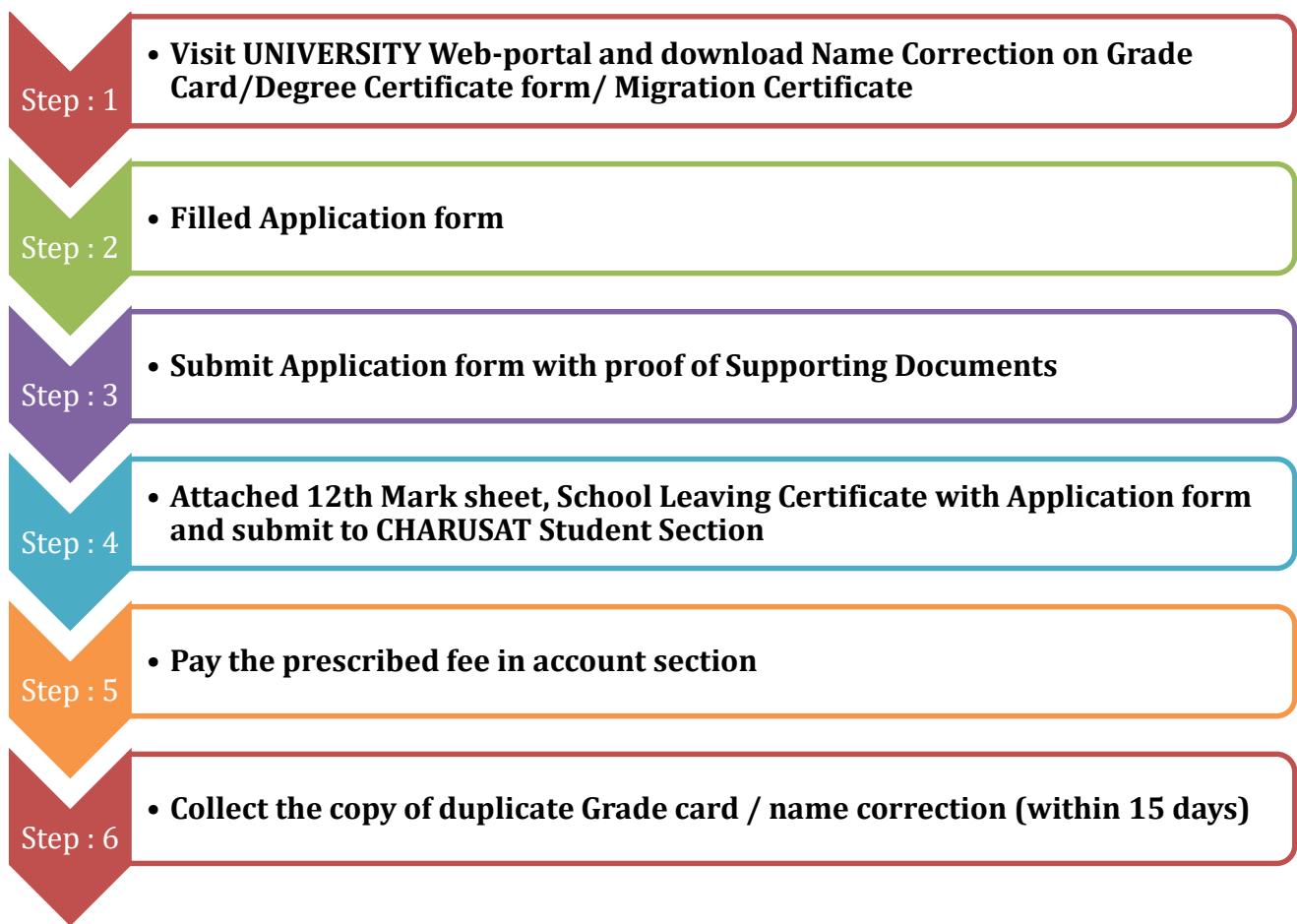
Process to obtain required Certificate from the institute



Process to obtain required Certificate from the University

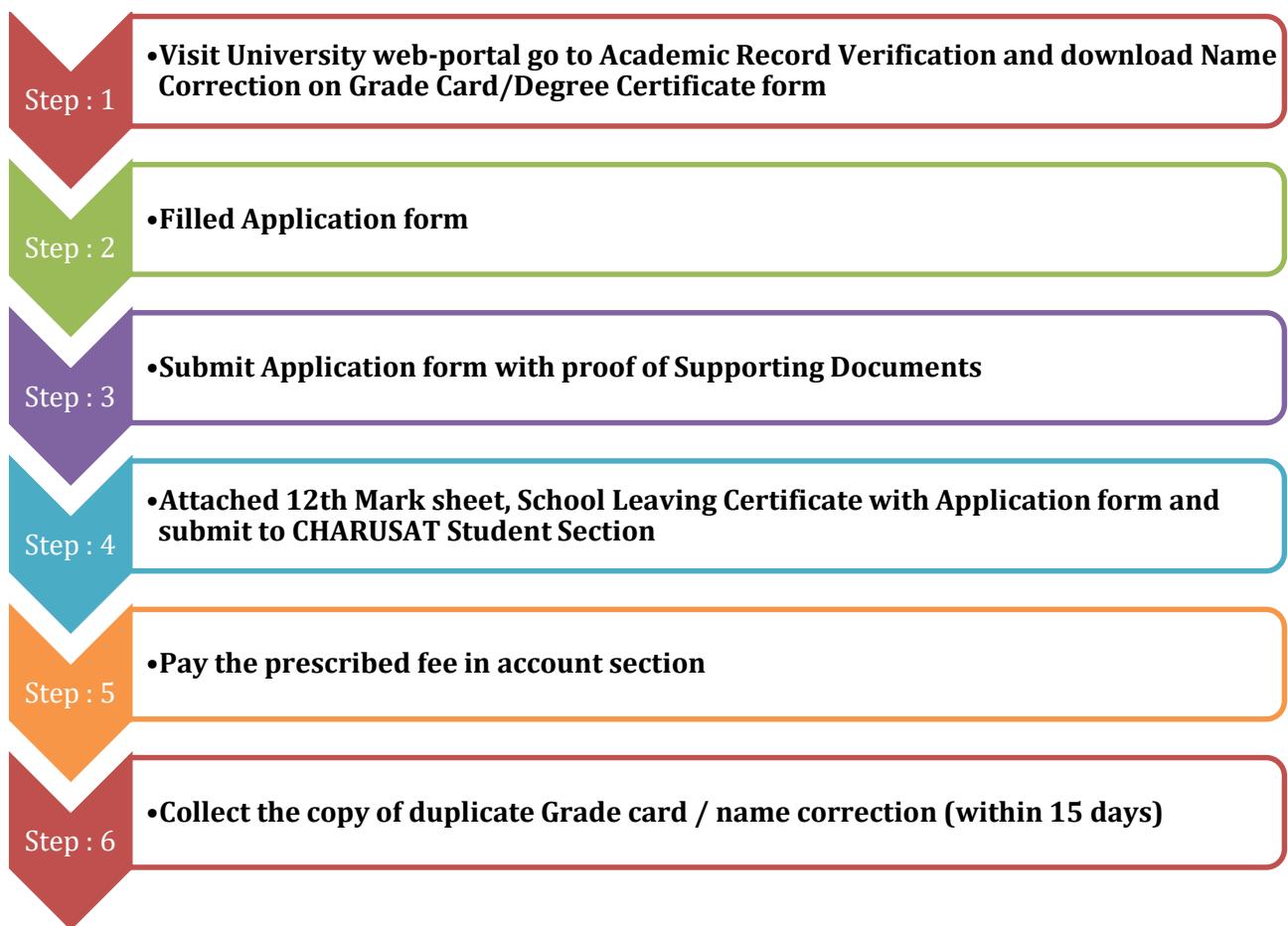
In order to obtain the required certificate at the University Level, students need to visit the Student Corner of the CHARUSAT University website. They can choose to apply online or offline and should ensure to include all necessary enclosures with their application. The application must be submitted to the Student Section of the University and should be duly attested by the relevant institute's HoD/ Principal/ Dean. Once all the necessary procedures are completed, the certificate will be issued at the University office.

Process to obtain Duplicate Grade Card/ Name correction in Grade Card/ Migration certificate

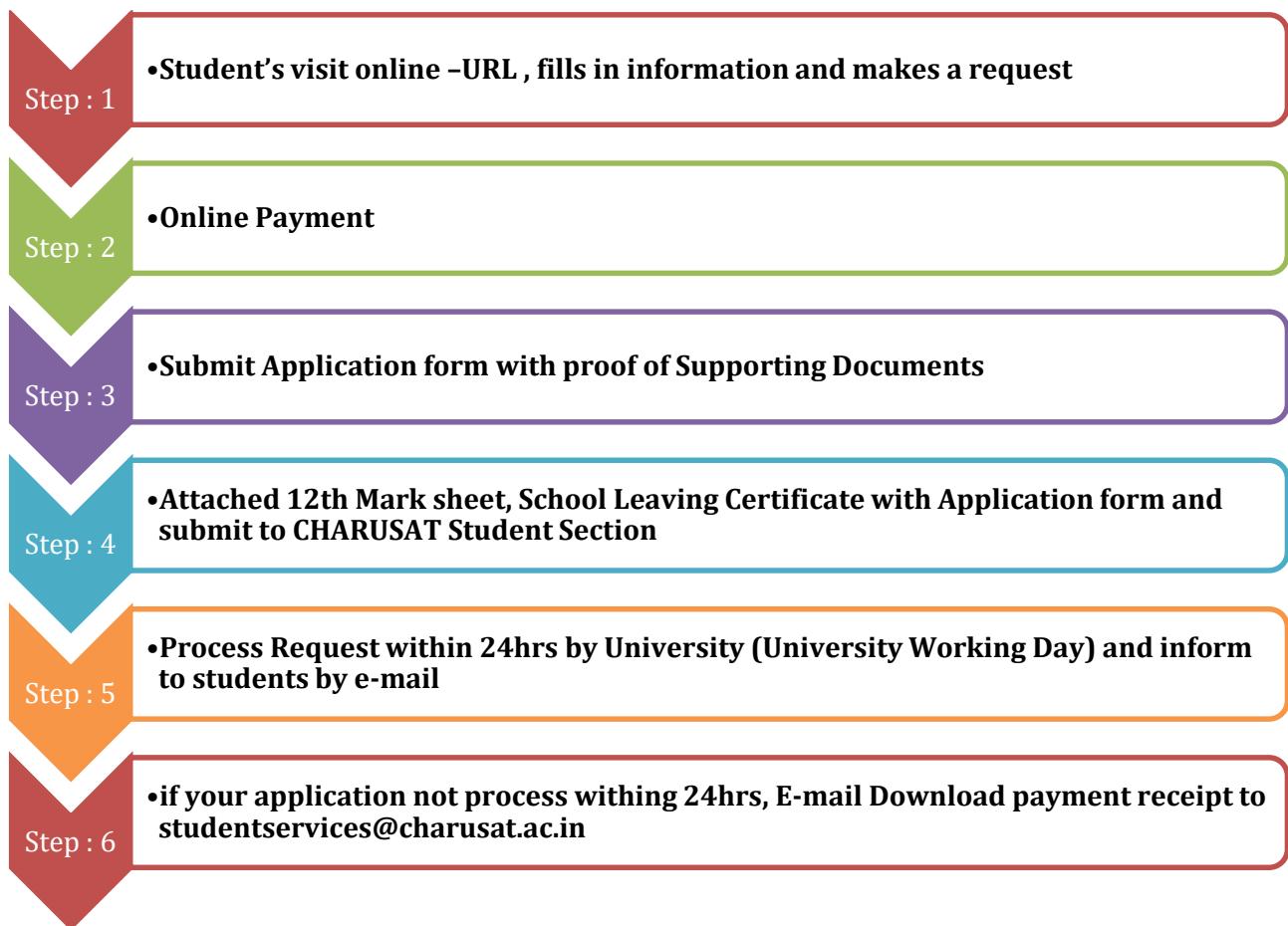


Initiator	Task
Student	Online Application Request through CHARUSAT Web Portal https://www.charusat.ac.in/student-corner Select Transcript / Duplicate Grade Card / Migration Certificate Select Document Type Migration Certificate Transcript/E-Transcript / WES Duplicate Grade Card Enter CHARUSAT Student ID Make Online Payment
Student	Pay fees at online Download Payment Receipt (for further Communication)
University Admin Office	University will get request after successful Payment (Time is depend on clearing of payment) Entire process time duration: 24hrs after payment done

Process for Academic Document Verification by External Agency



Work flow



SECTION – 3

UNDERTAKINGS AND DECLARATIONS

UNDERTAKING
(Observing Rules and Regulations of the University)

Roll No. _____

I, _____ Mr. /Ms. son/daughter of _____ have secured admission at the Smt. Chandaben Mohanbai Patel Institute of Computer Applications of CHARUSAT University in the academic year for the _____ Programme. We hereby confirm that we have gone through the academic rules and regulations of the Institute very carefully and we assure you that we will abide by the same.

Student Signature : _____

Name of the Parent/Guardian : 1. _____
2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

DECLARATION
(Code of Conducts and Disciplinary Rules)

I bearing roll no. admitted in (programme) of the Institute of....., CHARUSAT University, Changa do hereby declare and undertake that I will abide by the Code of Conduct, including rules for misconduct/indiscipline by the students, provisions like dress code on the campus, rules for maintaining vehicles on the campus, public display of affection (PDA), etiquette on the campus etc.

I will abide by all the rules and regulations as and when intimated by the university and if I am found violating any rules then, I shall be subjected to the major/minor penalties as may deemed fit by the university.

Signature : _____

Name of the Parent/Guardian : 1. _____
2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

UNDERTAKING
(Observing Rules & Regulations of the Examination)

I, Roll No..... studying in the First year of programme at Institute of, CHARUSAT University, Changad do hereby undertake that I have read and understood all the Rules & Regulations related to Academic Dishonesty at examinations/tests/assignments and punishment in case of using unfair means, I have also gone through the Academic Regulations related to Granting of Term and Cancellation of admission, and I shall observe, follow and abide by all these rules and regulations.

I shall abide by all the rules and regulations and if I am found violating any rules then, I shall be subjected to the necessary action/penalties as per provision of rules/regulations of the university.

Signature : _____

Name : _____

Address : _____

Signature of the Parent/Guardian : 1. _____ 2. _____

UNDERTAKING
(To Refrain from Consumption of Drugs and Alcohol)

I, _____ bearing Roll No._____ admitted in _____ (programme) at Institute of _____ do hereby declare and undertake that I will refrain myself from possession / consumption of Drugs and Alcohol.

I know that the use/possession of narcotics drugs and alcohol is a punishable offence under the law of the Government of Gujarat and if I am found guilty of using such thing/s, then it will amount to a criminal offence and I am liable for the appropriate penalty as per laws and also liable to cancel my admission from the university.

I hereby give an undertaking to the Institute that I will refrain myself from possession or consumption of Drugs and Alcohol in and around the campus.

Date :

Place :

Signature of Student

I undertake that I will take utmost care to see that my ward does not get involved in any such incident.

Name of the Parent/Guardian : 1. _____

2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

Address of Parent/ Guardian :

Contact no of Parent/ Guardian : 1. _____ 2. _____

4. IMPORTANT CONTACTS

+91-02697-265011 (Last 4 digits: Extension number)

Name and Designation	Extension number & Email-id
Dr. Sanskruti Patel Dean - Faculty of Computer Application	5243 Dean.fca@charusat.ac.in
Dr. Dharmendra Patel Principal	5241 Principal.cmpica@charusat.ac.in
Mr. Harikrushna Patel P.A to Principal	5242 Haripatel.mba@charusat.ac.in
Mr. Suresh Patel Librarian	5255 sureshsolanki.mca@charusat.ac.in
Mr. Harikrushna Patel Student Section	5242 Haripatel.mba@charusat.ac.in
Shri Mukesh Yadav Dy. Registrar, Academic Section	5008 dipenpatel.rnd@charusat.ac.in
Shri Bhavdip Patel Dy. Accounts Officer, Accounts Section	5024 bhavdippatel.acc@charusat.ac.in
Dr. Abhilash Shukla Examination Section	8222 abhilashshukla.mca@charusat.ac.in
Dr. Ritesh Patel Coordinator, E-governance	5251 coordinator.egov@charusat.ac.in
Shri Ritesh Bhatt WIN Cell Coordinator	5106 riteshbhatt.win@charusat.ac.in
Mr. Sujal Dadhaniya Corporate Development & Placement Cell	5213 tpo@charusat.ac.in,tnp@charusat.ac.in
Dr. Dilip Gosai Head, Charusat Rural Education Development Programme	5160 head.credp@charusat.ac.in
Dr. Gayatri Dave Chairperson, Women Development Cell	5192 gayatridave.bt@charusat.ac.in
Dr. Mrunali Patel Chairperson, Internal Complaint Committee	5163 chairperson.icc@charusat.ac.in
Dr. Vijay Panchal Head, Equal Opportunity Cell	5081 vijaypanchal.cv@charusat.ac.in
Mr. Kautilya Pandya, Member-Secretary Student Grievance Redressal Cell	5112 kautilpandya.adm@charusat.ac.in
Dr. Vijaykumar Chaudhary Convenor, Anti-ragging Cell	5221 / vijaychaudhary.me@charusat.ac.in



CHARUSAT[®]
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

STUDENT INFORMATION BOOKLET

VOLUME – 2:

Master of Science in Information Technology

Smt. Chandaben Mohanbhai Patel Institute of
Computer Applications

CHARUSAT UNIVERSITY
Off. Nadiad-Petlad Highway, Changa - 388 421
Anand, Gujarat, India

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PREAMBLE

The Handbook (Student's Information Booklet) for Students, printed in two volumes contain General Information Respectively about the CHARUSAT University anddetailed information about Smt. Chandaben Mohanbhai Patel Institute of Computer Applications.

Handbook Volume-I contains information about general rules to be followed by the students on campus. It gives information about the general facilities and support available for the students on campus. It gives insight about the discipline and conduct rules of the University.

This Handbook (Student's Information Booklet) is for the purpose of providing information to the students about the University and its programmes and is not a Regulation book of the University. Hence, no claim can be made based on the information given in the book.

The University / Institute reserves the right to amend the rules and regulations mentioned in the Handbook without any prior notice. The decision of the University shall be final on all matters. For any clarification, the Student Section may be contacted.Handbook Volume-II (Student's Information Booklet) contains academic information about the Institute, which includes the Academic Rules and Regulations regarding academic requirements and academic conduct of the students at the University including different policies and forms. Besides, it includes important information on registration, grading system, academic standards, attendance norms, discipline and the like. The students shall abide by these rules and shall, at all times, conduct in a manner so as to bring credit to the University and enhance its prestige in the society.

It is prime responsibility of the students to get familiar (themselves) with the rules and regulations.

ABOUT INSTITUTE

Smt. Chandaben Mohanbhai Patel Institute of Computer Applications (CMPICA) is a constituent institute of CHARUSAT. It is offering a MCA, M.Sc. (IT), BCA, B.Sc.(IT), Online BCA, Online MCA and Ph. D. programmes. The vision of the institute is to become one of the leading institutions in the country by imparting state-of-the-art education to the students in the field of computer applications and by contributing in the nation's efforts of computerizing public systems for the benefit of the masses. It is committed to excel in both teaching and research. Institute is reacting rapidly to the changing technological landscape by adapting quickly. The Institute is also committed to adapt industry practices.

The institute has received numerous prestigious awards from various organizations, including AICTE, the Government of India, and the Government of Gujarat. Additionally, it has been awarded a five-star rating in the Gujarat State Institutional Rating Framework (GSIRF) by the Government of Gujarat.

ACADEMIC REGULATIONS

&

SYLLABUS 2024 -25

Faculty of Computer Science & Applications

**Smt. Chandaben Mohanbhai Patel Institute of
Computer Applications**

**Master of Science in Information Technology M.Sc.(IT)
Programme**

(as per CHOICE BASED CREDIT SYSTEM- (CBCS))



Charotar University of Science and Technology (CHARUSAT)
CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad, District: Anand
Phone: 02697-247500, Fax: 02697-247100, Email: info@charusat.ac.in
www.charusat.ac.in

ACADEMIC RULES

To ensure uniform system of education, duration of post graduate programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

1. System of Education

The Semester system of education should be followed across the Charotar University of Science and Technology (CHARUSAT) at Master's levels. Each semester will be at least 90 working days duration. Every enrolled student will be required to take a specified load of course work in the chosen course of specialization and also complete a project/dissertation if any.

2. Duration of Programme

Postgraduate Programme	Master of Science in Information Technology M.Sc.(IT)
Minimum	4 Semesters (2 Academic years)
Maximum	6 Semesters (3 Academic years)

3. Eligibility & Mode of Admissions

Eligibility of a candidate and mode of admission to the programme will be according to the regulations for admission committee decided by Government of Gujarat from time to time.

4. Programme structure and Credits

A student admitted to a program should study the course and earn credits specified in the course structure.

5. Attendance

5.1 All activities prescribed under these regulations and listed by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student from attendance except on account of serious personal illness or accident or family calamity that may genuinely prevent a student from attending a particular session or a few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Dean/Principal.

5.2 Student attendance in a course should be 80%.

6. Course Evaluation

6.1 The performance of every student in each course will be evaluated as follows:

- 6.1.1 Internal evaluation by the course faculty member(s) based on continuous assessment, for 50% of the marks for the course.
- 6.1.2 Final examination by the University through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these, for 50% of the marks for the course.

6.2 University Examination

- 6.2.1 The final examination by the University for 50% of the evaluation for the course will be through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these.
- 6.2.2 In order to earn the credit in a course a student has to obtain grade other than FF.
- 6.2.3 Performance at Internal & University Examination will be done on the relative grading system.

7. Grading

The student's performance in any semester will be assessed by the Semester Grade Point Average (SGPA). Similarly, his performance at the end of two or more consecutive semesters will be denoted by the Cumulative Grade Point Average (CGPA). The SGPA and CGPA are defined as follows:

Grading Scheme	96.0-100	86.0-95.9	76.0-85.9	66.0-75.9	56.0-65.9	46.0 – 55.9	36.0 – 45.9	Below 36.0	Absent
Letter Grade	O (Outstanding)	A+ (Excellent)	A (Very Good)	B+ (Good)	B (Above Average)	C (Average)	P (Pass)	F (Fail)	Ab (Absent)
Grade Point	10	9	8	7	6	5	4	0	0

$SGPA = \sum CiGi / \sum Ci$ where Ci is the number of credits of course i Gi is the Grade Point for the course i and $i = 1$ to n , n = number of courses in the semester.

$CGPA = \sum CiGi / \sum Ci$ where Ci is the number of credits of course i Gi is the Grade Point for the course i and $i = 1$ to n , n = number of courses of all semesters up to which CGPA is computed.

8. Detention Rule

A student will be promoted to next year only if he/she has cleared all the courses of the year he/she is studying in.

Awards of Degree: Every student of the programme who fulfils the following criteria will be eligible for the award of the degree:

- 8.1.1 He should have earned at least minimum required credits as prescribed in course structure.
- 8.1.2 He should have cleared all evaluation components in every course.

9. Award of Class

The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:

Distinction:	CGPA ≥ 7 & ≤ 10
First class:	CGPA ≥ 6.0 & < 7
Second Class:	CGPA ≥ 5.0 & < 6.0
Pass Class:	CGPA < 5.0

10. Transcript

The transcript issued to the student at the time of leaving the University will contain a consolidated record of all the courses taken, credits earned, grades obtained, SGPA, CGPA, class obtained, etc.

CHOICE BASED CREDIT SYSTEM

The choice based credit system provides flexibility in designing curriculum and assigning credits based on the course content and hour of teaching. The choice based credit system provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective and open elective courses. The CBCS provides a cafeteria type approach in which the students can take courses of their choice and adopt an interdisciplinary approach to learning. The courses shall be evaluated on the grading system, which is considered to be better than the conventional marks system.

CBCS – Conceptual Definitions / Key Terms (Terminologies)

Types of Courses: The Programme Structure consist of 3 types of courses:

Foundation Courses, Core Courses and Elective Courses.

Foundation Course

These courses are offered by the institute in order to prepare students for studying courses to be offered at higher levels.

Core Courses

A Course which shall compulsorily be studied by a candidate to complete the requirements of a degree / diploma in a said programme of study is defined as a core course. Following core courses are incorporated in CBCS structure:

A. University Core Courses(UC):

University core courses are compulsory courses which are offered across university and must be completed in order to meet the requirements of programme.

B. Programme Core Courses(PC):

Programme core courses are compulsory courses offered by respective programme owners, which must be completed in order to meet the requirements of programme.

Elective Courses

Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline of study or which provides an extended scope or which enables an exposure to some other discipline / domain or nurtures the candidates

proficiency / skill is called an elective course. Following elective courses are incorporated in CBCS structure:

A. University Elective Courses(UE):

The pool of elective courses offered across all faculties / programmes.

B. Institute Elective Course (IE)

Institute elective courses are those courses which any students of the University/Institute of a Particular Level (PG/UG) will choose as offered or decided by the University/Institute from time-to-time irrespective of their Programme /Specialization.

C. Programme Elective Courses(PE):

The programme specific pool of elective courses offered by respective programme.

Vision, Mission, PEOs, POs and PSOs

Vision

To become a leading institution in the field of computer applications and contribute in national efforts of computerizing public systems.

Mission

To produce competent computer professionals with the ability to face future challenges.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates will:

PEO1: Be able to understand the requirement of computing problem and implement an effective solution.

PEO2: Be able to successfully take up various available career options.

PEO3: Be able to continuously learn in their preferred domains.

PEO4: Be able to acquit themselves in ethical and professional manner while demonstrating effective skills.

PROGRAM OUTCOMES (POs)

The Graduate of Computer Science and Applications will be able to:

PO1. Computational Knowledge: Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.

PO2. Problem Analysis: Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.

PO3. Design / Development of Solutions: Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies

PO4. Conduct Investigations of Complex Computing Problems: Ability to devise and conduct experiments, interpret data and provide well informed conclusions.

PO5. Modern Tool Usage: Ability to select modern computing tools, skills and techniques necessary for innovative software solutions

PO6. Professional Ethics: Ability to apply and commit professional ethics and cyber regulations in a global economic environment.

PO7. Life-long Learning: Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.

PO8. Project Management and Finance: Ability to understand, management and computing principles with computing knowledge to manage projects in multidisciplinary environments.

PO9. Communication Efficacy: Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.

PO10. Societal & Environmental Concern: Ability to recognize economical, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.

PO11. Individual & Team Work: Ability to work as a member or leader in diverse teams in multidisciplinary environment.

PO12. Innovation and Entrepreneurship: Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.

PROGRAM SPECIFIC OUTCOMES (PSOs)

At the end of the programme, the student should be able to

PSO1: Analyse, design and develop effective software applications for solving contemporary challenges.

PSO2: Harness the necessary skills with spirit of research and entrepreneurship.

Total Credits of Programme (4 Semesters): 108

**TEACHING SCHEME AND
EXAMINATION SCHEME
FOR
M.Sc. (IT) PROGRAMME**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

Elective-I											
Course Code		Course Title									
CTUE501		Cloud Computing Essentials									
CTUE502		Mobile and Wireless Communications									
CTUE503		Fuzzy Logic and Applications									
CTUE504		Distributed Operating Systems									
CTME501		Ethical Hacking									
CTME502		Introduction to Internet of Things									
Course Code	Course Title	Teaching Scheme					Examination Scheme				
		Contact Hours			Credit		Theory		Practical		
		Theory	Practical	Total			Internal	External	Term Work	External	
CTUE501- CTUE504 CTME501-502	Elective-I	3	-	3	3		50	50	-	-	100
CTUC505	Advanced Java	3	3	6	6		50	50	50	50	200
CTUC506	Web Development using .NET	3	3	6	6		50	50	50	50	200
CTUC507	Advanced Database Administration	3	3	6	6		50	50	50	50	200
CTUC508	Modern Software Engineering	2	-	2	2		50	50	-	-	100
HSUS502	Foreign Languages								25	25	50
HSUS501	Academic Speaking and Presentation Skills	-	2	2	2		-	-	25	25	50
		14	11	25	25	500			450		950

Teaching & Examination Scheme

Master of Science in Information Technology (M.Sc. (IT)) Programme

(Choice Based Credit System)

Effective from Year 2024 – 25

Semester – I

Teaching & Examination Scheme
Master of Science in Information Technology (M.Sc. (IT)) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25

Semester - II

Course Code	Course Title	Teaching Scheme			Examination Scheme					Total	
		Contact Hours			Credit	Theory		Practical			
		Theory	Practical	Total		Internal	External	Term Work	External		
CTUE509- CTUE512	Elective-II	3	3	6	6	50	50	50	50	200	
CTUC513	Web Development Using Open Source	2	3	5	5	50	50	50	50	200	
CTUC514	Advanced Mobile Application Development	3	3	6	6	50	50	50	50	200	
CTUC515	Full Stack Web Development	3	3	6	6	50	50	50	50	200	
HSUA501	Academic Writing	-	2	2	2	-	-	25	25	50	
	University Elective-I **	-	2	2	2	-	-	50	50	100	
		11	16	27	27	400		550		950	

Student will take any university elective offered by different institutions of university. CMPICA has decided to offer **CAUD516-Internet and Web Designing and **CAUD517-Mobile Application Development** course for others.

Elective-II	
Course Code	Course Title
CTUE509	Game Design
CTUE510	Advanced Python Programming
CTUE511	Block Chain Programming
CTUE512	HTTP Web Service for Enterprise Application

University Elective-I

Sr. No.	Course Code	Course Name	Department/Faculty
1	FTUD551	Project Management	Engineering
2	PTOD501	Fitness & Nutrition	Physiotherapy
3	MBUD557	Software based Statistical Analysis	Management
5	NROD555	First Aid & Life Support	Nursing
6	CHUD558	Introduction to Polymer Science	Applied Science
7	FTUD551	Occupational Health &Safety	Engineering
8	PH892.01	Intellectual Property Rights	Pharmacy
9	CAUD516	Internet and Web Designing	Computer Science
10	CAUD517	Mobile Application Development	Computer Science

Teaching & Examination Scheme
Master of Science in Information Technology (M.Sc. (IT)) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25
Semester - III

Course Code	Course Title	Teaching Scheme			Examination Scheme					Total	
		Contact Hours			Credit	Theory		Practical			
		Theory	Practical	Total		Internal	External	Term Work	External		
CTUE601- CTUE603	Elective-III	3	3	6	6	50	50	50	50	200	
CTUC604	Software Quality Assurance and Testing	3	3	6	6	50	50	50	50	200	
CTUC605	Mini Project	-	12	12	12	-	-	200	200	400	
CLUV601	Environmental Sciences	-	2	2	2	-	-	25	25	50	
		06	20	26	26	200		650		850	

Elective-III	
Course Code	Course Title
CTUE601	Advanced Game Development
CTUE602	Data Analytics
CTUE603	Internet of Things

Teaching & Examination Scheme
Master of Science in Information Technology (M.Sc. (IT)) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25
Semester - IV

Course Code	Course Title	Teaching Scheme			Credit	Internal	End Semester Examination		Total
		Contact Hours					Report	Presentation & Viva	
		Inst.	Industry	Total					
CTUC606	Dissertation / Project Work	2	28	30	30	400	200	200	800



TEACHING SCHEME & DETAILED SYLLABUS

Faculty of Computer Science & Applications
Smt. Chandaben Mohanbhai Patel Institute of
Computer Applications

M.Sc. (IT) Programme
(Choice Based Credit System)



**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**M.Sc. (IT) PROGRAMME
(1st SEMESTER)**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

Teaching & Examination Scheme
Master of Science in Information Technology (M. Sc. (IT)) Programme
(Choice Based Credit System)
Effective from Year 2024 - 25
Semester - I

Course Code	Course Title	Teaching Scheme			Examination Scheme					Total	
		Contact Hours			Credit	Theory		Practical			
		Theory	Practical	Total		Internal	External	Term Work	External		
CTUE501- CTUE504 CTME501-502	Elective-I	3	-	3	3	50	50	-	-	100	
CTUC505	Advanced Java	3	3	6	6	50	50	50	50	200	
CTUC506	Web Development using .NET	3	3	6	6	50	50	50	50	200	
CTUC507	Advanced Database Administration	3	3	6	6	50	50	50	50	200	
CTUC508	Modern Software Engineering	2	-	2	2	50	50	-	-	100	
HSUS502	Foreign Languages					-		25	25	50	
HSUS501	Academic Speaking and Presentation Skills	-	2	2	2		-	25	25	50	
		14	11	25	25	500		450		950	

Elective-I	
Course Code	Course Title
CTUE501	Cloud Computing Essentials
CTUE502	Mobile and Wireless Communications
CTUE503	Fuzzy Logic and Applications
CTUE504	Distributed Operating Systems
CTME501	Ethical Hacking
CTME502	Introduction to Internet of Things

CTUE501 - Cloud Computing Essentials

(100 Marks)

Contact Hours: 03

Pre-requisite: Operating System Concepts and Network Technology

Methodology & Pedagogy: During theory lectures the emphasis will be given on the fundamentals of cloud computing. Students will be introduced basic types, architecture, service providers, mechanism, security issues and some hidden aspects of cloud computing. Students will give practical exposure in form of case study and by showing cloud infrastructure of university.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Evolution of Cloud Computing	04
2	Understanding Cloud Computing and basic types	07
3	Fundamentals of Cloud Architecture and Service Providers	07
4	Cloud Computing Mechanisms	07
5	Cloud Computing Security and Business Use	06
6	Intensive analysis of Cloud Computing with case studies	05

Total Hours (Theory): 36

Total Hours: 36

Detail Syllabus:**Unit I : Evolution of Cloud Computing Hours 04**

Introduction of Cloud Computing, Growth of technology, Paradigm Shift in Computing, distributed nature of service Provisioning, Support entrepreneurship using Cloud Computing.

Unit II : Understanding Cloud Computing and basic types Hours 07

Advantages and drawbacks of Cloud Computing, Essential component for Cloud contract, Major outage of Cloud Computing and Enhancers for Cloud Computing. Introduction to SaaS, PaaS, IaaS. Introduction to Public Cloud, Private Cloud, Hybrid Cloud and Community Cloud, Storage Services for Cloud Computing.

Unit III : Fundamentals of Cloud Architecture and Service Providers Hours 07

Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture. Introduction to major Cloud Service Provider: Amazon Web Services, Google Cloud. Microsoft Windows Azure and Office 365, Hp Cloud, RackSpace, CSC Corp, Verizon Terrimark, DropBox.

Unit IV : Cloud Computing Mechanisms Hours 07

Introduction to Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud Storage Levels, Network Storage Interfaces, Object Storage Interfaces, Database Storage Interfaces, Relational Data Storage, on-Relational Data Storage, Cloud Usage Monitor, Monitoring Agent, Resource Agent, Polling Agent, Resource Replication. Introduction to Cloud Management Mechanisms: Remote Administration System, Resource Management System, SLA Management System, Billing Management System.

Unit V : Cloud Computing Security and Business Use Hours 06

Introduction to Encryption, Symmetric Encryption, Asymmetric Encryption, Hashing, Digital Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single SignOn (SSO), Cloud-Based Security Groups. Overview of Compliance and Certification, Access Control, Organizational Control. Benefits of Business using Cloud Computing, Risk of Cloud Computing, Cost factor in Cloud Computing.

Unit VI : Intensive analysis of Cloud Computing with case studies Hours 05

Overview of Cloud services, Designing Solutions for the Cloud, Implement & Integrate Solutions, Emerging Markets and the Cloud

Core Books:

1. Kevin L. Jackson, Scott Goessling: Architecting Cloud Computing Solutions: Packt Publication: 2018
2. Thomas Erl, Zaigham Mahmood and Ricardo Puttini: Cloud Computing Concepts, Technology & Architecture, PHI, 2013.
3. S. Srinivasan: Cloud Computing Basics, Springer, 2014.

Reference Books:

1. Derrick Rountree, Ileana Castrillo : The Basics of Cloud Computing, Syngress, 2013.
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinsk: Cloud Computing- Principles and Paradigms, John Wiley & Sons, 2011.

Web References:

1. http://whatisCloud.com/basic_concepts_and_terminology/Cloud [For basic terminology of Cloud Computing]
2. http://www.tutorialspoint.com/Cloud_Computing/ [For cloud computing lecture notes]
3. <http://www.intel.in/content/dam/www/public/us/en/documents/guides/cloudcomputingvirtualization-building-private-iaas-guide.pdf> [For cloud computing virtualization]
4. www.cs.purdue.edu/.../Anya-Kim-Bhargava-MCCWorkshop.ppt [Security issues PPTs]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will learn basics of cloud computing
CO2 :	The students will be familiar with various cloud architectures and services.
CO3 :	They will get the knowledge of various network mechanics.
CO4 :	Students will get various business aspects of cloud computing with security aspects
CO5 :	They will be able to design and deploy Cloud Infrastructure

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Evolution of Cloud Computing	√				
2	Understanding Cloud Computing and basic types		√			
3	Fundamentals of Cloud Architecture and Service Providers		√			
4	Cloud Computing Mechanisms			√		
5	Cloud Computing Security and Business Use				√	
6	Hidden Aspects of Cloud Computing					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	1	-	3	1	2	2	-	-	1	-
CO2	3	1	1	1	1	1	3	1	2	2	1	3	2	-
CO3	3	2	1	2	1	3	3	2	2	2	-	3	2	-
CO4	3	3	2	3	1	3	3	2	2	2	3	-	1	-
CO5	3	3	3	3	1	3	3	3	2	2	2	-	3	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE502 - Mobile and Wireless Communications (100 Marks)

Contact Hours: 03

Pre-requisite: Basic of computer and its working

Methodology & Pedagogy: During the lecture sessions, the teacher will discuss the applications of wireless communication, underlying concepts of wireless communication, cellular network and its working. The students will also learn about 5g, edge computing and security issues in wireless communication.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to wireless communications	05
2	Antenna and wave propagation	07
3	Encoding and modulation techniques	05
4	Cellular wireless network	08
5	Wireless link improvement techniques	06
6	Advanced concepts in wireless networks	05

Total Hours (Theory): 36

Total Hours: 36

Detail Syllabus:

Unit I: Introduction to wireless communications	Hours 05
Overview of communication system, component of communication system, digital vs analog communication, interface of analog to digital and digital to analog systems, conversation from analog to digital and digital to analog, examples of wireless communication, wireless vs. wired communication.	
Unit II: Antenna and wave propagation	Hours 07
Radiation patterns, antenna types, propagation modes, line of sight communication, attenuation and signal distortion, free space loss, noise, atmospheric absorption, multipath refraction.	
Unit III: Encoding and modulation techniques	Hours 05
Signal encoding criteria, digital data and analog signals – amplitude shift keying, frequency shift keying and phase shift keying, analog data and signal – amplitude modulation, angle modulation, analog data and digital signal – pulse code modulation, delta modulation.	
Unit IV: Cellular wireless network	Hours 08
Cellular system overview, organization, frequency reuse, increasingly capacity, operation of cellular system, steps in a mobile switching center (MSC) controlled call between mobile users, mobile radio propagation effect, additional function in MSC controlled call, handoff performance metrics, handoff strategies used to determine instance of handoff, power control, traffic engineering.	
Unit V: Wireless link improvement techniques	Hours 06
Equalization, diversity error detection methods – parity check, cyclic redundancy check, block error correction code – block codes, hamming codes, cyclic codes, reed Solomon codes.	
Unit VI: Advanced concepts in wireless concepts	Hours 05
Introduction to Wi-Fi, WiMAX, ZigBee Networks, Wireless Adhoc Network, Overview of 4g and 5g cellular technologies, edge computing and fog computing, Security aspects of wireless computing.	

Core Books:

1. William Stallings: Wireless communication & networks: 3rd Edition: Pearson: 2012.
2. David Tse: Fundamentals of Wireless Communication: 2nd Edition: Cambridge Uni. Press: 2014
3. Aditya K. Jagannatham: Principles of modern wireless communication Systems Theory and Practice: 1st Edition: McGraw Hill:2017

Reference Books:

1. T.S.Rappaport, "Wireless Communications Principles and Practice", 2nd edition, PHI,2002.
2. William C.Y.Lee, "Mobile Cellular Telecommunications Analog and Digital Systems", 2nd edition, TMH, 1995

Web References:

1. https://www.tutorialspoint.com/wireless_communication/index.htm [Wireless networking tutorials]
2. <https://www.javatpoint.com/mobile-communication-tutorial> [Mobile computing tutorials]
3. <https://www.youtube.com/watch?v=f2wlHL1Sok8> [Cellular system and wireless concepts -NPTEL course YouTube link]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Student will understand role of wireless networks in communication system.
CO2 :	Student will get insight into underlying principles of wireless communication system.
CO3 :	The student will grasp concepts of error and flow control of wireless network.
CO4 :	The student will get awareness of cellular network system and its working.
CO5 :	The student will know about modern and upcoming wireless communication technologies and concepts along with security aspects.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to wireless communications	√				
2	Antenna and wave propagation		√			
3	Encoding and modulation techniques			√		
4	Cellular wireless network				√	
5	Wireless link improvement techniques				√	
6	Advanced concepts in wireless concepts					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	1	2	2	2	-	1	1	3	2
CO2	3	3	3	3	3	3	3	2	3	-	2	2	3	2
CO3	2	2	3	3	2	2	3	2	2	-	1	1	3	2
CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3
CO5	3	3	3	3	3	3	3	3	2	1	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE503 - Fuzzy Logic and Applications

(100 Marks)

Contact Hours: 03

Pre-requisite: Basics of Set Theory, Fundamental of Computing

Methodology & Pedagogy: During theory lectures Basics of Fuzzy Logic, Fuzzy Set Theory, Fuzzy Relations, Fuzzification, Fuzzy systems and Applications will be introduced to students. Students will be made familiar with applications and systems related to Fuzzy Theory. Appropriate case studies will be discussed and assigned to students for real exposure related to Fuzzy logic.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Fuzzy Logic	05
2	Classical Sets and Fuzzy Sets	07
3	Classical Relations and Fuzzy Relations	06
4	Fuzzification and Defuzzification	06
5	Fuzzy Systems and Classification	06
6	Fuzzy Logic - Applications	06

Total Hours (Theory): 36

Total Hours: 36

Detail Syllabus:**Unit I : Introduction to Fuzzy Logic Hours 05**

A Historical Perspective, The Utility of Fuzzy Systems, imitations of Fuzzy Systems, The Illusion: Ignoring, Uncertainty and Accuracy, Uncertainty and Information, The Unknown, Fuzzy Sets and Membership, Chance Versus Fuzziness, Sets as Points in Hypercubes.

Unit II : Fuzzy Set Theory Hours 07

Classical Sets : Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions, Fuzzy Sets: Fuzzy Set Operations, Properties of Fuzzy Sets, Alternative Fuzzy Set Operations, Fuzzy Arithmetic.

Unit III : Classical Relations and Fuzzy Relations Hours 06

Crisp Relations: Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition.

Fuzzy Relations: Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition, Fuzzy Intervals.

Unit IV : Fuzzification and Defuzzification Hours 06

Features of the Membership Function, Various Forms, Fuzzification, Defuzzification to Crisp Sets and scalers, Approximate Reasoning, Fuzzy Inference, Fuzzy Logic in Databases, Information Retrieval with Fuzzy Logic, Quantification, Activity for choosing a suitable alternative needed for realizing goal.

Unit V : Fuzzy Systems and Classification Hours 06

Fuzzy Logic - Control System, Adaptive Fuzzy Controller: Basic Steps for Implementing Adaptive Algorithm, Parameters for selecting an Adaptive Fuzzy Controller.

Fuzzy (Rule-Based) Systems, Graphical Techniques of Inference, Classification by Equivalence Relations, Crisp Relations, Fuzzy Relations, Fuzzy Classification: Hard c-Means (HCM), Fuzzy c-Means (FCM)

Unit VI : Fuzzy Logic - Applications Hours 06

Fuzzy Logic - Applications in Pattern Recognition, Classification, Computer Network, Medical, Knowledge Engineering and Data Mining. Fuzzy logic with Neural Network. Intelligent control of complex systems. Exercises on Fuzzy Logic.

Core Books:

1. Timothy J.Ross: Fuzzy logic with Engineering Applications : Edition (4th), John Wiley & Sons, Ltd., 2017
2. Hans-Jurgen Zimmermann: Fuzzy Set Theory - and its Applications: Edition (4th), Springer Netherlands, 2001

Reference Books:

1. Klir.G, Yuan B. : Fuzzy Sets and Fuzzy Logic: Theory and Applications : Edition (4th), Pearson Education, 2015.
2. G. Chen and T. Pham : Introduction to fuzzy sets, fuzzy logic & Fuzzy control systems CRC Press, 2000.
3. Hung T. Nguyen, Elbert A. Walker: A First Course in Fuzzy Logic, CRC Press, 2005.
4. A. K. BHARGAVA: Fuzzy Set Theory Fuzzy Logic and their Applications S CHAND & Company Limited, 2013.
5. M. GANESH: INTRODUCTION TO FUZZY SETS AND FUZZY LOGIC, PHI Learning, 2006.
6. Barnabas Bede: Mathematics of Fuzzy Sets and Fuzzy Logic, Springer Berlin Heidelberg, 2012.

Web References:

1. <https://plato.stanford.edu/entries/logic-fuzzy/> [Fuzzy Logic]
2. <https://www.mathworks.com/help/fuzzy/what-is-fuzzy-logic.html> [What Is Fuzzy Logic?]
3. <https://www.guru99.com/what-is-fuzzy-logic.html> [Fuzzy Logic Tutorial: What is, Architecture, Application, Example]
4. https://www.tutorialspoint.com/fuzzy_logic/fuzzy_logic_applications.htm [Fuzzy Logic - Applications]

Course Outcomes: Upon successful completion of the course, students will be able

CO1 :	To understand concept of fuzzy logic principles.
CO2 :	To understand the skill in basic understanding of fuzzy logic.
CO3 :	To explore the components of fuzzy set and fuzzy operations.
CO4 :	To explore the functional components of fuzzy logic classification and controller.
CO5 :	To explore applications related to fuzzy logic.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Fuzzy Logic	√				
2	Classical Sets and Fuzzy Sets		√	√		
3	Classical Relations and Fuzzy Relations			√	√	
4	Fuzzification and Defuzzification			√	√	
5	Fuzzy Systems and Classification				√	√
6	Fuzzy Logic - Applications					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	3	-	-	-	-	2	3	2
CO2	3	3	2	2	-	-	3	-	-	-	-	2	3	2
CO3	3	3	2	2	1	-	3	-	-	-	-	2	3	2
CO4	3	3	2	2	1	-	3	-	-	-	-	2	3	2
CO5	2	2	2	3	2	-	3	-	-	-	-	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE504: Distributed Operating Systems (100 Marks)

Contact Hours: 03

Pre-requisite: Operating Systems concepts

Methodology & Pedagogy: During theory lectures fundamental concept of Distributed Systems will be covered along with the issues and management of distributed memory like synchronization in Distributed Operating Systems, Resource Management, Handling file and database in distributed systems and the Security concerns.

Outline of the Course:

Unit No.	Title of the Unit	Minimum Numbers of Hours Theory
1	Overview of Distributed Systems	07
2	Distributed Shared Memory	07
3	Synchronization in Distributed Operating Systems	07
4	Process and Resource Management in Distributed Operating Systems	05
5	Distributed File Systems	05
6	Distributed Web based System and Security	05

Total Hours (Theory): 36

Total Hours: 36

Detail Syllabus:

Unit - I: Overview of Distributed Systems **Hours: 07**
Computer architecture: CICS, RISC, Multi-core, Computer networking: ISO/OSI Model, Evolution of operating systems, Introduction to Distributed operating system, issues in designing distributed operating system – transparency, Reliability, Flexibility, performance, scalability, heterogeneity, security, Emulation of existing operating system, Introduction to distributed computing environment, Introduction to distributed computing systems (DCS), DCS design goals, Transparencies, Fundamental issues.

Unit - II: Distributed Shared Memory **Hours: 07**

Introduction to RPC, RPC Model, Implementing RPC Mechanism, Stub Generation, RPC Message, Introduction to Distributed Shared Memory, General Architecture of DSM Systems, Design and implementation issues of DSM, Granularity, Structure of Shared memory space, Message passing communication, Transaction Communication, Group communication; Broadcast atomic protocols.

Unit - III: Synchronization in Distributed Operating Systems **Hours: 07**

Distributed Coordination, Temporal ordering of events, Lamport's logical clocks, Vector clocks; Ordering of messages, Physical clocks, Global state detection Clock Synchronization – Implementation, drifting of clocks, Clock synchronization issues, Clock Synchronization algorithms, Mutual Exclusion – Centralized approach, Distributed Approach, Token Passing Approach, Deadlocks in distributed systems, Load scheduling and balancing techniques.

Unit - IV: Process and Resource Management in Distributed Operating Systems

Hours: 05

Introduction to resource management in distributed operating system, Desirable features of good global scheduling algorithm, Task Assignment approach, Load balancing Approach, Load Sharing Approach, Process migration – desirable feature of Process migration, process migration mechanisms, Process migration in heterogeneous systems, Advantages of process migration.

Unit - V: Distributed File and Database Systems **Hours: 05**

What is Distributed File system – Remote information sharing, User mobility, Availability, Diskless workstation. Types of services in distributed file system – Storage service, True file Service, Name Service. Desirable features of Distributed file system, File Models, File accessing models, Distributed database system.

Unit - VI: Distributed Web based System and Security **Hours: 05**

Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication: Web Proxy Caching, Replication for Web Hosting Systems, Replication of Web Applications, Introduction of Security in Distributed OS, Overview of security techniques, Features, Need, Access Control, Security Management.

Core Books:

1. Tim Kindberg, George Coulouris, Jean Dollimore : Distributed Systems : Concepts & Design Paperback Pearson Education,2010.
2. Pradip K. Sinha: Distributed Operating Systems Concepts and Design, Eastern Economy Edition, PHI, 2007.
3. Mukesh Singhal, Niranjan Shivaratri : Advanced Concepts In Operating Systems Paperback, McGraw Hill Education,2017.

Reference Books:

1. Andrew S. Tanenbaum: Distributed Operating Systems, 5th Edition, Pearson, 2008.
2. Doreen L. Galli: Distributed Operating Systems Concepts and Practice, Prentice Hall, 2000.
3. Andrew S. Tanenbaum, Herbet Bos: Modern Operating Systems, 4th Edition, Pearson Education, 2014.

Web References:

1. www.geeksforgeeks.org/types-of-operating-systems/ [Overview of Distributed OS]
2. www.javatpoint.com/distributed-operating-system [Examples and application of Distributes OS]
3. www.tutorialspoint.com/Distributed-Database-Management-System [Database Management of Distributes OS]

Course Outcomes: Upon successful completion of the course, the students will:

C01 :	Be familiar with Distributed Operating Systems and Shared Memory.
C02 :	Be familiar with the Synchronization issues in Distributed Operating Systems
C03 :	Be familiar with the Process and Resource management.
C04 :	Understand working of file and database in the distributed environment.
C05 :	Understand the working of web based system and security concerns in the distributed systems.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		C01	C02	C03	C04	C05
1	Overview of Distributed Systems	√				
2	Distributed Shared Memory and Remote Procedure Calls	√				
3	Synchronization in Distributed Operating Systems		√			
4	Process and Resource Management in Distributed Operating Systems			√		
5	Distributed File and Database Systems				√	
6	Distributed Web based System and Security					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	2	2	2	2	2	2	2	1
CO2	2	3	2	3	3	2	2	2	2	2	2	2	2	1
CO3	2	3	2	3	3	2	2	2	2	2	2	2	2	2
CO4	3	2	2	2	3	2	2	2	2	2	2	2	2	2
CO5	3	2	2	2	3	2	2	2	2	2	2	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTME501 Ethical Hacking

Description:

Credit and Week:

Teaching Scheme	Week	Marks	Credit
	12	100	3

About the course:

Ethical hacking is a subject that has become very important in present-day context, and can help individuals and organizations to adopt safe practices and usage of their IT infrastructure. Starting from the basic topics like networking, network security and cryptography, the course will cover various attacks and vulnerabilities and ways to secure them. There will be hands-on demonstrations that will be helpful to the participants. The participants are encouraged to try and replicate the demonstration experiments that will be discussed as part of the course.

Pre-requisites:

Basic concepts in programming and networking

Industry support:

TCS, Wipro, CTS, Google, Microsoft, Qualcomm

Course layout:

Week 1: Introduction to ethical hacking. Fundamentals of computer networking. TCP/IP protocol stack.

Week 2: IP addressing and routing. TCP and UDP. IP subnets.

Week 3: Routing protocols. IP version 6.

Week 4: Installation of attacker and victim system. Information gathering using advanced google search, archive.org, net craft, whois, host, dig, dnsenum and NMAP tool.

Week 5: Vulnerability scanning using NMAP and Nessus. Creating a secure hacking environment. System Hacking: password cracking, privilege escalation, application execution. Malware and Virus. ARP spoofing and MAC attack.

Week 6: Introduction to cryptography, private-key encryption, public-key encryption.

Week 7: Cryptographic hash functions, digital signature and certificate, applications.

Week 8: Steganography, biometric authentication, network-based attacks, DNS and Email security.

Week 9: Packet sniffing using Wireshark and burp suite, password attack using burp suite. Social engineering attacks and Denial of service attacks.

Week 10: Elements of hardware security: side-channel attacks, physical inclinable functions, hardware Trojans.

Week 11: Different types of attacks using Metasploit framework: password cracking, privilege escalation, remote code execution, etc. Attack on web servers: password attack, SQL injection, cross site scripting.

Week 12: Case studies: various attacks scenarios and their remedies.

Books and references

Text Books / Basic Material

1. Data and Computer Communications – W. Stallings.
2. Data Communication and Networking – B. A. Forouzan
3. TCP/IP Protocol Suite – B. A. Forouzan
4. UNIX Network Programming – W. R. Stallings
5. Introduction to Computer Networks and Cybersecurity – C-H. Wu and J. D. Irwin
6. Cryptography and Network Security: Principles and Practice – W. Stallings

Criteria to get a certificate:

Average assignment score = 25% of average of best 8 assignments out of the total 12 assignments given in the course.

Exam score = 75% of the proctored certification exam score out of 100

Final score = Average assignment score + Exam score

YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE >=10/25 AND EXAM SCORE >= 30/75. If one of the 2 criteria is not met, you will not get the certificate even if the Final score >= 40/100.

CTME502 Introduction to Internet of Things (IOT)

Description:

Credit and Week:

Teaching Scheme	Week	Marks	Credit
	12	100	3

About the course:

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain verticals ranging from civilian to defense sectors. These domains include agriculture, space, healthcare, manufacturing, construction, water, and mining, which are presently transitioning their legacy infrastructure to support IoT. Today it is possible to envision pervasive connectivity, storage, and computation, which, in turn, gives rise to building different IoT solutions. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

Pre-requisites:

Basic programming knowledge

Course layout:

Week 1: Introduction to IoT: Part I, Part II, Sensing, Actuation, Basics of Networking: Part-I.

Week 2: Basics of Networking: Part-II, Part III, Part IV, Communication Protocols: Part I, Part II.

Week 3: Communication Protocols: Part III, Part IV, Part V, Sensor Networks: Part I, Part II.

Week 4: Sensor Networks: Part III, Part IV, Part V, Part VI, Machine-to-Machine Communications.

Week 5: Interoperability in IoT, Introduction to Arduino Programming: Part I, Part II, Integration of Sensors and Actuators with Arduino: Part I, Part II.

Week 6: Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi.

Week 7: Implementation of IoT with Raspberry Pi (contd), Introduction to SDN, SDN for IoT.

Week 8: SDN for IoT (contd), Data Handling and Analytics, Cloud Computing.

Week 9: Cloud Computing(contd), Sensor-Cloud.

Week 10: Fog Computing, Smart Cities and Smart Homes.

Week 11: Connected Vehicles, Smart Grid, Industrial IoT.

Week 12: Industrial IoT (contd), Case Study: Agriculture, Healthcare, Activity Monitoring.

Books and references

Text Books / Basic Material

1) S. Misra, A. Mukherjee, and A. Roy, 2020. *Introduction to IoT*. Cambridge University Press.

Availability: https://www.amazon.in/Introduction-IoT-Sudip-Misra/dp/1108959741/ref=sr_1_1?dchild=1&keywords=sudip+misra&qid=1627359928&sr=8-1

2) S. Misra, C. Roy, and A. Mukherjee, 2020. *Introduction to Industrial Internet of Things and Industry 4.0*. CRC Press.

Availability: https://www.amazon.in/dp/1032146753/ref=sr_1_3?dchild=1&keywords=sudip+misra&qid=1627359971&sr=8-3.

3) Research Papers

Criteria to get a certificate:

Average assignment score = 25% of average of best 8 assignments out of the total 12 assignments given in the course.

Exam score = 75% of the proctored certification exam score out of 100

Final score = Average assignment score + Exam score

YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE >=10/25 AND EXAM SCORE >= 30/75. If one of the 2 criteria is not met, you will not get the certificate even if the Final score >= 40/100.

CTUC505 - Advanced Java

(200 Marks)

Contact Hours: 06

Pre-requisite: Fundamental Knowledge of Core Java (Java SE) concepts.

Methodology & Pedagogy: Advanced Java fundamentals like JDBC, Servlet, JSP and Servlet Security provides capabilities and features for developing web application which is essential for developer in order to understand entire web application development life cycle. During the theory sessions of the syllabus, fundamentals of the mentioned technologies will be explained in detail with real time examples. Moreover, practical session will provide hands-on exposure about JDBC, Servlet, JSP and Servlet Security with variety of practical assignment. Also, MVC architecture using these technologies will be covered during theory as well as practical sessions.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	JDBC Programming	06	36
2	Web Application Components Fundamentals	05	
3	Servlet API	08	
4	Advanced Servlet Features and Security	05	
5	Java Server Pages	07	
6	Packaging and Deploying Web Applications	05	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:

Unit I: JDBC Programming	Hours 06
The JDBC Connectivity Model, Database Programming: Connecting to the Database, creating a SQL Query, Getting the Results, Updating Database Data, Error Checking and the SQLException Class, the SQLWarning class, the Statement Interface, PreparedStatement, CallableStatement, the ResultSet Interface, Updatable Result sets, JDBC Types, Executing SQL Queries, ResultSetMetaData, Executing SQL Updates, Transaction Management	
Unit II: Web Application Components Fundamentals	Hours 05
Basics of web application development and web components, Introduction of MVC design pattern, Fundamentals of: Containers, Packaging Web Applications, Web Application Structure, JAR Files, WAR Files, HTTP, HTTP request methods, HTML Form Processing, HTTP request response cycle.	
Unit III: Servlet API	Hours 08
Servlet Model: Introducing Servlet, Introducing Servlet & the MVC Pattern, Introducing javax.servlet Packages, Introducing HTTP & Servlets, Understanding the Request/ Response Cycle, Input & Output Streams, Introducing Servlet/ Container Communication, Introducing ServletContext and ServletConfig, RequestDispatcher Interface. The Filter API: Filter, Filter Chain and Filter Config	
Unit IV: Advanced Servlet Features and Security	Hours 05
Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting. Understanding the Stateless nature of HTTP, Why Track Client Identity & State Maintain Sessions, Session Management Using the Servlet API.	
Unit V: Java Server Pages	Hours 07
JSP Overview: The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment JSP Directives, JSP Action, JSP Implicit Objects JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking JSP Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing	
Unit VI: Packaging and Deploying Web Applications	Hours 05

Basics of server container, build a WAR artifact for the web application, configure the Docker connection node and deploy the application to server container

Core Books:

1. Cay S Horstmann, Gary Cornell: Core Java, Volume II – Advanced Features, 8th Edition, Pearson Education.
2. Marty Hall, Larry Brown: Core Servlets and JavaServer Pages, Volume 2, Advanced Technologies, 2nd Edition, Pearson Education, 2008.

Reference Books:

1. Bryan Basham, Kathy Sierra and Bert Bates: Head First Servlet and JSP, O'Reilly Publication, 1st Edition
2. James Keogh: Complete Reference J2EE, McGraw publication

Web References:

1. <http://courses.coreservlets.com/Course-Materials/csajsp2.html> [Servlet Basics]
2. <http://www.ceit.es/asignaturas/InteInfo/Recursos/Servlets/JavaServlets.pdf> [Servlet Tutorial PDF]
3. <http://www.msuniv.ac.in/AdvancedJavaProgrammingwithDatabaseApplication.pdf> [JDBC Tutorial]
4. www.doc.ic.ac.uk/~rcheung/teaching/2720/ppt/lecture12.ppt [JSP Tutorial Slides]

Course Outcomes: Upon successful completion of the course, students will:

CO1 :	Able to connect Java application with various RDBMS using JDBC
CO2 :	Have understanding of web application architecture and terminologies
CO3 :	Able to develop real time web application using Servlet and JSP technologies
CO4 :	Be familiar with the concepts of JSPs, Servlets and related security issues.
CO5 :	Apply Model-View-Controller architecture to build complex client-server applications

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	JDBC Programming	√		√		
2	Web Application Components Fundamentals		√	√		
3	Servlet API			√	√	√
4	Advanced Servlet Features and Security			√	√	√
5	Java Server Pages			√	√	√
6	Packaging and Deploying Web Applications					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	1	-	-	-	-	-	-	-	3	2
CO2	3	2	3	2	-	-	-	-	-	-	2	1	2	2
CO3	3	2	3	2	2	-	-	-	-	2	2	3	3	3
CO4	3	2	3	2	2	2	-	-	1	-	2	1	3	2
CO5	2	2	3	3	2	-	1	1	-	2	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC506 - Web Development Using .NET (200 Marks)

Contact Hours: 06

Pre-requisite: Familiarity with basic concepts of object oriented programming

Methodology & Pedagogy: In the lectures students will learn about basics of .NET framework, ASP.NET and other advanced concepts related to programming with .NET framework. In the lab sessions the student will learn about solving real world problems with .NET framework and related technologies.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to ASP.NET	05	36
2	Applications development with ASP.NET	06	
3	Database with ADO.Net	08	
4	MVC architecture in .NET framework	08	
5	SOA in .NET framework	05	
6	AJAX in .NET	04	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:

Unit I: Introduction to ASP.NET	Hours 05
Introduction to .NET framework, Introduction to Web Programming, Introduction to ASP and ASP.NET, Deploying ASP.NET Application	
Unit II: Applications development with ASP.NET	Hours 06
ASP.NET Page Life Cycle, Structure of an ASP.NET Page: ASPX Page, Code behind File, WebConfig and machine config, Developing a web form, Working with master pages, State management techniques, Application Tracing, Error Handling	
Unit III: Database with ADO.Net	Hours 08
Introduction to ADO and ADO.NET, ADO.NET architecture, Connection Oriented and Connection Less architecture, Binding data to web controls and working with data controls, working with XML	
Unit IV: MVC architecture in .NET framework	Hours 08
Introduction to MVC Architecture in ASP.NET, CRUD operation using MVC architecture, working with web controls in MVC architecture, introduction to LINQ.	
Unit V: SOA in .NET framework	Hours 05
Introduction to service oriented architecture concept, SOAP protocol, Concept of UDDI and WSDL, Applications of SOA, Building SOA application with ASP.NET.	
Unit VI: AJAX in .NET	Hours 04
Introduction to ASP.NET AJAX, AJAX control toolkit and extender controls.	

Core Books:

1. Cogent Solutions Inc.: ASP.Net 4.5 Black book, Dreamtech press, 2019
2. Mridila Parihar, Essam Ahmed: ASP .Net Bible, Wiley, 2017
3. Stephon Walther: ASP.Net Unleashed, BPB publication, 2018

Reference Books:

1. Mesbah Ahmed, Chris Garrett, Jeremy Faircloth, Chris Payne: ASP.Net Programming. Developer's Guide, Dreamtech, 2016.
2. Greg Buczek: ASP.Net Tips & Techniques, Tata McGraw Hill Edition, 2016.

3. Bolton, Justin Langford, Glenn Berry, Gavin Payne, Amit Banerjee, Rob Farley: Professional SQL Server 2019 internals and troubleshooting, Wiley India publication, October, 2019.

Web References:

1. <http://msdn.microsoft.com/en-us/aa336522.aspx> [For software download]
2. <https://docs.microsoft.com/en-us/aspnet/overview> [For ASP.NET technical documentation]
3. https://www.tutorialspoint.com/dotnet_core/dotnet_core_overview.htm [for .NET Core]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will be able to understand .NET framework and develop ASP.NET application.
CO2 :	Students will be able to develop database centric applications.
CO3 :	Students will be familiar with concepts of MVC for application development.
CO4 :	Students will be able to understand and develop SOA based applications with .NET framework.
CO5 :	Students will be familiar with the concepts of AJAX

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to ASP.NET	✓				
2	Applications development with ASP.NET	✓				
3	Database with ADO.Net		✓			
4	MVC architecture in .NET framework			✓		
5	SOA in .NET framework				✓	
6	AJAX in .NET					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	2	1	-	-	2	-	-	2	1
CO2	2	3	3	2	-	2	1	-	-	2	2	1	3	1
CO3	1	2	2	-	-	-	-	-	-	-	2	1	3	2
CO4	2	3	3	-	2	-	-	-	-	-	2	1	3	2
CO5	3	2	3	2	-	-	3	-	-	-	-	2	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC507 - Advanced Database Administration

(200 Marks)

Contact Hours: 06

Pre-requisite: To be able to implement a simple DBMS and design and implement information systems using DBMS technology.

Methodology & Pedagogy: During theory lectures, illustrations of certain complex real world applications, which emphasize the use of advanced concepts of databases, will be discussed. The fundamental concepts regarding database development activities, various database management systems and other advanced issues in database management will also be discussed. In addition, there may be announced or unannounced quizzes/assignments. During Practical sessions, students will be required to carry out case studies using the concepts and techniques they have learnt during theory sessions.

Outline of the course:

Unit No.	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to DBA	05	36
2	User Access and Security	06	
3	Data Storage Management and Migration	07	
4	Managing Database Backup and Recovery	07	
5	Database Security and Auditing	05	
6	Query Processing and Optimization	06	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:**Unit I: Introduction to DBA** **Hours: 05**

Types of Oracle Database Users, DBA Roles and Responsibilities; Database Architecture; ORACLE logical and physical database structure; Memory and Process Structure, SQLPLUS Overview, creating a database.

Unit II: User Access and Security **Hours: 06**

Administrative User Accounts, Database Administrator Authentication, Administrative Privileges and its operations, managing Password authentication, Granting and Revoking Administrative Privileges.

Unit III: Data Storage Management and Migration **Hours: 07**

Disk Storage, Basic File structure and Indexing, Indexing structure for Files, Data Migration, Data Utilities (SQL loader and Import – Export)

Unit IV: Managing Database Backup and Recovery **Hours: 07**

Backup and Recovery Overview, Database backup, restoration and recovery, defining a backup and recovery strategy, Backup and Recovery options; Data Dump; User-Managed Backup and Recovery; Configuring RMAN; RMAN Backups, Restore and Recovery.

Unit V: Database Security and Auditing **Hours: 05**

Database Security and Auditing; Database Authentication and Authorization Methods; Data Encryption Techniques, Virtual Private Database

Unit VI: Query Processing and Optimization **Hours: 06**

Query Processing, Steps of Query Processing, Query Optimization, Distributed Database System, Centralized Database Management System, Difference of Distributed Database System and Centralized Database System, Advantage and Disadvantage of Distributed and Centralized Database Management System.

Core Books:

1. Oracle® Database Database Administrator's Guide by Mark Doran, Padmaja Potineni, Rajesh Bhatiya, Oracle Press.

Reference Books:

1. Abraham Silberschatz, Henry F.Koeth, S.Sudarshan: Database System Concepts, 6th edition, McGraw Hill Publication.
2. Ramez Elmasri, Shamkant B. Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Publication.
3. C.J. Date, An Introduction to Database Systems (eighth edition), Addison Wesley, 2000

Web References:

1. A Practical Guide to Oracle Database Administration for DBA & Developers (oracletutorial.com)

Course Outcomes: Upon successful completion of the course, students will be,

C01 :	Create and manage databases
C02 :	Be familiar with database storage management
C03 :	Manage backup and recovery
C04 :	Control user security
C05 :	Managing database query optimization

Course Outcomes Mapping: -

Unit No.	Unit Name	Course Outcomes				
		C01	C02	C03	C04	C05
1	Introduction to DBA	✓				
2	User Access and Security	✓	✓			
3	Data Storage Management and Migration	✓	✓	✓		
4	Managing Database Backup and Recovery		✓		✓	✓
5	Database Security and Auditing			✓		✓
6	Query Processing and Optimization				✓	✓

Course Articulation Matrix: -

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	3	1	3	1	2	-	-	-	3	-
CO2	2	2	3	2	1	3	3	2	-	-	-	3	-
CO3	3	3	2	1	2	3	2	1	-	-	-	3	3
CO4	3	3	3	1	2	3	3	1	-	-	-	3	3
CO5	3	3	2	3	2	2	3	1	-	-	-	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC508 - Modern Software Engineering (100 Marks)

Contact Hours: 02

Pre-requisite: Analysis and design of Information Systems, Fundamental concepts of Object Oriented Programming.

Methodology & Pedagogy: During theory sessions, the focus will be given on different concepts of software engineering and related aspects such as Project management and Agile software development. The emphasis will be given on the basics of software engineering concepts and UML. Students will get exposure to various concepts of DevOps, as well as Process Improvement and Reengineering.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Software Engineering	04
2	Requirement analysis and project management	04
3	Understanding UML	04
4	Agile Development	05
5	Overview of DevOps	04
6	Software maintenance and risk management	03

Total Hours (Theory): 24

Total Hours: 24

Detail Syllabus:

Unit I: Introduction to Software Engineering	Hours 04
The Role of Software in today's era, Software Engineering: Software Process Models, The Linear Sequential Model, The Prototyping Model, Evolutionary Process Models	
Unit II: Requirement analysis and project management	Hours 04
Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation, Requirement Engineering. Introduction to the basic concepts of Project Scheduling, Project scheduling principles, relationships, Process Definition, Effort Estimation and Scheduling, Project Management Plan, Configuration Management.	
Unit III: Understanding UML	Hour 04
Introduction to UML, Structure and Unstructured modelling: Class Diagram, Use case Diagram, Interaction Diagram, Activity Diagram.	
Unit IV: Agile Development	Hours 05
Introduction to Agile Software Development, Characteristics of Agile Process, Problems with Agile methods, Extreme Programming, Scrum.	
Unit V: Overview of DevOps	Hour 05
What is DevOps?, DevOps Importance and Benefits, DevOps Principles and Practices, 7 C's of DevOps Lifecycle for Business Agility, Challenges with DevOps Implementation.	
Unit VI: Software maintenance and risk management	Hour 03
Software risks, risk identification, risk projection, risk mitigation, monitoring and management. Concept of software reengineering, reverse engineering, Applications of Software Engineering.	

Core Books:

1. Roger S.Pressman, Software Engineering- A practitioner's Approach, McGraw-Hill InternationalEditions
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User
3. Rajib Mall, Fundamentals of software Engineering, Prentice Hall of India.

Reference Books:

1. Ian Sommerville, Software engineering, Pearson education Asia
2. Pankaj Jalote, Software Engineering – A Precise Approach Wiley
3. Merlin Dorfman (Editor), Richard H. Thayer (Editor) ,Software Engineering
4. Robert C. "Uncle Bob" Martin , Clean Architecture: A Craftsman's Guide to Software Structure andDesign
5. Deepak Gaikwad, Viral Thakkar, DevOps Tools from Practitioner's ViewPoint, Wiley

Web References:

1. https://en.wikibooks.org/wiki/Introduction_to_Software_Engineering/Process/Methodology [Introduction to Software Engineering/Process/Methodology]
2. <https://www.uml-diagrams.org/> [UMLUnits]
1. <https://nptel.ac.in/courses/106/101/106101061/> [Agile Software Development and ExtremeProgramming and Overview of DevOps]

Course Outcomes: Upon successful completion of the course, students will be,

C01 :	Understanding Software Engineering Process Models
C02 :	Able to analyze requirements and mange project
C03 :	Get familiar with the concepts of Unified Modeling Language
C04 :	Understanding of the Agile software development concepts
C05 :	Able to apply DevOps concepts and understand risk management

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Software Engineering	√				
2	Requirement analysis and projectmanagement		√			
3	Understanding UML			√		
4	Agile Development				√	
5	Overview of DevOps					√
6	Software maintenance and riskmanagement					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	3	3	2	2	2	1	2	3	3
CO2	3	2	2	2	2	3	3	3	3	2	3	2	3	3
CO3	2	2	3	2	2	2	2	2	2	1	1	2	3	2
CO4	3	3	3	2	2	2	2	1	1	1	3	2	3	2
CO5	2	2	3	2	1	3	2	1	1	1	2	1	3	2

HSUS502: FOREIGN LANGUAGES (French)

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	02/01	--	30/15	02
Marks	--	100	--	100	

Pre-requisite courses:

- French Language Studies- Introduction (Coursera)

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to French Language	08
2.	Grammar: Articles, Tense, Forms, Numbers, Verbs, Days, Months, Family	08
3.	Grammar : Adjectives, Adverbs, Interrogative Forms, Directions, Countries, Nationalities, Seasons, Weather, Professions, Verbs	08
4.	Grammar: Prepositions, Conjunctions, Tenses, Colors, Vegetables, Fruits, Shapes, Verbs	06

Total hours (Practical) :30

Total hours :30

Detail Syllabus:

1.	Introduction to French Language	08 Hours	28%
	Facts and figures about French Language; Basic French Linguistics-* Alphabets * Accents * Liaison * Nasalization French Culture, Differ between French and English; Grammar -Subject Pronoun, Verbs: (être, avoir, habiter, regarder, manger ... "er" verb), Form of address, Numbers (1 to 20), Nouns and plurals of nouns, The expression: C'est, Il y a; Presentation: -1) Self-Introduction-2) Question and answering; Dialogue		
2.	Grammar: Articles, Tense, Forms, Numbers, Verbs, Days, Months, Family	08 Hours	28%
	Grammar -Definite articles, Indefinite articles, Present tense (Positive Forms, Negative Forms), Numbers (21 to 100, 100-1000), Days, Months, Family, Verbs: (aller, venir, finir, pouvoir, vouloir ... "ir" verb); Social Links- 1), My family & relations 2) Appointments 3) Gathering information from someone; Dialogue		
3.	Grammar : Adjectives, Adverbs, Interrogative Forms, Directions, Countries, Nationalities, Seasons, Weather, Professions, Verbs	08 Hours	28%
	Grammar - Common Adjectives, Comparative Adjectives, Common Adverbs, Interrogative Forms, The expression: "On", Directions, Countries, Nationalities, Seasons, Weather, Professions, Verbs: (Prendre, Apprendre, Comprendre, faire ... "re" verb); Work , Study and Travel -1) Job/ Profession 2) Ticket Reservation (At Bus/At Railway/At Airport); Dialogue		
4.	Grammar: Prepositions, Conjunctions, Tenses, Colours, Vegetables, Fruits, Shapes, Verbs	06 Hours	26%
	Grammar -1) Common Prepositions 2) Common Conjunctions 3)Past Tense 4) Future Tense 5) Colors ,Shapes, Animals ,Vegetables, Fruits 6) Verbs: ("er", "ir","re" etc...); Food & Shopping -1) Buy a vegetables and fruits 2) Any Conversation between Customer and Vendor (At Mall/At Restaurant / At Market); Dialogue		

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	Gain basic communication skills in French language with preliminary understanding of grammar
CO2	Develop vocabulary required to speak about him/herself and his/her immediate environment.
CO3	Become capable of interacting in simple ways, to ask simple questions to get necessary information, to reply simple questions.
CO4	Become capable of understanding and using simple instructions in their personal, academic and professional environments.
CO5	Develop skills and intelligences to function in multi-disciplinary and cross-cultural work environment.
CO6	Practice new global trends in communication in multiple perspectives at personal, professional, and social level.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO6	-	-	-	-	-	-	3	-	-	-	-	-	-	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put “-”

Recommended Study Material:

Text book:

1. Complete French: All-In-One, McGraw-Hill, Amazon
2. Best for Grammar: Easy French Step-by-Step, McGraw-Hill, Amazon

Reference book:

1. Basic French: McGraw-Hill, Amazon
2. French Grammar for Beginners, Amazon

Web material:

1. <https://alison.com/course/french-language-studies-introduction>
2. <https://alison.com/course/basic-french-language-skills-for-everyday-life-revised-2017>
3. <http://www.bbc.co.uk/languages/french/>
4. <https://www.loecsen.com/en/learn-french>
5. <https://www.youtube.com/watch?v=ujDtm0hZyII>

HSUS501 : ACADEMIC SPEAKING AND PRESENTATION SKILLS

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	30/15	--	30/15	02
Marks	--	100	--	100	

Pre-requisite courses:

- Beginner/Intermediate level language proficiency

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Foundations of Advance Communication	04
2.	Art of Conversation	06
3.	Science of Power Speaking	06
4.	Academic Speaking Application – Part I	08
5.	Academic Speaking Application – Part II	06

Total hours (Practical) :30

Total hours :30

Detail Syllabus:

1.	Foundations of Advance Communication	04 Hours	14%
	Meaning and Definition of Advance Communication; Advance Communication in Digital, Social, Mobile World; Strategies for Advance Communication; Meaning and Concept of Academic Language; High Frequency Academic Vocabulary		
2.	Art of Conversation	06 Hours	20%
	Describing people, places and things; Expressing opinions; Making suggestions; Persuading someone; Interpreting and Summarizing		
3.	Science of Power Speaking	06 Hours	20%
	Phonemes, Word Stress, Pronunciation, Intonation, Pause, Register, Fluency, Prosody, Lexical Range		
4.	Academic Speaking Application – Part I	08 Hours	26%
	Art of Oratory, Formal Presentation, Speech Analysis – Decoding Best Speeches		
5.	Academic Speaking Application – Part II	06 Hours	20%
	Job Interview, Group Discussion, Meeting		

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	understand and demonstrate advance communication and academic speaking skills
CO2	demonstrate ability to communicate in diverse situations
CO3	activate and extend their linguistic and communicative competence
CO4	demonstrate the formal presentation skills
CO5	demonstrate performing ability at group discussion and personal interview

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	2	-	3	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	-	3	-	-	-

Recommended Study Material:

Reference book:

1. *Business Communication Today* (Thirteenth Edition) by Courtland L. Bovee, John V. Thill and Roshan Lal Raina
2. *Effective Speaking Skills* by Terry O' Brien
3. *Speak Better Write Better* by Norman Lewis
4. *Well Spoken: Teaching Speaking to All Students* by Erik Palmer
5. *Let Us Hear Them Speak : Developing Speaking – Listening Skills in English* by Jayshree Mohanraj (Publisher – Sage Publication)
6. *The craft of scientific presentations: Critical steps to succeed and critical errors to avoid.* New York: Springer by Michael Alley
7. *Presentation Skills in English* by Bob Dignen (Publisher: Orient Black Swan)

Web material:

1. TED Talk : How to speak so that people want to listen
[https://www.ted.com/talks/julian treasure how to speak so that people want to liste n?language=en](https://www.ted.com/talks/julian_treasure_how_to_speak_so_that_people_want_to_listen?language=en)
2. TED Talk: The 110 techniques of communication and public speaking
[https://www.ted.com/talks/david jp phillips the 110 techniques of communication an d public speaking](https://www.ted.com/talks/david_jp_phillips_the_110_techniques_of_communication_and_publicSpeaking)

**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**M.Sc. (IT) PROGRAMME
(2nd SEMESTER)**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

Teaching & Examination Scheme
Master of Science in Information Technology (M. Sc. (IT)) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25
Semester – II

Course Code	Course Title	Teaching Scheme			Credit	Examination Scheme				Total		
		Contact Hours				Theory		Practical				
		Theory	Practical	Total		CCE	SEE	CCE	SEE			
CTUE509- CTUE512	Elective-II	3	3	6	6	50	50	50	50	200		
CTUC513	Web Development Using Open Source	2	3	5	5	50	50	50	50	200		
CTUC514	Advanced Mobile Application Development	3	3	6	6	50	50	50	50	200		
CTUC515	Full Stack Web Development	3	3	6	6	50	50	50	50	200		
HSUA501	Academic Writing	-	2	2	2	-	-	25	25	50		
	University Elective-I **	-	2	2	2	-	-	50	50	100		
		11	16	27	27	400		550		950		
*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.) *SEE- Semester -End- Evaluation												

**Student will take any university elective offered by different institutions of university.
 CMPICA has decided to offer **CAUD516-Internet and Web Designing and CAUD517-Mobile Application Development** course for others.

Elective-II	
Course Code	Course Title
CTUE509	Game Design
CTUE510	Advanced Python Programming
CTUE511	Blockchain Programming
CTUE512	HTTP Web Service for Enterprise Application

University Elective-I

Sr. No.	Course Code	Course Name	Department/Faculty
1	FTUD551	Project Management	Engineering
2	PTOD501	Fitness & Nutrition	Physiotherapy
3	MBUD557	Software based Statistical Analysis	Management
5	NROD555	First Aid & Life Support	Nursing
6	CHUD558	Introduction to Polymer Science	Applied Science
7	FTUD551	Occupational Health &Safety	Engineering
8	PH892.01	Intellectual Property Rights	Pharmacy
9	CAUD516	Internet and Web Designing	Computer Science
10	CAUD517	Mobile Application Development	Computer Science

CTUE509 - Game Design (200 Marks)

Contact Hours: 06

Pre-requisite: Knowledge of C++, physics and mathematics concepts

Methodology & Pedagogy: During theory lectures illustrations Graphics, animation and various concepts regarding Game Development. Emphasize will be given on some mathematical and physics concepts, Fundamental of Graphics and Graphics Programming, Vectors, Image Data, 2D graphics, Collision detections, Fundamental of Game programming, Gameloop, Game Engine and many more. During Practical sessions, students will be developing Simple 2D graphics, Implement animation on that graphics, Handles Input and Output of data according to event generation. Student will develop simple 2D age using Visual C++.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Basics of Graphics and Game	04	36
2	Important Aspects of Mathematics and Physics	07	
3	Graphics Programming Fundamentals	05	
4	Animation, Transformations and Collision Detection	07	
5	Actual Game Programming	09	
6	Game Engine Introduction	04	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:

Unit I: Basics of Graphics and Game **Hours 04**
The World of Computer Graphics, Current and Future Application Areas, User-Interface Considerations, History of Games and Game Development.

Unit II: Important Aspects of Mathematics and Physics **Hours 07**
Vector Addition, Subtraction, Dot Product, Cross Product, Magnitude, Finding the Normal of a Vector, Projection of one vector over another vector, Matrix and operations: Matrix Addition, Subtraction, Multiplication, Transpose, and Inverse of a Matrix, Basic Trigonometry: Meaning of Sin, Cosine, and Tan functions, Cartesian coordinate system, Polar Coordinate System, Nested Coordinate Systems Physics Concepts: Speed, Velocity, Acceleration, Mass, Force, Gravity, Friction.

Unit III: Graphics Programming Fundamentals **Hours 05**
Video Ram, Pixels and screen sizes, Graphics Card, Frame Buffer, Double Buffer, Screen, Refresh Rates (on LCD display units), Screen Resolutions, Vector Graphics and Raster Graphics, Image Data - How are images represented in a Bitmap file, Drawing images on a screen.

Unit IV: Animation, Transformations and Collision Detection **Hours 07**
Programming Simple Animations and understanding animation frame rates, Concept of Sprites in Animation, Line Drawing Algorithm, Circle Drawing Algorithm, Transformations - Translate, Rotate, Scale, Transformation Matrix, Collision detection techniques for 2D Shapes: Circle to Circle, Rectangle to Rectangle, Circle to Line, Circle to Rectangle, Line to Line.

Unit V: Actual Game Programming **Hours 09**
Application and Window Management, Input Management, File Input and Output, Audio, Programming, Game loop, Frame rate independent entity behaviors.

Unit VI: Game Engine Introduction **Hours 04**
Introduction to Game Engine, Types of Game Engines, Some of the most popular Game Engines of today: Unity, Unreal, Cocos2d-X, Box2d.

Core Books:

1. Laszlo Michael, Computational Geometry and Computer Graphics in C++, Pearson Education; First edition, 2017.
2. Roger Mayne, Introduction to Windows and Graphics Programming with Visual C++.NET, World Scientific Publishing Co. Pte. Ltd., 2005.

3. John Horton, Beginning C++ Game Programming, Packt Publishing Limited, 2016.
4. Michael Dawson, Beginning C++ Through Game Programming, Cengage; 4th edition, 2014.
5. Eric Lengyel, Foundations of Game Engine Development, Volume 1: Mathematics, Terathon Software LLC; 1 edition, 2017.

Reference Books:

1. John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley, "Computer Graphics: Principles and Practice in C", 3rd Edition, Addison Wesley Professional, 2013
2. David Conger, Ron Little, Creating Games in C++: A Step-by-step Guide, Pearson Education, 2006.
3. Fabien Sanglard, Game Engine Black Book: Wolfenstein 3D, Create Space Independent Publishing Platform; 1 edition
4. Constantine Pozrikidis, Introduction to C++ Programming and Graphics, Springer-Verlag New York Inc.; 2007
5. James M. Van Verth, Lars M. Bishop, Essential Mathematics for Games and Interactive Applications, A K Peters/CRC Press; 3rd edition, 2015

Web References:

1. <http://cplusplus.happycodings.com/computer-graphics/> [Graphics Tutorial]
2. <http://cplusplus.happycodings.com/games/> [Game Tutorial]
3. <https://www.geeksforgeeks.org/basic-graphic-programming-in-c/>
4. <https://www.thecrazyprogrammer.com/2013/04/simple-program-to-create-moving-carin.html>
5. <http://mytechnotrick.blogspot.com/2015/07/#>
6. <https://www.youtube.com/watch?v=hfBR6UL0Ojw>

Course Outcomes: Upon successful completion of the course, students will be,

C01 :	Be having basic knowledge of computer graphics
C02 :	Be familiar with tools and techniques used for graphics and game programming
C03 :	Be able to perform mathematic calculation required for game programming
C04 :	Be familiar with the various image data and shapes.
C05 :	Be able to create animated and interactive graphics which lead to develop a game

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Basics of Graphics and Game	√				
2	Important Aspects of Mathematics and Physics		√			
3	Graphics Programming Fundamentals	√		√		
4	Animation, Transformations and Collision Detection			√		
5	Actual Game Programming				√	
6	Game Engine Introduction					√

Course Articulation Matrix:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2
C01	3	2	-	1	2	-	2	1	1	-	1	1	2	3
C02	3	2	-	2	2	-	2	1	1	-	1	1	2	1
C03	3	1	1	3	2	-	2	1	1	-	2	2	2	1
C04	3	2	2	2	2	1	2	3	1	2	3	3	3	2
C05	3	3	3	2	2	1	2	3	1	3	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE510 - Advanced Python Programming

(200 Marks)

Contact Hours: 06

Pre-requisite: Basics of Programming.

Methodology & Pedagogy: Theory sessions are required to address computational power of python through its ability to deploy programs using functional, object oriented and advance python based aspects. Practical sessions demonstrate the implementation of the concepts which are taught during the theory sessions. Case study will help the students to come out with one working module in any of the advanced python programming.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Fundamentals of Python	6	36
2	Iterable Object in Python and Function	7	
3	Object oriented Programming with Python	5	
4	GUI Programming using Python	6	
5	Python libraries and Data collection	6	
6	Use of Python to develop AI based application	6	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:**Unit I: Fundamentals of Python** **Hours 06**

Introduction to Python Program, Features of Python. Environmental setup for Python Programming, Basic program structure to write Python, Data Type, Input and Output Statements, Comment in Python, If Statement with its variation, While and For Loop.

Unit II: Iterable Object in Python and Function **Hours 07**

List, Tuple, Set, Dictionary and custom iterable object What are functions, calling functions, creating functions, passing functions, formal arguments, variable length arguments, default arguments, returning values from the functions, returning multiple values from the functions.

Unit III: Object oriented Programming with Python **Hours 05**

Basics of class, object and instance. Class level attribute and instance level attribute. Constructor and other magic methods. Bound and unbound methods. Built in functions for python class and objects

Unit IV: GUI Programming using Python **Hours 06**

Introduction, Python's GUI library: Tkinter (installing and getting started), Introduction to GUI programming, top-level window, Tk widgets: Label, Button, scale, scroll bar, text, Checkbutton, Radiobutton. Developing GUI based applications using Tkinter.

Unit V: Python libraries and Data collection **Hours 06**

NumPy: Introduction, 2D arrays, Numpy array Vs. Python List. Pandas: Introduction, importing data with pandas, Data frames and Series, pre-processing phase of data analysis, handling missing values in data, formatting data to standardize it and make it consistent, normalizing data

Unit VI: Use of Python to develop AI based application **Hours 06**

ML: Introduction to machine learning- Supervised and Unsupervised Learning, Model development using Linear Regression, Model Visualization, Prediction and Decision Making, Model Evaluation: Over-fitting, Under-fitting and Model Selection
DIP: Introduction to digital image Processing, Basic function to import draw and display images using Python.

Core Books:

1. Wesley J. Chun : Core Python Programming, 2nd edition, Pentice Hall,2006.
2. Megnus Lie Hetland : Beginning Python from novice to professional, 2nd edition, Apress,2009.

Reference Books:

1. Mark Lutz : Programming Python, 4th Edition, O'reilly, 2011 .
2. Dusty Philips: Python 3 Object oriented Programming, PACKT publishing, 2010.
3. Steve Holden: Python Web Programming, 1st edition,2002.

Web References:

1. <https://developers.google.com/edu/python/> [Google's Python class]
2. <https://www.learnpython.org/> [Learnpython.org]
3. <https://docs.python.org/3/tutorial/> [Python tutorial]
4. <https://www.tutorialspoint.com/python/index.htm> [Tutorialspoint]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will be able to understand scripting and programming constructs of Python.
CO2 :	Understanding Python's iterable objects and functions.
CO3 :	Clear Understanding of the object-oriented concepts using Python.
CO4 :	Students exposed to GUI programming and Python libraries to handle data.
CO5 :	Students will learn model development using advance concepts of Machine Learning and its applications.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Fundamentals of Python	√				
2	Iterable Object in Python and Function		√			
3	Object oriented Programming with Python			√		
4	GUI Programming using Python				√	
5	Python libraries and Data collection				√	
6	Use of Python to develop AI based application					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	2	3	2	1	1	1	1	3	2
CO2	2	3	3	3	3	2	3	2	1	1	1	1	3	2
CO3	2	3	3	3	3	2	3	3	2	1	2	1	3	2
CO4	3	3	3	3	3	3	3	3	2	2	3	2	3	2
CO5	3	3	3	3	3	3	3	3	1	2	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE511 – Blockchain Programming

(200 Marks)

Contact Hours: 06

Pre-requisite: None

Methodology & Pedagogy: During the lecture sessions, the students will learn about various sub systems that work in integrated manner to make blockchain work. The teacher will introduce students to concepts of bitcoin and ethereum technologies. The students will also understand about application domains where blockchain can be applied. In the lab sessions, the students will learn to program smart contracts with solidity on ethereum platform.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to blockchain	07	36
2	Functioning of blockchain	07	
3	Bitcoin and related concepts	05	
4	Ethereum and related concepts	09	
5	Introduction to solidity programming	04	
6	Advanced concepts in solidity programming	04	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:**Unit I: Introduction to blockchain****Hours 07**

History of blockchain, Centralized, decentralized and distributed systems, Layers of blockchain, Importance of blockchain, Applications of blockchain

Unit II: Functioning of blockchain**Hours 07**

Cryptographic concepts- Symmetric key cryptography, Cryptographic hash function, Asymmetric key cryptography, Byzantine general's problem, Merkle tree, Structure of block

Unit III: Bitcoin and related concepts**Hours 05**

What is bitcoin? Working with bitcoin, Bitcoin network, Bitcoin mining, Consensus algorithms

Unit IV: Ethereum and related concepts**Hours 09**

Design of ethereum, Ethereum blockchain, Smart contracts in ethereum, Ethereum virtual machine, Ethereum eco system

Unit V: Introduction to solidity programming**Hours 04**

Ethereum networks, Geth, Solidity compiler, Web3 library, Metamask wallet, emix, Ganache, Structure of ethereum smart contract, datatypes in solidity

Unit VI: Advanced concepts in solidity programming**Hours 04**

Global variables and functions, expressions and control structures, writing smart contracts in solidity

Core Books:

1. Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda: Beginning Blockchain - A Beginner's Guide to Building Blockchain Solutions: 1st Edition: APress Publication: 2018.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder: Bitcoin and Cryptocurrency Technologies - A Comprehensive Introduction: 1st Edition: Princeton University Press: 2016.
3. Ritesh Modi: Solidity Programming Essentials - A Beginner's Guide to Build Smart Contracts for Ethereum and Blockchain: 1st Edition: Packt Publishing: 2018

Reference Books:

1. Fabian Schar, Aleksander Berentsen: Bitcoin, Blockchain, and Cryptoassets: 1st Edition: MIT Press: 2020
2. Kevin Solorio, Randall Kanna, David H. Hoover: Hands-On Smart Contract Development with Solidity and Ethereum From Fundamentals to Deployment: 1st Edition: O'Reilly Media: 2019

Web References:

1. <https://andersbrownworth.com/cms/460/blockchain/demo> [Blockchain Demo]
2. <https://ethdocs.org/en/latest/introduction/what-is-ethereum.html> [Ethereum Introduction]
3. <https://www.youtube.com/watch?v=M576WGiDBdQ> [Solidity Programming]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	The students will learn about underlying technologies of blockchain and various applications of blockchain technology.
CO2 :	The students will understand working of blockchain in detail.
CO3 :	The students will learn about how the blockchain is used to power bitcoin.
CO4 :	The students will see how ethereum utilizes blockchain.
CO5 :	The students will be able to create and deploy solidity based smart contracts on ehtereum platform.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to blockchain	√				
2	Functioning of blockchain		√			
3	Bitcoin and related concepts			√		
4	Ethereum and related concepts				√	
5	Introduction to solidity programming					√
6	Advanced concepts in solidity programming					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	3	1	2	1	2	-	-	1	1	-
CO2	3	-	2	2	2	1	1	2	1	-	-	1	2	-
CO3	2	2	3	3	3	2	2	1	2	-	-	1	2	-
CO4	3	-	3	3	3	2	3	3	1	-	1	2	3	-
CO5	3	-	3	3	3	2	3	3	2	-	2	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE512 - HTTP Web Service for Enterprise Application

(200 Marks)

Contact Hours: 06

Pre-requisite: Work experience with C#, ASP.NET MVC, MSSQL, HTML, CSS, JavaScript and have some understanding of JQuery.

Methodology & Pedagogy: During theory lectures, illustrations emphasizing the need for advance features of WEB API and ASP.NET will be covered. During Practical sessions, students will require to develop Web API using concepts of .NET framework and other pre-requisite technologies, discussed during class.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	ASP.NET Web API - Overview	4	36
2	MVC and Web API Controller with Entity Framework	8	
3	Web API Routing	4	
4	Web API (Action Formatter and Filters)	4	
5	Backend Validation with Exception Handling	8	
6	AJAX and JQuery	8	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:**Unit I: ASP.NET Web API - Overview** **Hours 04**

Introduction to RESTful WEB API, Characteristics of ASP.NET WEB API, versions of Web API, Difference among web service, Window Communication Foundation and WEB API, Test Web API Fiddler and Postman

Unit II: MVC and Web API Controller with Entity Framework **Hours 08**

Use of Web API Controller in Controller class of Web API, Functionality of Web API Controller, Difference between Web API controller and MVC controller, Action Method Naming Conventions, Action Result, MVC with WEB API, CRUD operation with Entity Framework in Web API.

Unit III: Web API Routing **Hours 04**

Routing in Web API, Routing: Convention-based Routing and Attribute based Routing, Routing and Action Execution.

Unit IV: Web API (Action Formatter and Filters) **Hours 04**

Data Formatter, Media Type Formatter, Web API Filter, Exception Filters: HttpResponseException, Exception Filters, Registering Exception Filters, HttpError

Unit V: Backend Validation with Exception Handling **Hours 08**

Model Validation with annotation, Custom Exception, recognizing need of custom Exceptions, Backend validation using Custom Exception for robustness and Data Integrity.

Unit VI: AJAX and JQuery **Hours 08**

Consume RESTful Web API through GET, POST, PUT and DELETE. Understanding JQuery and JavaScript. JQuery usage and AJAX Request configuration and parameters understanding.

Core Books:

1. Mithun Pattankar, Malendra Hurbuns, Mastering ASP.NET Web API: Build powerful HTTP services and make the most of the ASP.NET Core Web API platform 1st Edition. – 2017.

Reference Books:

1. Jamie Kurtz, Brian Wortman , ASP.NET Web API 2: Building a REST Service from Start to Finish. - 2014

Web References:

1. https://www.tutorialspoint.com/asp.net_mvc/asp.net_mvc_web_api.htm

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Be familiar with RESTful API and ASP .NET Web API.
CO2 :	Be able to implement ASP .NET Web API Controller and configure its Routing and implementing Entity Framework.
CO3 :	Be able to Configure actions in API Controllers, Filters and Formatters.
CO4 :	Be able provide Data Integrity with validations with Exceptions.
CO5 :	Be able to call API through testing applications and AJAX calls from 3 rd Party Applications.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	ASP.NET Web API - Overview	✓				
2	MVC and Web API Controller with Entity Framework		✓			
3	Web API – Routing		✓			
4	Web API (Action Formatter and Filters)			✓		
5	Backend Validation with Exception Handling				✓	
6	AJAX and JQuery					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	3	1	3	-	-	2	2	2	2	2	2	2
CO2	2	1	2	2	3	2	2	3	-	3	2	2	3	3
CO3	2	2	2	2	3	2	2	2	-	1	2	2	3	2
CO4	3	3	3	3	2	3	2	2	-	2	3	2	3	2
CO5	2	3	3	1	3	2	2	3	2	2	3	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC513 - Web Development using Open Source (200 Marks)

Contact Hours: 05

Pre-requisite: Basic understanding of HTML and MySQL.

Methodology & Pedagogy: During theory and practical sessions, students able to install & configure PHP and prerequisite software(s). Also, student will be emphasized to develop dynamic web applications.

Outline of the course:

Unit No.	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Basics of HTML and Java Script	04	36
2	Introduction to Open Source Software and PHP, Basics of PHP	03	
3	Control Structure, Function, Array and Overview of OOP in PHP	04	
4	Form Handling Using PHP	05	
5	PHP Utilities	03	
6	Relational Database Using PHP	05	

Total Hours (Theory): 24

Total Hours (Lab): 36

Total Hours: 60

Detail Syllabus:**Unit I: Basics of HTML and Java Script****Hours: 04**

Basics of HTML, Introduction of JavaScript, Variables, Overview of operators, Control statements and looping statement, Overview of DOM, function declaration and calling with event.

Unit II: Introduction to Open Source Software and PHP, Basics of PHP**Hours: 03**

Overview of Open Source Software, Installation & Configuration of PHP, Introduction to PHP, Working of HTML with PHP, PHP language Basics: Lexical Structure, Data types, Variables, Expressions and Operators.

Unit III: Control Structure, Function, Array and Overview of OOP in PHP**Hours: 04**

PHP language Basics: Control and Looping statements. Functions: Function Definition, Function Parameters, Returning Values. Strings: Usages and String Functions, Arrays: Types of Arrays and its Usages, Array functions. Overview: Objects, Declaring Class, Properties, Methods, Exception Handling, Examples.

Unit IV: Form Handling Using PHP**Hours: 05**

Capturing data with PHP Using HTML Form Elements, Send Form data using GET Method & POST Method, Receive Form data using \$_GET, \$_POST & \$_REQUEST variables, Super Global Variables, State Management Techniques: Concept of Session, starting session, modifying session variables, Un registering and deleting session variable, Concept of Cookies.

Unit V: PHP Utilities**Hours: 03**

File Uploading: Upload Single and Multiple file using PHP script, Understanding HTTP requests, Exploring and modifying HTTP responses, getting information from web server.

Unit VI: Relational Databases Using PHP**Hours: 05**

Relational Databases and SQL, Using PHP to access Databases, CRUD operations, Handling Errors.

Core Books:

1. Vikram Vaswani, PHP: A Beginner's Guide: Indian Edition, First Edition, McGraw Hill, 2009
2. Matt Doyle , Beginning PHP 5.3 , Wrox , 2010
3. Ballard and Moncur, Teach Yourself Javascript in 24 Hours, Sams Publishing, 2015

Reference Books:

1. Timothy Boronczyk , Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass): Beginning PHP6, Apache, MySQL Web Development: Wrox , 2009.
2. Lynn Beighley and Michael Morrison, Head First PHP & MySQL, First Edition, O'Reilly Publication, 2009.

Web References:

1. <https://github.com/PHPMailer/PHPMailer> [PHP Mailer Code]
2. <https://www.php.net/> [Official website of PHP]
3. <https://www.geeksforgeeks.org/php-tutorials/> [Lecture notes of PHP]
4. <https://www.w3schools.com/php/default.asp> [Lecture notes of PHP]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Gain understanding of HTML and Java Script.
CO2 :	To utilize knowledge and skills for basics of PHP and functions of PHP
CO3 :	Acquire the knowledge of array and OOP in PHP
CO4 :	Learn Form handling and utilities in PHP.
CO5 :	Be able to develop dynamic web based application using PHP and MySQL with state management techniques.

Course Outcomes Mapping: -

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Basics of HTML and Java Script	✓				
2	Introduction to Open Source Software and PHP, Basics of PHP		✓			
3	Control Structure, Function, Array and Overview of OOP in PHP			✓		
4	Form Handling Using PHP				✓	
5	PHP Utilities				✓	
6	Relational Database Using PHP					✓

Course Articulation Matrix: -

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02
C01	3	3	3	3	-	1	-	1	1	-	-	3	-	3
C02	3	3	3	3	-	1	-	1	1	-	-	3	-	3
C03	3	3	2	3	-	1	-	1	2	-	-	2	-	3
C04	3	3	3	3	-	1	-	1	1	-	-	3	-	3
C05	3	3	3	3	2	1	1	1	2	1	1	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC514 - Advanced Mobile Application Development (200 Marks)

Contact Hours: 06

Pre-requisite: Object Oriented Programming Concepts

Methodology & Pedagogy: During theory lectures illustrations emphasizing the need for basic features of Mobile Computing and Cross Platform- the Mobile Application Development platform will be given. During Practical sessions, students will be required to develop Mobile Application using Dart language in Flutter. Student shall also develop applications with elegant user interface that deal with data storage using Firebase and state management

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to Cross-platform advance with Flutter & Dart	05	36
2	UI Designing with Flutter	07	
3	State management with App creation	05	
4	Architecting Flutter applications and Its packages	08	
5	Introduction to Backend to Flutter-I	05	
6	Introduction to Backend to Flutter-II	06	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:**Unit I: Introduction to Cross-platform advance with Flutter & Dart Hours 05**

Set up a new Flutter project using Android Studio. Widget tree, Interface design: pre-made Flutter Widgets. Image and Text Widgets. App Icons for iOS and Android. Add and load image assets to Flutter projects. Run Flutter apps on iOS Simulator, Android Emulator and physical devices.

Unit II: UI Designing with Flutter**Hours 07**

Hot Reload and Hot Restart, Use of Pubspec.yaml file, custom assets and fonts. An introduction to the Widget build(), layout widgets: Columns, Rows, Containers and Cards. Material icons, Icons class. Theme widgets. Refactoring widgets. Dart annotations and modifiers. Immutability of Stateless and Stateful Widgets. Update screen with the build(). Custom Flutter Widgets. Difference between final and const in Dart. Maps, enums and the ternary operator. Functions and arguments in Dart. Multi-screen Flutter apps, routes and the Navigator widget. Flutter favours composition vs. inheritance (customizing widgets).

Unit III: State management with App creation**Hours 05**

About Stateful and Stateless Widgets, callbacks. Declarative style of UI programming, Flutter widgets react to state changes. Import Dart libraries. Variables, data types and functions in Dart. Build flexible layouts. Understand the relationship between setState(), State objects and Stateful Widgets.

Unit IV: Architecting Flutter applications and Its packages**Hours 08**

Dart package manager, Flutter compatible packages. The structure of the pubspec.yaml file. Incorporate the audio players package to play sound. Functions in Dart and arrow syntax. Refactor widgets, Flutter's philosophy of UI as code. The lists and conditionals in Dart. Classes and objects. Understand Object Oriented Dart. Dart Constructors for Flutter widgets. Design patterns to structure Flutter apps. Structuring and organizing Flutter apps.

Unit V: Introduction to Backend to Flutter-I**Hours 05**

Asynchronous programming in Dart and use of async/await. Stateful Widget lifecycle methods, Handling exceptions in dart. Null aware operators. Location data from both iOS and Android. Http package and live data from open APIs. Parse JSON data using the dart:convert library.

Unit VI: Firebase and State Management with Flutter-II**Hours 06**

State objects via the Stateful Widget. Use the TextField Widget to take user input. Pass data backwards using the Navigator widget. Hero animations in Flutter apps. Animation controller,

custom animations. The use of Dart mixins. Firebase Cloud Firestore into your Flutter apps. Authentication with Firebase Auth package.

Core Books:

1. Marco L. Napoli: Beginning Flutter: A Hands On Guide to App Development: Wrox publication: 2019.

Reference Books:

1. Eric Windmill: Flutter in Action: Edition: Manning Publication: January 2020.
2. Alessandro Biessek: Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2: Packt publication: September 2019

Web References:

1. <https://docs.flutter.dev/reference/tutorials>
2. <https://www.tutorialspoint.com/flutter/index.htm>
3. <https://www.javatpoint.com/flutter>
4. <https://flutternutorial.in/>

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	able to clear all object oriented programming and cross platform concepts
CO2 :	able to learn Flutter and Dart step by step
CO3 :	able to learn the reduce the code through native app performance, animated UI with material design and least testing
CO4 :	able to use Firebase to authenticate the users and use the remote database
CO5 :	able to build engaging native mobile apps for both Android and iOS

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to cross-platform development with Flutter and Dart	√				
2	Creating UI with Flutter	√	√			
3	Building Apps with state			√		
4	Leveraging Flutter packages and structuring Flutter applications			√		
5	Incorporating backend data with Flutter application					√
6	Integrating Flutter Application with Firebase and State Management				√	√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	3	2	1	3	-	1	-	1	-	-	1
CO2	3	1	3	2	3	1	2	1	1	-	1	1	1	2
CO3	3	-	3	1	3	1	1	2	1	-	1	1	1	2
CO4	3	3	3	3	3	1	1	3	1	-	2	2	3	1
CO5	3	3	3	1	3	1	1	3	1	1	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC515 - Full-Stack Web Development

(200 Marks)

Contact Hours: 06

Pre-requisite: Working knowledge of HTML and JavaScript

Methodology & Pedagogy: During the theory sessions students will understand the various JavaScript frameworks and its architecture, also able to comprehend MEAN stack application concepts. During the practical sessions students will learn how to reduce the amount of code you write to build rich user interface applications, Modularizing code, retrieving data from back-end- server and manipulate it.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to JavaScript and JavaScript Frameworks.	04	36
2	Directives in AngularJS	07	
3	MVW-The AngularJS way	06	
4	Introduction to NodeJS	07	
5	Working with ExpressJS Framework	06	
6	Working with Database	06	

Total Hours (Theory): 36

Total Hours (Lab) : 36

Total Hours: 72

Detail Syllabus:**Unit I: Introduction to JavaScript and JavaScript Frameworks Hours 04**

Introduction JavaScript and its DOM concepts, Arrow function, JSON Objects, JavaScript Frameworks & Libraries, MEAN.JS introduction, Architecture of MEAN.JS.

Unit II: Introduction to AngularJS Hours 07

Introduction to AngularJS, Features of AngularJS, Data Binding in angularJS, working with Expressions in angularJS, Introduction to Directives, Directive Lifecycle, Using Angular JS built-in directives, creating a custom directive, Overview of \$scope, \$rootScope.

Unit III : MVW-The Angular JS way Hours 06

MVW Architecture: Model-View-Controller and Model-View-View-Model Architecture, Introduction to AngularJS Modules – Application module & Controller modules, Attaching Properties and functions to scope, Controller in external files, AngularJS Filters, working with Angular Forms, Form events, validating Angular forms.

Unit IV : Introduction to NodeJS Hours 07

Introduction to NodeJS, Features of NodeJS, Traditional web Server Model, Node.js process Model, Installation of NodeJS, working with Node Package Manager, Command Line options, NodeJS modules – Core Modules, Creating Local modules & Exporting Local modules, Third-party modules, Creating NodeJS web server.

Unit V : Introduction to ExpressJS Framework Hours 06

Introduction to ExpressJS, Installing ExpressJS using NPM, Advantages of ExpressJS, Installing Express.js, building web server, configure routes, ExpressJS middleware's, Serve Static Resources using Express.js, working with HTTP methods of ExpressJS, ExpressJS routing, Creating RESTful API.

Unit IV : Working with Database Hour 07

Introduction to Mongo DB, Installation of MongoDB – MongoDB Server & MongoDB Shell, MongoDB Compass, MongoDB Database, Collections, and documents, Basic operations using MongoDB – Create, Insert, Update and Delete, Access MongoDB in Node.js, setting up mongoose, Connecting MongoDB, Insert, update and delete document.

Core Books:

1. Jeffry Houser : "Learn With: Angular 5, Bootstrap, and NodeJS", Kindle Edition,
2. Shyam Seshadri Brad Green: "AngularJS – Up and Running, Brad Green", Second Edition, O'REILLY
3. Basarat Ali Syed: "Beginning Node.js", Apress Publication.
4. Greg Lim : "Beginning MEAN Stack (MongoDB, Express, Angular, Node.js)", kindle Edition.

Reference Books:

1. Agus Kurniawan: "AngularJS Programming by Example 2017 Edition", Kindle Edition.
2. Adam Freeman: " Pro AngularJS 2017 Edition", Apress.
3. Krasimir Tsonev: "Node.js By Example", Packt Publishing
4. Ethan Brown: "Web Development with Node and Express", O'REILLY

Web References:

1. <http://www.w3schools.com/angular/default.asp> [Tutorial link for AngularJS]
2. <http://www.tutorialspoint.com/angularjs/> [Tutorial link for AngularJS]
3. https://www.tutorialspoint.com/angularjs/angularjs_tutorial.pdf [E-book for AngularJS]
4. <http://www.tutorialsteacher.com/nodejs/nodejs-modules> [Tutorial link for NodeJS]
5. <https://www.javatpoint.com/mean-stack-tutorial> [MEAN stack development]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Familiar with JavaScript and JavaScript frameworks.
CO2 :	Able to understand basic fundamental of AngularJS and implement Model-View-View-Model Architecture.
CO3 :	Able to create NodeJS and ExpressJS applications.
CO4 :	Able to create Restful API to access data from MongoDB.
CO5 :	Able to create Single page application and MEAN stack application.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to JavaScript and JavaScript Frameworks	√				√
2	Introduction to AngularJS		√			√
3	MVV-The Angular JS way		√			√
4	Introduction to NodeJS			√	√	√
5	Introduction to ExpressJS Framework			√	√	√
6	Working with Database				√	√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	2	-	1	-	-	-	-	1	-	-
CO2	1	2	2	1	2	-	1	1	-	1	1	2	1	2
CO3	1	-	3	1	3	-	2	1	-	-	1	2	1	1
CO4	2	2	3	2	3	2	2	3	-	2	2	3	3	3
CO5	2	3	3	2	3	2	2	3	2	2	3	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation

HSUA501 : ACADEMIC WRITING

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	30/15	--	30/15	2
Marks	--	100	--	100	

Pre-requisite courses:

- An Intermediate Guide to Writing in English for University Study
<https://www.futurelearn.com/courses/english-for-study-intermediate/4/todo/62943>

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Academic Writing and Research Process	05
2.	Anatomy of Academic Writing	05
3.	Key Academic Skills	05
4.	Accuracy in Academic Writing	05
5.	Using and Citing Sources of Ideas	05
6.	Contemporary Practices in Academic Writing	05

Total hours (Practical): 30

Total hours :30

Detail Syllabus:

- | | |
|---|---------|
| 1. Academic Writing and Research Process | 5 Hours |
| Introduction to Academic Writing, Academic Writing as a Part of Research, Types of Academic Writing, Features of Academic Writing, Importance of Good Academic Writing in various Academic Works | |
| 2. Anatomy of Academic Writing | 5 Hours |
| Academic Vocabulary, Simple and Complex Sentences, Organizing Paragraphs, The Writing Process, Adopting Academic Writing Style | |
| 3. Key Academic Skills | 5 Hours |
| Note – taking, Note – making, Paraphrasing, Summarizing | |
| 4. Accuracy in Academic Writing | 5 Hours |
| Lexical Range, Academic Language and Structures, Elements of Writing, Proof Reading, Editing, and Rewriting | |
| 5. Using and Citing Sources of Ideas | 5 Hours |
| Academic Texts and their Types, Intellectual Honesty in Academic Writing, Avoiding Plagiarism – Idea Theft, Degrees of Plagiarism, Types of Borrowing, Anatomy of Citations, Common Citation Styles | |
| 6. Contemporary Practices in Academic Writing | 5 Hours |
| Analytical Essays, Graph / Table / Process Interpretation and Description, Writing Reports and Abstract, Writing Research / Concept Papers | |

Course Outcome (COs):

At the end of the course, the students

CO1	Will have sound understanding of the concept and applications of academic writing
CO2	Will have acquired enough knowledge of academic writing style, strategy and approach
CO3	Will be able to demonstrate error free and effective academic writing
CO4	Will be able to demonstrate ability to work on project/report/paper writing
CO5	Will have the sound understanding of the Research and Research Methodology
CO6	Will be effectively communicating in diverse academic and professional settings.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO5	-	-	-	-	-	-	3	-	3	-	-	-	-	2
CO6	-	-	-	-	-	-	2	-	-	-	-	-	-	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put “-”

Recommended Study Material:

Text book:

1. Academic Writing for International Students, Routledge
2. Academic Writing: A Guide for Management Students and Researchers. Monipally, M.M. & Pawar, B.S. Sage. 2010. New Delhi
3. Effective Academic Writing Level - 1,2,3,4 (Second Edition) By: Alice Savage, Patricia Mayer, Masoud Shafiei, Rhonda Liss, & Jason Davis; Publisher: Oxford

Reference book:

1. Writing Your Thesis (2nd Edition) by Paul Oliver, Sage
2. Development Communication In Practice by Vilanilam V J, Sage
3. Intercultural Communication by Mingsheng Li, Patel Fay, Sage

Web material:

1. www.owl.psu.edu

**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**M.Sc. (IT) PROGRAMME
(3rd SEMESTER)**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

Teaching & Examination Scheme
Master of Science in Information Technology (M. Sc. (IT)) Programme
(Choice Based Credit System)

Effective from Year 2024 - 25
Semester - III

Course Code	Course Title	Teaching Scheme			Examination Scheme					
		Contact Hours			Credit	Theory		Practical		Total
		Theory	Practical	Total		Internal	External	Term Work	External	
CTUE601- CTUE603	Elective-III	3	3	6	6	50	50	50	50	200
CTUC604	Software Quality Assurance and Testing	3	3	6	6	50	50	50	50	200
CTUC605	Mini Project	-	12	12	12	-	-	200	200	400
CLUV601	Environmental Sciences	-	2	2	2	-	-	50	50	100
		06	20	26	26	200		700		900

Elective-III	
Course Code	Course Title
CTUE601	Advanced Game Development
CTUE602	Data Analytics
CTUE603	Internet of Things

CTUE601 - Advanced Game Development

(200 Marks)

Contact Hours: 06

Pre-requisite: Basics of Animation, C# Language, Mathematics and Physics concepts

Methodology & Pedagogy: During theory lectures illustrations Graphics, animation and various concepts regarding Game Development. Emphasize will be given on some mathematical and physics concepts, Fundamental of Graphics and objects creation, 3D graphics, Collision detections, Fundamental of Game programming, Game loop, Game Engine and many more. During Practical sessions, students will develop 3D games using Unity.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to Unity for Game Development	06	36
2	Tools and Resources for Game Development	06	
3	Scene Designing in Gaming	06	
4	Interface Designing in Gaming	06	
5	Rendering and Walkthrough	06	
6	Testing and Deployment of Game	06	

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:

Unit I: Introduction to Unity for Game Development Hours 06

Getting started with 3D, Coordinates, Local space versus World space, Vectors, Cameras, Polygons, edges, vertices, and meshes, Materials, textures, Shaders, Rigid Body physics, Collision detection. Essential Unity concepts, Introduction to Assets, Scenes, Game Objects, Components, Scripts, Prefabs. The Interface: Scene window and Hierarchy, Inspector, Project and Game window.

Unit II: Tools and Resources for Game Development Hours 06

The terrain editor: menu features, importing and exporting height maps, Terrain Toolset: Raise, plain and smooth the height, Paint texture, place trees, and terrain settings, creating island: use of Sun, Sea and Sand. Importing Model package. Player characters: working with inspector, Tags, Layers, Prefabs and the Inspector, Deconstructing the First Person Controller object, Parent-child issues, First Person Controller objects. Scripting basics: Variables, Functions, If Else, comments and major syntax. The FPS walker script

Unit III: Scene Designing in Gaming Hours 06

Discovering Collisions, ray casting, Adding the outpost, Opening the outpost, Collision detection and creating new assets, attaching a script. Ray casting with disabling collision detection. Prefab. Collection and HUD: Creating the battery prefab. Download, import, and place, Tagging the battery, Scale, collider, and rotation, scattering batteries, Displaying the battery GUI, Creating the GUI Texture object, Positioning the GUI Texture, Scripting for GUI change, Battery collection with triggers, Restricting outpost access, Restricting access Hints for the player, Creating the fire particle systems

Unit IV: Interface Designing in Gaming Hours 06

Interfaces and menus, Making the main menu, Adding the play button, Disabling Game Objects, Writing an OnGUI() script for a simple menu, Flexible positioning for GUIs, Adding UnityGUI buttons, Opening scenes with custom functions, GUI skin settings.

Decision time

Unit V: Rendering and Walkthrough Hours 06

Downloading assets, Making the smoke material, Particle system settings, Ellipsoid Particle Emitter settings, Particle Animator settings, Adding audio to the volcano, Volcano testing, Coconut trails, Editing the Prefab, Trail Renderer component, Updating the prefab, Performance tweaks, Camera Clip Planes and fog, Ambient lighting Instructions scene, Adding screen text, Text Animation using Linear Interpolation (Lerp), Menu return, Island level fade-in, UnityGUI texture rendering, Game win notification.

Unit VI: Testing and Deployment of Game**Hours 06**

Build Settings, Web Player, Player Settings, Web Player Streamed, OS X Dashboard Widget, OS X/Windows, Standalone, Building the game, adapting for web build, Texture compression and debug stripping, building standalone 266Indie versus Pro, building for the Web, adapting web player builds, Quality Settings, Player Input settings, sharing your work, Testing and finalizing: Public testing

Core Books:

1. Will Goldstone: Unity Game Development Essentials: Edition 2nd: Packt Publication: 2009.
2. Greg Lukosek, "Learning C# by Developing Games with Unity 5.x", 2nd Edition, Packt Publishing, 2016
3. Ashley Godbold, Simon Jackson, "Mastering Unity 2D Game Development", 2nd Edition, Packt Publishing, 2016.
4. Joe Hocking, "Unity in Action: Multiplatform game development in C#", 2nd Edition, Manning Publications, 2018
5. Sue Blackman, "Beginning 3D Game Development with Unity 4: All-in-one, multi-platform game development", 2nd Edition, Apress, 2013

Reference Books:

1. Nicolas Alejandro Borromeo: Hands-On Unity 2021, Game Development: Edition 2nd: Packt Publication: 2021.
2. Ben Tristem, Mike Geig, "Unity Game Development in 24 Hours- Sams Teach Yourself" ,2nd Edition, Paperback, December 19, 2015
3. Michelle Menard, "Game Development with Unity", Course Technology, 2013.
4. Matt Smith, Chico Queiroz, "Unity 5.x Cookbook", Packt Publishing, October 5, 2015
5. Francesco Sapiro, "Unity UI Cookbook", Packt Publishing, 2015
6. P Patrick Felicia, "Unity 5 from Zero to Proficiency: A step-by-step guide to creating your first game", CreateSpace Independent Publishing Platform, February 25, 2016
7. Matt Smith, "Unity 2018 Cookbook", 3rd Edition, Packt Publishing, August 31, 2018
8. Alan Thorn, "Mastering Unity Scripting", Packt Publishing, January 29, 2015

Web References:

1. <https://subscription.packtpub.com/search?query=unity>
2. <https://itsourcecode.com/free-projects/python-projects/mario-game-in-python-with-source-code/>
3. <http://learn.unity.com>
4. <https://unity3d.com/learn/tutorials/topics/developer-advice/how-start-your-game-development> [Game Tutorial]
5. <https://www.studytonight.com/game-development-in-2D/> [Game Tutorial]
6. <https://msdn.microsoft.com/en-us/magazine/dn759441.aspx> [Game Tutorial]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	able to gain a basic understanding of game development using Unity 3D
CO2 :	able to learn concepts such as manipulating objects, scripting, and compiling
CO3 :	able to learn graphics and visuals in game development
CO4 :	able to develop script writing for any problem and solution as game
CO5 :	able to develop full 3D game

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Unity for Game Development	√				
2	Tools and Resources for Game Development		√			
3	Scene Designing in Gaming		√			
4	Interface Designing in Gaming			√		
5	Rendering and Walkthrough				√	
6	Testing and Deployment of Game					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	1	2	-	2	1	1	-	1	1	2	3
CO2	3	2	-	2	2	-	2	1	1	-	1	1	2	1
CO3	3	1	1	3	2	-	2	1	1	-	2	2	2	1
CO4	3	2	2	2	2	1	2	3	1	2	3	3	3	2
CO5	3	3	3	2	2	1	2	3	1	3	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE602 - Data Analytics

(200 Marks)

Contact Hours: 06

Pre-requisite: CA845: Advanced Database Technologies

Methodology & Pedagogy: During theory lectures the emphasis will be given on the basics of data analytics and related tools and techniques. Students will be introduced to the concepts of data science, exploratory data analysis, supervised and unsupervised learning methods. Applications as well as research trends and future direction of data analytics will be discussed with the length. During the practical sessions, students will be introduced to tools of data analytics such as R and Python. Students will be given appropriate case studies of data analytics to get the real time exposure of data analytics.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours	Practical
1	Introduction of Data Analytics	06	
2	Exploratory Data Analysis	06	
3	Supervised & Unsupervised Learning Methods	06	
4	Deep Re-enforcement Learning	06	
5	Data visualization	06	
6	Recent trends and future directions	06	36

Total Hours (Theory): 36

Total Hours (Lab): 36

Total Hours: 72

Detail Syllabus:

Unit I : Introduction of Data Analytics	Hours 06
What is Data Science? ,Big Data and Data Science hype ,Why now? , Datafication , Current landscape of perspectives , Skill sets needed, Data Analysis cycle, Data analysis Vs Data analytics, Life cycle of data	
Unit II : Exploratory Data Analysis	Hours 06
Philosophy of EDA - The Data Science Process ,Statistical Inference , Populations and samples , Statistical modeling, probability distributions, fitting a model Introduction to R ,Basic tools (plots, graphs and summary statistics) of EDA, SQL with data life cycle, Python for EDA.	
Unit III : Supervised & Unsupervised Learning Methods	Hours 06
Supervised methods: Linear Regression , Classification Trees, Random Forest, Clustering, Support Vector Machine, Regularization, Radial Basis, Association Rule Mining, Dimensionality Reduction - Singular Value Decomposition – Principal Component Analysis	
Unit IV : Deep Re-enforcement Learning	Hours 06
Introduction to Neurons, Activation functions, single and multi-layer perceptron, back propagation, Application, Hyper-parameters and Estimation, Gradient Descent, Curiosity driven learning.	
Unit V : Data visualization	Hours 06
Introduction of data visualization, Power BI, and Tableau, ggplot+ggplot2, Seaborn.	
Unit VI : Recent trends and future directions	Hours 06
Data Visualization - Basic principles, ideas and tools for data visualization, Data Science and Ethical Issues - Discussions on privacy, security, ethics, Next-generation data scientists, Basics of Big Data analytics	

Core Books:

1. Cathy O'Neil and Rachel Schutt: Doing Data Science, Straight Talk From The Frontline, O'Reilly. 2014.
2. Jure Leskovec, Anand Rajaraman, and Jeffrey David Ullman, Mining of Massive Datasets Cambridge University Press,2nd Edition, New York, NY, USA,2014.
3. Howard B. Demuth, Mark H. Beale, Orlando De Jess, and Martin T. Hagan, Neural Network Design , paperback USA, 2nd Edition,2014.

Reference Books:

1. Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. , Probability & statistics for engineers & scientists ,9th edition, Prentice Hall,2012.
2. Haykin, S. S., Haykin, S. S., Haykin, S. S., & Haykin, S. S., Neural networks and learning machines Pearson, Vlolume 3,2009.
3. Mohammed J. Zaki and Wagner Miera Jr, Data Mining and Analysis: Fundamental Concepts and Algorithms.,Cambridge University Press. 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc17_mg24/preview [Online Data Analytics Course]
2. <https://www.itl.nist.gov/div898/handbook/eda/section1/eda11.htm> [Exploratory Data AnalysisMaterial]
3. https://datahoarder.io/Humble%20Bundle%20Books/Humble%20Book%20Bundle_%20Data%20Science%20presented%20by%20O_Reilly/doingdatascience.pdf [Data Science E-Book]
4. http://www.astro.caltech.edu/~george/aybi199/Donalek_Classif.pdf [Supervised andunsupervised methods tutorials]
5. <https://yourstory.com/2017/12/data-analytics-future-trends/> [Future Trends of Data Analytics]
6. http://www.astro.caltech.edu/~george/aybi199/Donalek_Classif.pdf [Supervised andunsupervised methods tutorials]
7. <https://yourstory.com/2017/12/data-analytics-future-trends/> [Future Trends of Data Analytics]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Describe what Data Science and Data Analytics are and the skill sets needed to be a data scientist.
CO2 :	Understand significance of exploratory data analysis in statistical and visualization aspects.
CO3 :	Understand and apply data analytics techniques such as supervised, unsupervised and EDA.
CO4 :	Understand the importance of self-learning environments
CO5 :	Able to understand the recent trends and future directions of data analytics.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction of Data Analytics	√				
2	Exploratory Data Analysis		√			
3	Supervised & Unsupervised Learning Methods			√		
4	Deep Re-enforcement Learning				√	
5	Data visualization				√	
6	Recent trends and future directions					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	1	-	-	-	2	3	1
CO2	2	2	1	1	-	1	-	-	-	-	-	2	2	1
CO3	1	3	3	2	-	1	3	-	-	-	-	2	1	1
CO4	2	1	2	2	2	1	2	-	-	-	-	2	1	2
CO5	1	1	2	3	1	-	2	-	-	-	-	3	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE603 - Internet of Things

(200 Marks)

Contact Hours: 06

Pre-requisite: -

Methodology & Pedagogy: In order to achieve the objectives and goals, students will be taught the basics of IOT with its structure, layers and applications. Fundamentals controllers are introduced which can be used to implement the IOT based projects. Students will also be introduced to interface GPIO with controllers like arduino and Raspberry PI. They can also learn to develop a desktop application and mobile application which can control the device remotely.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Hours	
		Theory	Practical
1	Introduction to Internet of Things	06	36
2	Programming Internet of Things System	08	
3	Sensors and Actuators for Internet of Things System	04	
4	IoT Connectivity Techniques	06	
5	ESP8266 and ESP32 Microcontroller for IOT	06	
6	Raspberry Pi for IOT Projects	06	

Total Hours (Theory): 36

Total Hours (Lab) :36

Total Hours:72

Detail Syllabus:

Unit I : Introduction to Internet of Things **Hours: 06**
Introduction - Overview of Internet of Things (IoT), The building blocks of IoT, Various technologies making up IoT ecosystem, IoT levels, IoT design methodology, The Physical Design and Logical Design of IoT, Functional blocks of IoT and Communication Models, Development Tools used in IoT.

Unit II : Programming Internet of Things System **Hours: 08**
Arduino / node MCU controller for IOT Programming, Embedded C data types, variables, constants and operators, programming using control statements, loops, string and array, Arduino IDE. Variables and Numbers, Looping Structures, Conditional Statements, Lists, Tuples and Dictionaries, Type Conversions, Function declaration, calling functions and passing values, Function Returning values. Exiting from functions.

Unit III : Sensors and Actuators for Internet of Things System **Hours: 04**
Interfacing with various sensors like temperature sensor, PIR sensor and ultrasonic sensor. Interfacing with servomotor, DC motor, Gas sensor.

Unit IV : IoT Connectivity Techniques **Hours: 06**
RFID, RFID Features, IoT Protocols based on Functionalities, 6LoWPAN, WiFi, Bluetooth, LPWAN, Data Protocols, MQTT, MQTT Components, MQTT Methods, MQTT Applications, SMQTT, CoAP, CoAP Message Types, CoAP Request Response Model.

Unit V : ESP8266 and ESP32 Microcontroller for IOT **Hours: 06**
Basics of Wireless Networking, Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi library, Web server- introduction, installation, configuration, Posting sensor(s) data to web server, Introduction to ESP32 microcontroller.

Unit VI : Raspberry Pi for IOT Projects **Hours: 06**
Introduction to Raspberry Pi, Why Raspberry pi, Features of Raspberry pi, Basic set up and first boot configuration, Different uses of Raspberry pi, Different Versions of Raspberry pi, Vision of Raspberry pi, Different components of the Board.

Core Books:

1. Arshdeep Bahga, Vijay Madisetti: Internet of Things: A Hands-On Approach, VPT Publication, 2014.

2. Dr. Simon Monk: Programming the Raspberry Pi: Getting Started with Python, McGraw Hill Publication

Reference Books:

1. M. Richardson, S. Wallace: Getting Started with Raspberry Pi, O'Reilly, 2012
2. Dr. Simon Monk: Programming the Raspberry Pi: Getting Started with Python, McGraw Hill Publication

Web References:

1. <https://www.tutorialspoint.com/arduino/index.htm> [Arduino Fundamentals]
2. www.tinkercad.com [Arduino Simulator]
3. <https://www.youtube.com/watch?v=UUOCh0Cby8> [Raspberry Pi - How to start programming with Python]
4. <https://www.raspberrypi.org/documentation/usage/python/> [Step by Step Programming]

Course Outcomes: Upon successful completion of the course, students will be,

C01 :	Ability to understand IOT Terminology
C02 :	Understanding IOT Programming
C03 :	Understanding use of sensors and actuators
C04 :	Learning IoT Connectivity methods
C05 :	Designing IOT projects using ESP8266 and ESP32 and Raspberry PI

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		C01	C02	C03	C04	C05
1	Introduction to Internet of Things	√				
2	Programming Internet of Things System		√			
3	Sensors and Actuators for Internet of Things System			√		
4	IoT Connectivity Techniques				√	
5	ESP8266 and ESP32 Microcontroller for IOT					√

6	Raspberry Pi for IOT Projects						✓
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Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	3	1	1	1	1	1	-	-	1	-	-
CO2	3	1	2	3	1	1	1	2	2	-	-	1	1	-
CO3	2	2	2	1	1	1	2	2	2	-	-	2	1	1
CO4	2	2	3	2	1	2	2	2	2	-	-	2	1	1
CO5	1	2	3	2	1	2	3	2	2	-	-	2	1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC604 - Software Quality Assurance and Testing

(200 Marks)

Contact Hours: 06

Pre-requisite: Software Engineering.

Methodology & Pedagogy: The theory sessions will cover the software testing concepts and practices that support the production of quality software. The practical sessions will cover the application of testing techniques at various levels of testing using manual and automated testing tools. This is

Outline of the Course:

Unit No.	Title of the Unit	Minimum Numbers of Hours	
		Theory	Practical
1	Basic concepts of Software Testing	05	36
2	White Box Testing Techniques	05	
3	Black Box Testing Techniques	07	
4	Levels of Testing	07	
5	Test Planning and Design	06	
6	Test Execution and Measurements	06	

Total Hours (Theory): 36

Total Hours(Lab): 36

Total hours : 72

Detail Syllabus:**Unit - I: Basic concepts of Software Testing Hours: 05**

Introduction to testing and its importance in software development, software testing role, responsibilities and principles, concept of quality, Verification and Validation, Design test case, Introduction to Static Techniques and Dynamic test case design techniques.

Unit - II: White Box Testing Techniques Hours: 05

Overview of White Box, Control flow testing: Statement Coverage Testing, Branch Coverage Testing, Path Coverage Testing, Conditional Coverage Testing

Data flow testing: Data Flow Anomaly, Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Terms, Data Flow Testing Criteria.

Unit - III: Black Box Testing Techniques Hours: 07

Overview of Black Box: Equivalence Class Partition, Boundary Value Analysis, Pairwise Technique, Cause Effective Graph, Decision Table.

Unit - IV: Levels of Testing Hours: 07

Introduction to functional and non functional testing

Functional Testing : Unit Testing, Integration Testing, System Testing, User Acceptance Testing. Sanity/Smoke Testing, Regression Test.

Non Functional Testing: Performance Testing, Scalability Testing, Interoperability Testing, Security Testing, Recovery Testing, Basic Testing.

Unit - V: Test Planning and Design Hours: 06

Requirements Analysis/Design : Understand the requirements, Prepare Traceability Matrix

Test Planning: Object, Scope of Testing, Schedule, Approach, Roles & Responsibilities,

Assumptions, Risks & Mitigations, Entry & Exit Criteria, Test Automation, Deliverables.

Test Cases Design: Write Test cases, Review Test cases, Test Cases Template, Types of Test Cases, Difference between Test Scenarios and Test Cases.

Test Environment setup: Understand the SRS, Hardware and software requirements, Test Data

Unit - VI: Test Execution and Measurements Hours: 06

Test Execution: Execute test cases, Defect Tracking and Reporting: Types of Bugs, Identifying the Bugs, Bug/Defect Life Cycle, Reporting the Bugs, Severity and priority.

Test Closure: Criteria for test closure, Test summary report

Test Metrics: Test Measurements, significance of Test Metrics, Metric Life Cycle, Types of Manual Test Metrics.

Core Books:

1. Sagar Naik, Piyu Tripathy: Software Testing and Quality Assurance, Theory and Practice, Wiley, 2008.
2. Paul C. Jorgensen : Software Testing: A Craftsman's Approach, 4th Edition by , CRC press, Taylor and Francis Group,2014
3. Roger S Pressman: Software Engineering – A Practitioner's Approach, 7th Edition, McGRAW HILL International Edition, 2010.

Reference Books:

1. Mauro Pezze, Michael Young: Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012.
2. Boris Beizer: Software Testing Techniques: 2nd Edition, Van Nostrand Reinhold, 1990.
3. Daniel Galin: Software Quality Assurance, Pearson Education,2004.
4. Ron Patton: Software Testing, Pearson Education, 2005.

Web References:

1. <http://tryqa.com/what-is-software-testing> [Basic of Software Testing]
2. <https://www.guru99.com/functional-testing.html> [Functional Testing]
3. <http://www.softwaretestinggenius.com/download/bgstpadmini.pdf> [Software Testing Life Cycle]

Course Outcomes: Upon successful completion of the course, the students will:

C01 :	Understand the role of testing in software development.
C02 :	Apply the test case design techniques.
C03 :	Acquire the various levels of testing.
C04 :	Document test plan and design.
C05 :	Execute test case and measure the results.

Course Outcomes Mapping :

Unit No.	Unit Name	Course Outcomes				
		C01	C02	C03	C04	C05
1	Basic concepts of Software Testing	√				
2	White Box Testing Techniques	√	√			
3	Black Box Testing Techniques	√	√			
4	Levels of Testing	√		√		
5	Test Planning and Design	√			√	
6	Test Execution and Measurements	√				√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	3	2	2	3	2	2	2	3	2
CO2	3	2	2	2	3	2	2	1	1	2	1	1	1	2
CO3	3	2	2	1	2	3	2	1	1	1	2	1	1	2
CO4	3	2	1	1	2	2	2	2	1	2	1	2	1	1
CO5	3	3	2	1	2	1	2	1	2	2	1	2	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC605 - Mini Project

(400 Marks)

Contact Hours: 12

Objective:

The main objective of this mini project is to let the students apply the programming knowledge to a real-world situation/problem and exposed the students with specific programming skills and help in developing a working model in terms of application.

Course Outcomes:

CO1:	Student will understand the implementation of concepts of SDLC and Software Engineering.
CO2:	The programming concepts they learn during their academics, it will be converted in to the actual implementations.
CO3:	Students will be exposed to understand the requirement of proposed software and implement these requirements in terms of programming logic and methods.
CO4:	Students must understand the difference between a program and professional application/product/software.
CO5:	Students will learn different categories of applications like Desktop application, Web applications, etc.

Guidelines:

Mini Project is in house project development. Every student is required to carry out Mini Project work under the supervision of a guide provided by the placement Coordinator. The guide shall monitor progress of the student continuously. A candidate is required to present the progress of the Mini Project work during the semester as per the schedule provided by the placement Coordinator.

Mini Project proposal should be prepared in consultation with project guide. It should clearly state the objectives and environment of proposed Mini Project to be undertaken. Project documentation must be with the respect to the project only. Project report should strictly follow the points suggested in format of project report. Placement coordinator will provide the format of project report. Student has to submit one copy of Mini Project to the institute. Each

Student is required to make a copy of Mini Project in CD and submit along with Mini Project report.

Evaluation:

The project must be evaluated in two aspects:

- a. Internal (100 Marks):
 - i. Reporting to internal project guide
 - ii. Incorporation of suggestions by project guide
 - iii. Internal Project viva examination
- b. External (300 Marks):
 - i. Project Report Preparation & Evaluation
 - ii. External Project Viva Examination

Course Code	Course Title	Teaching Scheme		Internal	End Semester Examination		Total
		Contact Hours	Credit	Continuous Evaluation	Report	Presentation & Viva	
	Mini Project	12	12	200	100	100	400

Web References:

1. <http://techwhirl.com/writing-software-requirements-specifications/> [For effective SRS]
2. http://www.ibm.com/developerworks/websphere/library/techarticles/0306_perks/perks2.html [For best practices of Software Project Development]
3. http://www.uacg.bg/filebank/acadstaff/userfiles/publ_bg_397_SDP_activities_and_steps.pdf [Requirement analysis guidelines]
4. <http://www.cs.wustl.edu/~schmidt/PDF/design-principles4.pdf> [Software Design Principles and Guidelines]
5. <http://www.cse.hcmut.edu.vn/~hiep/KiemthuPhanmem/Tailieuthamkhao/Effective%20Software%20Testing%20-2050%20specific%20ways%20to%20improve%20your%20testing.pdf> [For Effective Software Testing]
6. http://www.cs.uics.edu/~jbell/CourseNotes/00_SoftwareEngineering/SE_Project_Report_Template.pdf [For guidelines to prepare software project report]

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	3	3	3	3	2	2	2	3	2
CO2	3	3	3	2	3	3	3	3	3	2	2	2	3	2
CO3	3	3	3	2	3	3	3	3	3	2	2	2	3	2
CO4	3	3	3	2	3	3	3	3	3	2	2	2	3	2
CO5	3	3	3	2	3	3	3	3	3	2	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation

**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**M.Sc. (IT) PROGRAMME
(4th SEMESTER)**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

Teaching and Examination Scheme
Master of Science in Information Technology (M.Sc.(IT)) Programme
(Choice Based Credit System)

Effective from Year 2024-25

Semester-IV

Course Code	Course Title	Teaching Scheme			Credit	SEE		Total		
		Contact Hours				Continuous Evaluation	Report			
		Inst.	Industry	Total						
CTUC606	Dissertation / Project Work	2	28	30	30	400	200	200	800	

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.) *SEE- Semester -End- Evaluation

CTUC606 - Dissertation/Project Work

(800 Marks)

Contact Hours: 30

Objective:

The main objective of this Dissertation is to let the students apply the programming knowledge to a real-world situation/problem and exposed the students with specific programming skills and help in developing a working model in terms of application.

Course Outcomes:

CO1:	Student will understand the implementation of concepts of SDLC and Software Engineering.
CO2:	The programming concepts they learn during their academics, it will be converted in to the actual implementations.
CO3:	Students will be exposed to understand the requirement of proposed software and implement these requirements in terms of programming logic and methods.
CO4:	Students must understand the difference between a program and professional application/product/software.
CO5:	Students will learn different categories of applications like Desktop application, Web applications, etc.

Guidelines:

Dissertation is in house project development. Every student is required to carry out Dissertation work under the supervision of a guide provided by the placement Coordinator. The guide shall monitor progress of the student continuously. A candidate is required to present the progress of the Dissertation work during the semester as per the schedule provided by the placement Coordinator.

Dissertation proposal should be prepared in consultation with project guide. It should clearly state the objectives and environment of proposed Dissertation to be undertaken. Project documentation must be with the respect to the project only. Project report should strictly follow the points suggested in format of project report. Placement coordinator will provide the format of project report. Student has to submit one copy of Dissertation to the institute. Each Student is required to make a copy of Dissertation in CD and submit along with Dissertation report.

Evaluation:

The project must be evaluated in two aspects:

- a. Internal (200 Marks):
 - i. Reporting to internal project guide
 - ii. Incorporation of suggestions by project guide
 - iii. Internal Project viva examination
- b. External (600 Marks):
 - i. Project Report Preparation & Evaluation
 - ii. External Project Viva Examination

Course Code	Course Title	Teaching Scheme		Internal	End Semester Examination		Total
		Contact Hours	Credit		Continuous Evaluation	Report	
CTU606	Dissertation / Project	30	30	200	200	400	800

Web References:

1. <http://techwhirl.com/writing-software-requirements-specifications/> [For effective SRS]
2. http://www.ibm.com/developerworks/websphere/library/techarticles/0306_perks_perks2.html [For best practices of Software Project Development]
3. http://www.uacg.bg/filebank/acadstaff/userfiles/publ_bg_397_SDP_activities_and_steps.pdf [Requirement analysis guidelines]
4. <http://www.cs.wustl.edu/~schmidt/PDF/design-principles4.pdf> [Software Design Principles and Guidelines]
5. <http://www.cse.hcmut.edu.vn/~hiep/KiemthuPhanmem/Tailieuthamkhoa/Effective%20Software%20Testing%20-2050%20specific%20ways%20to%20improve%20your%20testing.pdf> [For Effective Software Testing]
6. http://www.cs.uics.edu/~jbell/CourseNotes/OO_SoftwareEngineering/SE_Project_Report_Template.pdf [For guidelines to prepare software project report]

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	3	3	2	3	3	3	3	3	2	2	2	3	2	-
C02	3	3	3	2	3	3	3	3	3	2	2	2	3	2	-
C03	3	3	3	2	3	3	3	3	3	2	2	2	3	2	-
C04	3	3	3	2	3	3	3	3	3	2	2	2	3	2	-
C05	3	3	3	2	3	3	3	3	3	2	2	2	3	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY, CHANGA															
Smt. Chandaben Mohanbai Patel Institute of Computer Applications															
FACULTY OF COMPUTER SCIENCE AND APPLICATIONS															
BCA, B Sc(IT), MCA, M Sc (IT) Programmes (ODD Semester)															
Academic Calendar (2024-2025)															
Week No	Month	M	T	W	T	F	S	S	Activity						
1	June	<u>24</u>	25	26	27	28	29	<u>30</u>	Commencement of New Academic Sessions of BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT-III Bridge Course for BCA-I, B.Sc.IT-I (Online Mode)						
2	July-August	<u>1</u>	2	3	4	5	6	<u>7</u>	Teaching Bridge Course for MCA-I, M.Sc.IT-I (Online Mode) Commencement Celebration for BCA-I, B.Sc.IT-I (Offline Mode)						
3		<u>8</u>	9	10	11	12	<u>13</u>	<u>14</u>	Teaching Bridge Course for MCA-I, M.Sc.IT-I(Online Mode) Commencement of Acedemic sessions for BCA-I, B.Sc.IT-I						
4		<u>15</u>	16	<u>17</u>	18	19	20	<u>21</u>	Teaching Commencement Celebration for MCA-I, M.Sc.IT-I(Offline Mode) Muharram						
5		22	23	24	25	26	<u>27</u>	<u>28</u>	Teaching Commencement of Acedemic sessions for MCA-I, M.Sc.IT-I	Expert Session					
6		29	30	<u>31</u>	1	2	3	<u>4</u>	Teaching	Expert Session					
7	August-September	5	<u>6</u>	<u>7</u>	8	<u>9</u>	10	<u>11</u>	Teaching	Workshop on Current Trends	Aarohan Club Activity				
8		<u>12</u>	13	14	<u>15</u>	16	17	<u>18</u>	Teaching	Independence Day	Vastuvit Club Activity				
9		<u>19</u>	20	21	22	<u>23</u>	<u>24</u>	<u>25</u>	Teaching	(Online Mode)	Rakshabandhan	Samarpan Club Activity			
10		<u>26</u>	27	<u>28</u>	29	30	31	<u>1</u>	Teaching	Janmashtami	Samvardhan Club Activity				
11		<u>2</u>	3	4	5	6	<u>7</u>	<u>8</u>	Teaching	Industrial Visit Samvatsari(Ganesh Chaturthi)					
12	September-October	9	<u>10</u>	11	12	<u>13</u>	<u>14</u>	<u>15</u>	Teaching	Expert Session	Tarkmanthan Club Activity				
13		16	17	<u>18</u>	19	<u>20</u>	21	<u>22</u>	Teaching	Expert Session	Vignatma Club Activity				
14		<u>23</u>	24	25	26	27	<u>28</u>	<u>29</u>	Teaching	Aavishkar Club Activity					
15		30	1	<u>2</u>	3	4	5	<u>6</u>	Teaching	Gandhi Jyanti					
16		7	<u>8</u>	<u>9</u>	10	11	<u>12</u>	<u>13</u>	Teaching	Workshop on Current Trends					
17	October-November	<u>14</u>	15	16	17	18	19	<u>20</u>	Teaching	Sessional Examination (BCA-III,V, B.Sc.IT-III,V,MCA-III,M.Sc.IT-III)					
18		<u>21</u>	<u>22</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	DIWALI VACATION						
19		<u>28</u>	<u>29</u>	<u>30</u>	<u>31</u>	<u>1</u>	<u>2</u>	<u>3</u>							
20		<u>4</u>	<u>5</u>	<u>6</u>	7	8	<u>9</u>	<u>10</u>	Teaching (Online Mode)	University Practical Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT- III)					
21	November - December	<u>11</u>	12	13	14	<u>15</u>	16	<u>17</u>	Teaching MCA-I, M.Sc.IT-I	University Practical Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT- III) (Continue) Sessional Examination(BCA-I, B.Sc.IT-I) Guru Nanak Jayanti					
22		18	19	20	21	22	<u>23</u>	<u>24</u>	Teaching MCA-I, M.Sc.IT-I	University Theory Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT- III) Sessional Examination(BCA-I, B.Sc.IT-I)					
23		<u>25</u>	26	27	28	29	30	<u>1</u>	University Theory Examination (BCA-III,V,B.Sc.IT-III,V, M.Sc.IT-III, MCA-III) (Continue) University Practical Examination(BCA-I,B.Sc.IT-I)						
24		<u>2</u>	3	4	5	6	7	<u>8</u>	Sessional Examination(MCA-I, M.Sc.IT-I)						

25	December	9	10	11	12	13	14	15	University Practical Examination(MCA-I,M.Sc.IT-I) University Theory Examination (BCA-I, B.Sc.IT-I) (Continue) icSoftComp2024 International Conference Remedial Examination of BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT-III
26		16	17	18	19	20	21	22	University Theory Examination(MCA-I,M.Sc.IT-I) Teaching Commencement of New Academic Sessions of BCA-IV,VI, B.Sc.IT-IV,VI, MCA-IV,M.Sc.IT-IV Remedial Examination for BCA-III,V, B.Sc.IT-III,B.Sc.IT-V, MCA-III and M.Sc.IT-III (Continue) AGNITIO
27		23	24	25	26	27	28	29	University Theory Examination(MCA-I,M.Sc.IT-I) Christsmas Teaching Commencement of New Academic Sessions of BCA-II, B.Sc.IT-II Remedial Examination for BCA-I, B.Sc.IT-I
28	December-January	30	31	1	2	3	4	5	Commencement of New Academic Sessions of MCA-II,M.Sc.IT-II Teaching Remedial Examination for BCA-I, B.Sc.IT-I (Continue)

SECTION - 2

VARIOUS ADMINISTRATIVE PROCESS

Payment of tuition fees or other charges

Step : 1

- Visit University web-portal click on Pay Fees :
<https://www.charusat.ac.in/student-corner> or visit
<https://charusat.edu.in:912/FeesPaymentApp/>

Step : 2

- Enter your Student ID and Pay your Fees

Step : 3

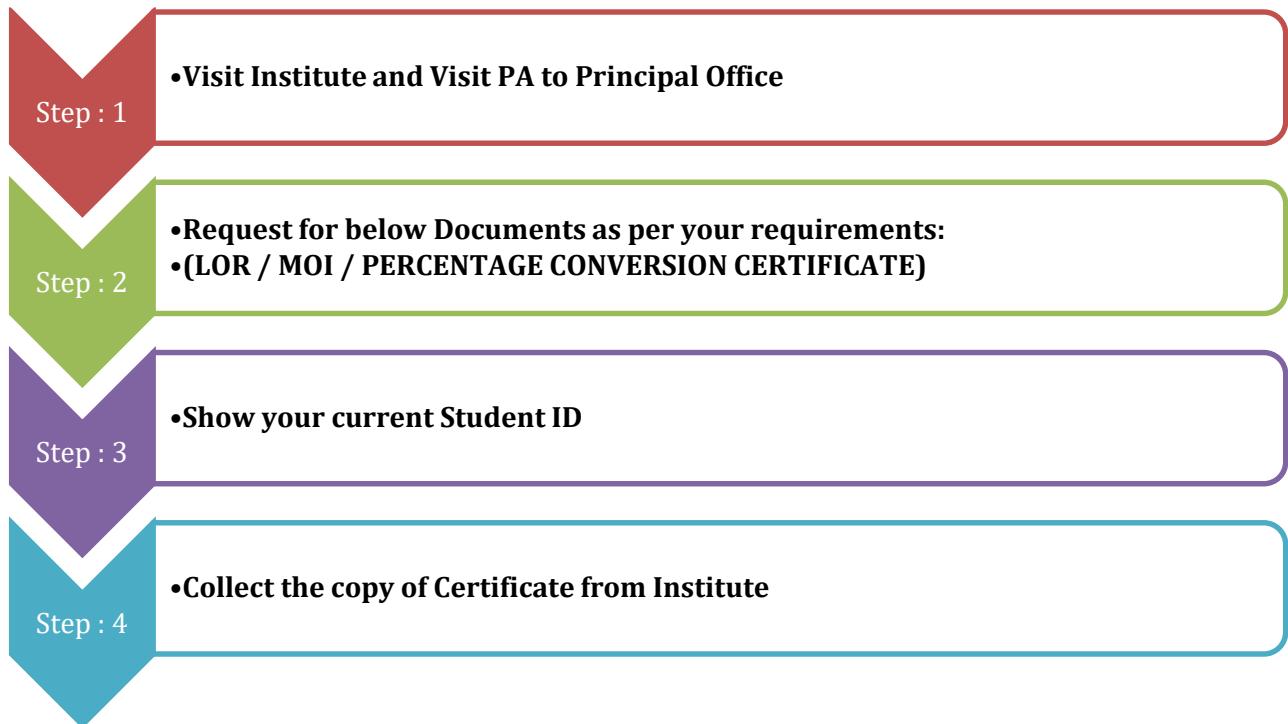
- After Successfull payment download your fees receipt

Process of Acquiring WIFI Access

To access the Wi-Fi on the Charotar University of Science and Technology (CHARUSAT) campus, students can use the following:

- **Wi-Fi enabled campus:** The entire CHARUSAT campus is Wi-Fi enabled.
- **Computers with internet:** All computers on campus have internet access.
- **Dedicated bandwidth:** Students are given a large bandwidth for internet surfing.
- **Ring connectivity:** The campus has ring connectivity to provide uninterrupted network access.

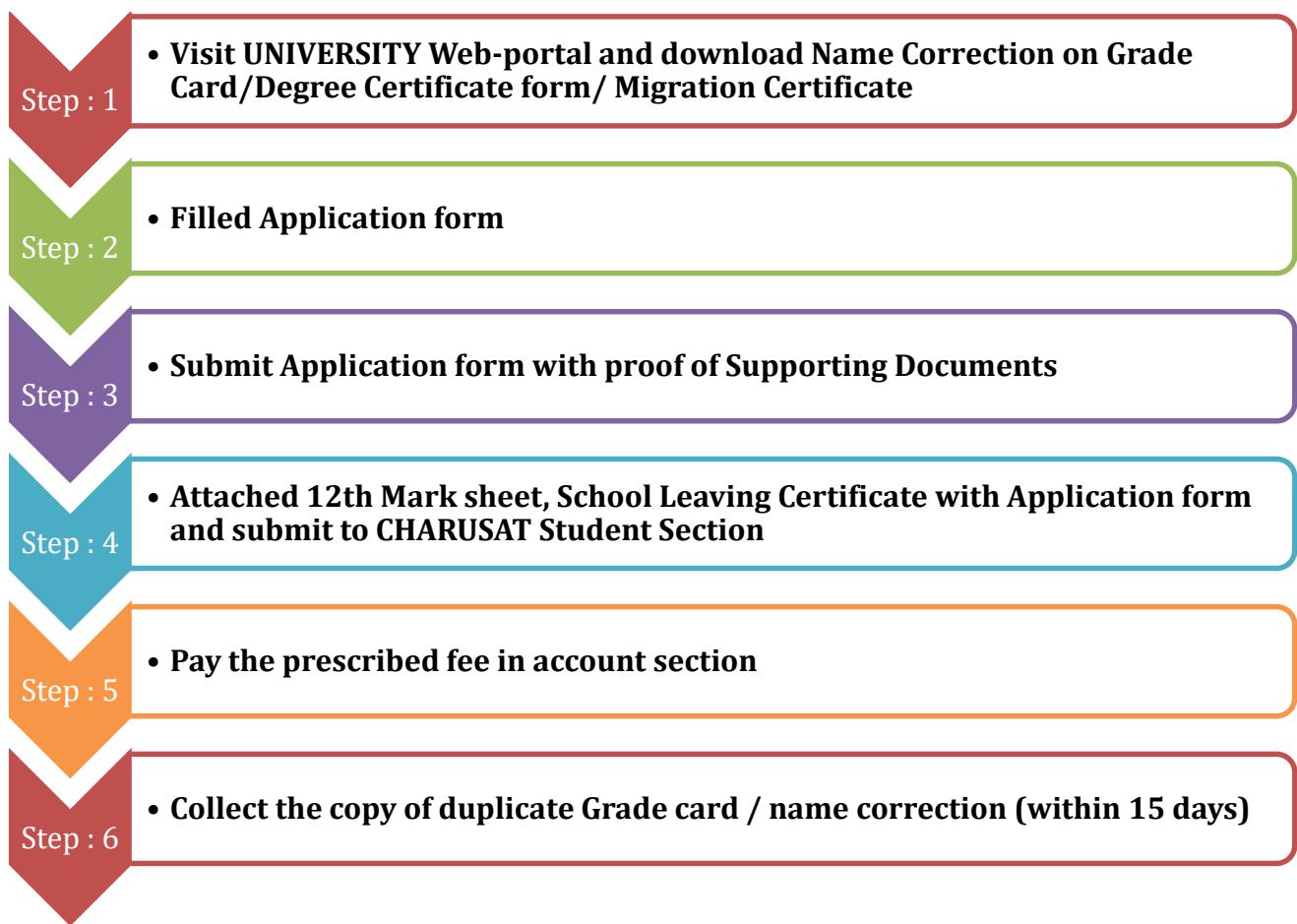
Process to obtain required Certificate from the institute



Process to obtain required Certificate from the University

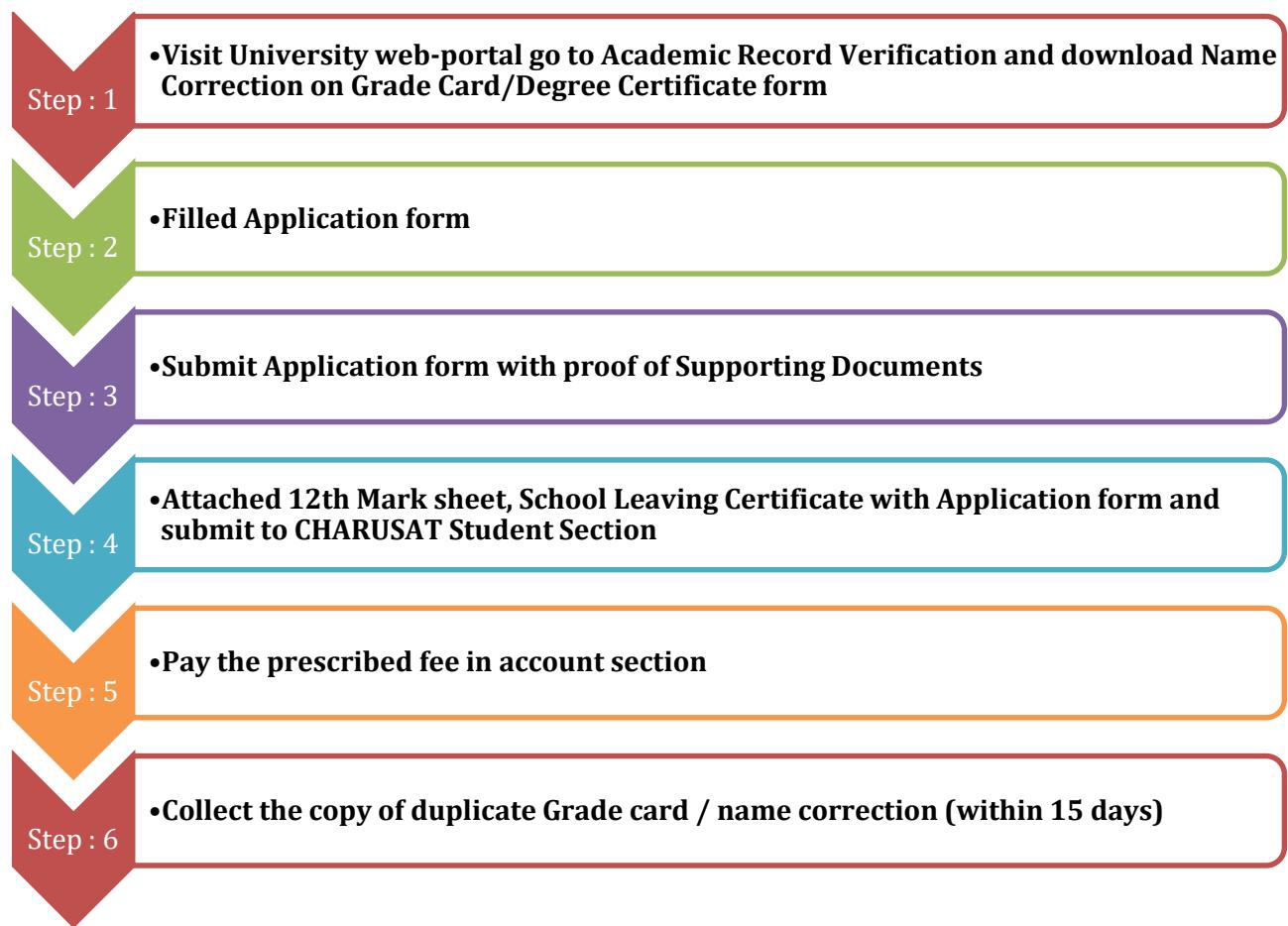
In order to obtain the required certificate at the University Level, students need to visit the Student Corner of the CHARUSAT University website. They can choose to apply online or offline and should ensure to include all necessary enclosures with their application. The application must be submitted to the Student Section of the University and should be duly attested by the relevant institute's HoD/ Principal/ Dean. Once all the necessary procedures are completed, the certificate will be issued at the University office.

Process to obtain Duplicate Grade Card/ Name correction in Grade Card/ Migration certificate

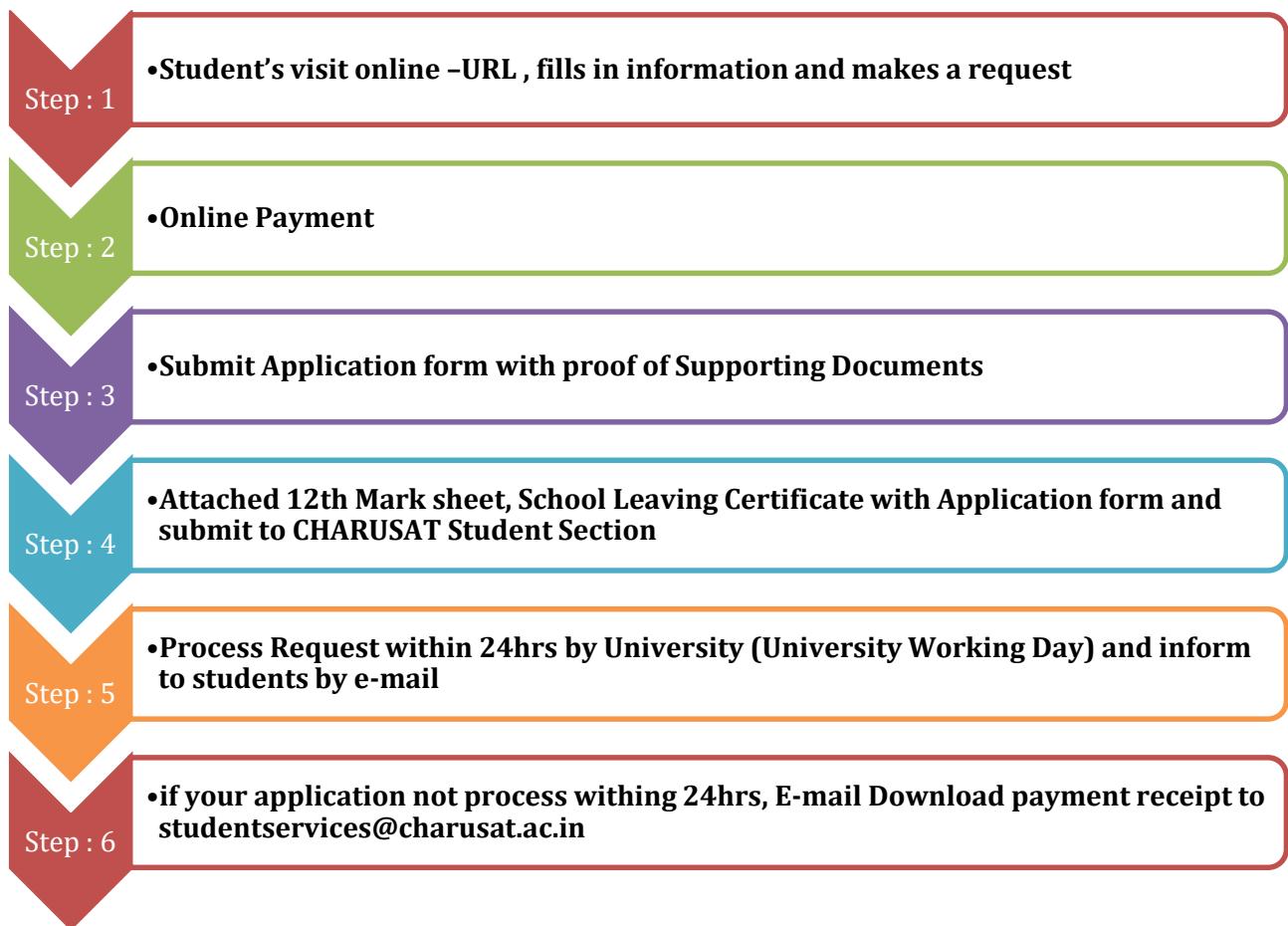


Initiator	Task
Student	Online Application Request through CHARUSAT Web Portal https://www.charusat.ac.in/student-corner Select Transcript / Duplicate Grade Card / Migration Certificate Select Document Type Migration Certificate Transcript/E-Transcript / WES Duplicate Grade Card Enter CHARUSAT Student ID Make Online Payment
Student	Pay fees at online Download Payment Receipt (for further Communication)
University Admin Office	University will get request after successful Payment (Time is depend on clearing of payment)

Process for Academic Document Verification by External Agency



Work flow



SECTION – 3

UNDERTAKINGS AND DECLARATIONS

UNDERTAKING
(Observing Rules and Regulations of the University)

Roll No. _____

I, _____ Mr. /Ms. son/daughter of _____ have secured admission at the Smt. Chandaben Mohanbai Patel Institute of Computer Applications of CHARUSAT University in the academic year for the _____ Programme. We hereby confirm that we have gone through the academic rules and regulations of the Institute very carefully and we assure you that we will abide by the same.

Student Signature : _____

Name of the Parent/Guardian : 1. _____
2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

DECLARATION
(Code of Conducts and Disciplinary Rules)

I bearing roll no. admitted in (programme) of the Institute of....., CHARUSAT University, Changa do hereby declare and undertake that I will abide by the Code of Conduct, including rules for misconduct/indiscipline by the students, provisions like dress code on the campus, rules for maintaining vehicles on the campus, public display of affection (PDA), etiquette on the campus etc.

I will abide by all the rules and regulations as and when intimated by the university and if I am found violating any rules then, I shall be subjected to the major/minor penalties as may deemed fit by the university.

Signature : _____

Name of the Parent/Guardian : 1. _____
2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

UNDERTAKING
(Observing Rules & Regulations of the Examination)

I, Roll No..... studying in the First year of programme at Institute of, CHARUSAT University, Changad hereby undertake that I have read and understood all the Rules & Regulations related to Academic Dishonesty at examinations/tests/assignments and punishment in case of using unfair means, I have also gone through the Academic Regulations related to Granting of Term and Cancellation of admission, and I shall observe, follow and abide by all these rules and regulations.

I shall abide by all the rules and regulations and if I am found violating any rules then, I shall be subjected to the necessary action/penalties as per provision of rules/regulations of the university.

Signature : _____

Name : _____

Address : _____

Signature of the Parent/Guardian : 1. _____ 2. _____

UNDERTAKING
(To Refrain from Consumption of Drugs and Alcohol)

I, _____ bearing Roll No._____ admitted in _____ (programme) at Institute of _____ do hereby declare and undertake that I will refrain myself from possession / consumption of Drugs and Alcohol.

I know that the use/possession of narcotics drugs and alcohol is a punishable offence under the law of the Government of Gujarat and if I am found guilty of using such thing/s, then it will amount to a criminal offence and I am liable for the appropriate penalty as per laws and also liable to cancel my admission from the university.

I hereby give an undertaking to the Institute that I will refrain myself from possession or consumption of Drugs and Alcohol in and around the campus.

Date :

Place :

Signature of Student

I undertake that I will take utmost care to see that my ward does not get involved in any such incident.

Name of the Parent/Guardian : 1. _____

2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____
Address of Parent/ Guardian : _____

Contact no of Parent/ Guardian : 1. _____ 2. _____

4. IMPORTANT CONTACTS

+91-02697-265011 (Last 4 digits: Extension number)

Name and Designation	Extension number & Email-id
Dr. Sanskruti Patel Dean - Faculty of Computer Application	5243 Dean.fca@charusat.ac.in
Dr. Dharmendra Patel Principal	5241 Principal.cmpica@charusat.ac.in
Mr. Harikrushna Patel P.A to Principal	5242 Haripatel.mba@charusat.ac.in
Mr. Suresh Patel Librarian	5255 sureshsolanki.mca@charusat.ac.in
Mr. Harikrushna Patel Student Section	5242 Haripatel.mba@charusat.ac.in
Shri Mukesh Yadav Dy. Registrar, Academic Section	5008 dipenpatel.rnd@charusat.ac.in
Shri Bhavdip Patel Dy. Accounts Officer, Accounts Section	5024 bhavdippatel.acc@charusat.ac.in
Dr. Abhilash Shukla Examination Section	8222 abhilashshukla.mca@charusat.ac.in
Dr. Ritesh Patel Coordinator, E-governance	5251 coordinator.egov@charusat.ac.in
Shri Ritesh Bhatt WIN Cell Coordinator	5106 riteshbhatt.win@charusat.ac.in
Mr. Sujal Dadhaniya Corporate Development & Placement Cell	5213 tpo@charusat.ac.in, tnp@charusat.ac.in
Dr. Dilip Gosai Head, Charusat Rural Education Development Programme	5160 head.credp@charusat.ac.in
Dr. Gayatri Dave Chairperson, Women Development Cell	5192 gayatridave.bt@charusat.ac.in
Dr. Mrunali Patel Chairperson, Internal Complaint Committee	5163 chairperson.icc@charusat.ac.in
Dr. Vijay Panchal Head, Equal Opportunity Cell	5081 vijaypanchal.cv@charusat.ac.in
Mr. Kautilya Pandya, Member-Secretary Student Grievance Redressal Cell	5112 kautilpandya.adm@charusat.ac.in
Dr. Vijaykumar Chaudhary Convenor, Anti-ragging Cell	5221 / vijaychaudhary.me@charusat.ac.in



CHARUSAT[®]
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

STUDENT INFORMATION BOOKLET

VOLUME – 2:

Bachelor of Computer Application

Smt. Chandaben Mohanbhai Patel Institute of
Computer Applications

CHARUSAT UNIVERSITY
Off. Nadiad-Petlad Highway, Changa - 388 421
Anand, Gujarat, India

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PREAMBLE

The Handbook (Student's Information Booklet) for Students, printed in two volumes contain General Information Respectively about the CHARUSAT University anddetailed information about Smt. Chandaben Mohanbhai Patel Institute of Computer Applications.

Handbook Volume-I contains information about general rules to be followed by the students on campus. It gives information about the general facilities and support available for the students on campus. It gives insight about the discipline and conduct rules of the University.

This Handbook (Student's Information Booklet) is for the purpose of providing information to the students about the University and its programmes and is not a Regulation book of the University. Hence, no claim can be made based on the information given in the book.

The University / Institute reserves the right to amend the rules and regulations mentioned in the Handbook without any prior notice. The decision of the University shall be final on all matters. For any clarification, the Student Section may be contacted.Handbook Volume-II (Student's Information Booklet) contains academic information about the Institute, which includes the Academic Rules and Regulations regarding academic requirements and academic conduct of the students at the University including different policies and forms. Besides, it includes important information on registration, grading system, academic standards, attendance norms, discipline and the like. The students shall abide by these rules and shall, at all times, conduct in a manner so as to bring credit to the University and enhance its prestige in the society.

It is prime responsibility of the students to get familiar (themselves) with the rules and regulations.

ABOUT INSTITUTE

Smt. Chandaben Mohanbhai Patel Institute of Computer Applications (CMPICA) is a constituent institute of CHARUSAT. It is offering a MCA, M.Sc. (IT), BCA, B.Sc.(IT), Online BCA, Online MCA and Ph. D. programmes. The vision of the institute is to become one of the leading institutions in the country by imparting state-of-the-art education to the students in the field of computer applications and by contributing in the nation's efforts of computerizing public systems for the benefit of the masses. It is committed to excel in both teaching and research. Institute is reacting rapidly to the changing technological landscape by adapting quickly. The Institute is also committed to adapt industry practices.

The institute has received numerous prestigious awards from various organizations, including AICTE, the Government of India, and the Government of Gujarat. Additionally, it has been awarded a five-star rating in the Gujarat State Institutional Rating Framework (GSIRF) by the Government of Gujarat.

ACADEMIC REGULATIONS

&

SYLLABUS 2024 -25

Faculty of Computer Science & Applications

**Smt. Chandaben Mohanbhai Patel Institute of
Computer Applications**

**Bachelor of Computer Applications (B.C.A.) Programme
(as per NEP-2020)**



Charotar University of Science and Technology (CHARUSAT)

CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad, District: Anand
Phone: 02697-247500, Fax: 02697-247100, Email: info@charusat.ac.in
www.charusat.ac.in

ACADEMIC RULES

To ensure uniform system of education, duration of under graduate programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

1. System of Education

The Semester system of education should be followed across the Charotar University of Science and Technology (CHARUSAT) at Bachelor's levels. Each semester will be at least 90 working days' duration. The Curriculum and Credit Framework for Undergraduate Programmes (CCFUP) is based on the University Grants Commission's (UGC) guidelines, with a student-centric focus, flexible choice-based credit system, and a multidisciplinary approach. This framework also provides multiple entry and exit options, facilitating students to align their education with their career aspirations by choosing subjects/fields of their interest. Every enrolled student will be required to take a specified load of course work in the chosen course of specialization and also complete a project/dissertation if any.

2. Certification and Duration of Study with Multiple Entry Multiple Exit (MEME)

The undergraduate degree will have a flexible duration of either three or four years, with multiple exit options during this period. The table below outlines the various certifications a student can earn at different stages of their undergraduate study:

Table-1 Certification and Duration on MEME

Duration of Study	Semesters Completed	Certification Earned
4 Years	Eight Semesters(4 Academic Years)	Bachelor's Degree (Honours)
		Bachelor's Degree (Honours with Research)
3 Years	Six Semesters(3 Academic Years)	Bachelor's Degree
2 Years	Four Semesters(2 Academic Years)	Undergraduate Diploma
1 Year	Two Semesters(1 Academic Year)	Undergraduate Certificate

In consonance with the National Education Policy (NEP) 2020 and the guidelines of the University Grants Commission (UGC), Charotar University of Science and Technology(CHARUSAT) implements the Multiple Entry and Multiple Exit (MEME) scheme in their Bachelor of Computer Applications(BCA) programme. This structure provides students with the flexibility to enter, exit, and re-enter the programme at various stages, each with its corresponding certification mentioned above in Table-1.

Table 2: Multiple Entry Multiple Exit options

NCrF Credit Levels	Qualification Title	Credit Requirement	Programme Exit	Additional Requirement	Re-entry to Degree Programme
4.5	UG Certificate	48	After Year 1	Completion of one 4- credit of summer internship in core specific NSQF defined course during summer vacation of Year 1	Within three years of exit
5	UG Diploma	92	After Year 2	Completion of one 4- credit	Within three years of exit

				of summer internship in core specific NSQF defined course during summer vacation of Year 2	
5.5	Three Year Bachelor Degree	132	After Year 3	Compliance with minimum credit requirements specified in regulations	Within three years of exit
6	Bachelor's Degree with Honors	176	After Year 4	Compliance with minimum credit requirements specified in regulations	NA
6	Bachelor's Degree with Honors with Research	176	After Year 4	Compliance with credit requirements as specified in regulations	NA

Students who are opting for exit at any level, shall re-enter the institution to complete the UG Degree, where they had left off. They can re-enter within three years of exit and complete the degree programme within the stipulated maximum period of seven years from the date of admission to UG programme.

3. CREDIT FRAMEWORK FOR BCA (Bachelor of Computer Applications)

Arrangement of Credit Distribution Framework for three/four years Honors/Honors with Research Degree Programme with Multiple Entry and Exit Options.

(As per GR No: KCG/admin/2023-24/0607/kh.1, Sachivalaya, Gandhinagar, Date- 11/07/2023)

	Credit Requirement for each Category
--	---

Sr.No .	Categories of Courses	Certificate (1 Year)	Diploma (2 Years)	3-Year UG	4-Year UG (Honors)	4-Year UG (Honors+Research)
1	Major - Core Courses	16	40	64	88	88
2	Minor-Discipline Specific Electives	8	12	24	32	32
3	Multidisciplinary Courses Open Electives	8	10	12	12	12
4	Ability Enhancement Courses(AEC)	4	8	10	10	10
5	Skill Enhancement Courses(SEC)	4	10	14	14	14
6	Value Added Courses (VAC)	4	8	8	8	8
7	Summer Internship/ Research Project /Dissertation	-	-	-	12	12
8	Exit Courses	4	4	-	-	
	Total	48	92	132	176	176

4. Structure of BCA (Bachelor of Computer Applications)

NCrF Credit Level	Semester	Major Core	Minor	Multi/Interior Disciplinary	Ability Enhancements Courses(AEC)	Skill Enhancement Courses(SEC)	Value Added Courses(VAC)/IKS	Research Project/Dissertation	Total	Qualification/Certificate
4.5 First Year	I	8	4	4	2	2	2	-	22	UG Certificate
	II	8	4	4	2	2	2	-	22	
1st Year Credit Total		16	8	8	4	4	4	-	44	
Exit 1: Award of UG certificate in Major course with 44 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for the next NCrF credit level										
NCrF Credit Level	Semester	Major Core	Minor	Multi/Interior	Ability Enhancements	Skill Enhancement Courses(SEC)	Value Added Courses(VAC)/IKS	Research Project/Dissertation	Total	Qualification/Certificate

5.0	III	12	-	2	2	4	2	-	22	
Second Year	IV	12	4	2	-	2	2	-	22	
2nd Year Credit Total		24	4	6	2	6	4	-	44	
Grand Total 1st and 2nd Year Credit		40	12	12	6	10	8	-	88	

Exit 2: Award of UG Diploma in Major course with 88 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for the next NCrF credit level

NCrF Credit Level	Semester	Major Core	Minor	Multicellular Disciplinary	Ability Enhancers Courses(AEC)	Skill Enhancement Courses(SEC)	Value Added Courses(VAC)/IKS	Research Project/Dissertation	Total	Qualification/Certificate
5.5	V	12	8	-	-	2	-	-	22	
Third Year	VI	12	4	-	2	4	-	-	22	
3rd Year Credit Total		24	12	-	2	6	-	-	44	
Grand Total 1st to 3rd Year Credit		64	24	12	08	16	8	-	132	

Exit 3: Award of UG Degree in Major course with 132 credits.

NCrF Credit Level	Semester	Major Core	Minor	Multicellular Disciplinary	Ability Enhancers Courses(AEC)	Skill Enhancement Courses(SEC)	Value Added Courses(VAC)/IKS	Research Project/Dissertation	Total	Qualification/Certificate
6	VII	12	4	-	-	-	-	6(OJT)	22	
Fourth Year	VIII	12	4	-	-	-	-	6(OJT)	22	
4th Year Credit Total		24	8	-	-	-	-	12	44	

Award of UG Honors Degree in Major course with 176 credits.

6	VII	12	4	-	-	-	-	6(RP)	22	
Fourth Year	VIII	12	4	-	-	-	-	6(RP)	22	
4th Year Credit Total		24	8	-	-	-	-	12	44	
Grand Total 1st to 4th Year Credit		88	32	12	08	16	8	12	176	

Award of UG Honors with Research Degree in Major course with 176 credits.

2 credit course on Community Service/NSS/NCC/Sports as a compulsory course to be undertaken by students during the initial two years of the study. This course will not affect the overall SGPA/CGPA of the students.

5. Eligibility & Mode of Admissions

Eligibility of a candidate and mode of admission to the programme will be according to the regulations for admission committee decided by Government of Gujarat from time to time.

6. Programme structure and Credits

A student admitted to a program should study the course and earn credits specified in the course structure.

7. Attendance

7.1 All activities prescribed under these regulations and listed by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student from attendance except on account of serious personal illness or accident or family calamity that may genuinely prevent a student from attending a particular session or a few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Dean/Principal.

7.2 Student attendance in a course should be 80%.

8. Course Evaluation

8.1 The performance of every student in each course will be evaluated as follows:

- 8.1.1** Continuous and Comprehensive Evaluation using various components such as Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc. by the course faculty member(s). The weightage of these components is 50% of the marks for the course; and
- 8.1.2** Semester-End-Evaluation by the University through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these, for 50% of the marks for the course.

8.2 University Examination

- 8.2.1** The final examination by the University for 50% of the evaluation for the course will be through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these.
- 8.2.2** In order to earn the credit in a course a student has to obtain grade other than FF.
- 8.2.3** Performance of Continuous and Comprehensive Evaluation(CCE) and Semester-End-Examination(SEE) Examination will be done on the grading system.

9. Grading

The student's performance in any semester will be assessed by the Semester Grade Point Average (SGPA). Similarly, his performance at the end of two or more consecutive semesters will be denoted by the Cumulative Grade Point Average (CGPA). The SGPA and CGPA are defined as follows:

Grading Scheme	96.0-100	86.0-95.9	76.0-85.9	66.0-75.9	56.0-65.9	46.0 – 55.9	36.0 – 45.9	Below 36.0	Absent
Letter Grade	O (Outstanding)	A+ (Excellent)	A (Very Good)	B+ (Good)	B (Above Average)	C (Average)	P (Pass)	F (Fail)	Ab (Absent)
Grade Point	10	9	8	7	6	5	4	0	0

SGPA = $\Sigma C_i G_i / \Sigma C_i$ where C_i is the number of credits of course i G_i is the Grade Point for the course i and $i = 1$ to n , n = number of courses in the semester.

CGPA = $\Sigma C_i G_i / \Sigma C_i$ where C_i is the number of credits of course i G_i is the Grade Point for the course i and $i = 1$ to n , n = number of courses of all semesters up to which CGPA is computed.

The minimum passing marks for each pattern of evaluation are 36% .

10. Detention Rule

A student will be promoted to next year only if he/she has cleared all the courses of the year he/she is studying in. Awards of Degree.

10.1 Every student of the programme who fulfils the following criteria will be eligible for the award of the degree:

10.1.1 He should have earned at least minimum required credits as prescribed in course structure; and

10.1.2 He should have cleared all evaluation components in every course;

11. Award of Class

The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:

Distinction:	CGPA ≥ 7 & ≤ 10
First class:	CGPA ≥ 6.0 & < 7
Second Class:	CGPA ≥ 5.0 & < 6.0
Pass Class:	CGPA < 5.0

12. Transcript

The transcript issued to the student at the time of leaving the University will contain a consolidated record of all the courses taken, credits earned, grades obtained, SGPA, CGPA, class obtained, etc.

Choice of Courses

Undergraduate students will make course selections from the various lists and that will fall into categories as outlined below:

Major Course:

This is the primary subject area a student wishes to delve into during their undergraduate course. It is the area of study that the student is most passionate about and may wish to pursue as a career.

Minor Course:

This is a secondary area of study that complements the student's chosen Major. Students who complete a sufficient number of courses in a discipline or an interdisciplinary area of study other than their chosen Major will qualify for a Minor in that discipline or interdisciplinary area.

Multidisciplinary Course:

All undergraduate students are required to complete three introductory-level courses relating to any of the broad disciplines. These courses aim to broaden the student's intellectual experience and form part of liberal arts and science education.

Ability Enhancement Course (AEC):

These are Modern Indian Language (MIL) & English language courses focused on enhancing language and communication skills. The courses aim to enable students to acquire and demonstrate core linguistic skills, including critical reading and expository and academic writing skills. The courses also emphasize the development and enhancement of skills such as communication, and the ability to participate in/conduct discussion and debate.

Skill Enhancement Courses (SEC):

These courses aim to impart practical skills, hands-on training, soft skills, etc., to enhance the employability of students. The institution may design courses as per the students' needs and available institutional resources.

Value Added Course (VAC):

These courses are designed to provide extra skills or knowledge beyond the standard curriculum, often tailored towards enhancing employability, promoting entrepreneurship, or developing personal and professional skills.

The choice based credit system provides flexibility in designing curriculum and assigning credits based on the course content and hour of teaching. The choice based credit system provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective and open elective courses. The CBCS provides a cafeteria type approach in which the students can take courses of their choice and adopt an interdisciplinary approach to learning. The courses shall be evaluated on the grading system, which is considered to be better than the conventional marks system.

Core Courses

A Course which shall compulsorily be studied by a candidate to complete the requirements of a degree / diploma in a said programme of study is defined as a core course. Following core courses are incorporated in CBCS structure:

A. University Core Courses(UC):

University core courses are compulsory courses which are offered across university and must be completed in order to meet the requirements of programme.

B. Programme Core Courses(PC):

Programme core courses are compulsory courses offered by respective programme owners, which must be completed in order to meet the requirements of programme.

Elective Courses

Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline of study or which provides an extended scope or which enables an exposure to some other discipline / domain or nurtures the candidates

proficiency / skill is called an elective course. Following elective courses are incorporated in CBCS structure:

A. University Elective Courses(UE):

The pool of elective courses offered across all faculties / programmes.

B. Institute Elective Course (IE)

Institute elective courses are those courses which any students of the University/Institute of a Particular Level (PG/UG) will choose as offered or decided by the University/Institute from time-to-time irrespective of their Programme /Specialization.

C. Programme Elective Courses (PE):

The programme specific pool of elective courses offered by respective programme.

Credit Hour Allocation for Different Course Types

Definition and Standardization

The workload associated with a course will be measured in terms of credit hours. One credit hour is equivalent to one hour of instructional time per week over the duration of a semester (minimum 15 weeks).

Types of Course Components

Courses can be comprised of one or more of the following components:

1. Lecture
2. Practicum
3. Seminar/ Internship/ Studio Activities/ Field / Practice /Projects / Community Engagement and Service

Credit Hours per Course Component

The weekly and semester-wise instructional hours associated with each credit for different components are as follows:

Credit Hours per Course Component

Course Component	Weekly Hours per Credit	Total Hours in a 15-week Semester
Lecture	1 Hour	15 Hours
Practicum	2 Hours	30 Hours
Internship, Field Practice/Projects, Community Engagement and Service/NCC/NSS/Sports	2 Hours	30 Hours

Course Categories

Courses in the study program are categorised based on the nature of the learning activities. These include:

Lecture courses: These involve expert-led sessions related to a specific field.

Practicum or Laboratory work: These apply previously learned principles/theories in practical projects or lab activities.

Internship: These involve professional activities or work experiences, typically supervised by experts from the relevant external entities.

Field practice/projects: These involve field-based learning or projects supervised by external experts.

Community engagement and service/NCC/NSS/Sports: These involve activities exposing students to societal socio-economic issues, facilitating the application of theoretical and practical knowledge to real-life problems. It also involves skills and physical fitness among students through indoor & outdoor sports, field & track events.

Vision, Mission, PEOs, POs and PSOs

Vision

To become a leading institution in the field of computer applications and contribute in national efforts of computerizing public systems

Mission

To produce competent computer professionals with the ability to face future challenges.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates will:

PEO1: Be able to understand the requirement of computing problem and implement an effective solution.

PEO2: Be able to successfully take up various available career options.

PEO3: Be able to continuously learn in their preferred domains.

PEO4: Be able to acquit themselves in ethical and professional manner while demonstrating effective skills.

PROGRAM OUTCOMES (POs)

The Graduate of Computer Science and Applications will be able to:

PO1: Computational Knowledge: Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge to provide effective solution in the area of computing.

PO2: Problem Analysis: Identify, formulate, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PO3: Design /Development of Solutions: Design and evaluate solutions for computing problems, and design and evaluate systems, components, or processes that meet specified needs by considering several societal aspects.

P04: Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools for any computing activities, with an understanding of the limitations.

P05: Professional Ethics: Understand and commit to professional ethics, responsibilities, and norms of professional computing practice.

P06: Life-long Learning: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

P07: Project management: Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

P08: Communication Efficacy: Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

P09: Societal and Environmental Concern: Understand and assess societal and environmental issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

P10: Individual and Team Work: Function effectively as an individual and as a member or a leader in diverse teams and in multidisciplinary environments.

P11: Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PROGRAM SPECIFIC OUTCOMES

At the end of the programme, the student should be able to

PSO1: Analyze, evaluate and formulate workable computing solutions to real world problems using computing methods.

PSO2: Apply proficiencies of communication, teamwork and management skills with spirit of entrepreneurship.

SALIENT FEATURES

- Four Years unique programme as per National Education Policy-2020.
- Have a flexible duration of either three or four years, with multiple exit options during this period.
- Provides students with the flexibility to enter, exit, and re-enter the programme at various stages, each with its corresponding certification.
- Award of Degree:
 - **UG Certificate** (Candidate wish to Exit after the First Year with additional requirements of 4 credits summer internship)
 - **UG Diploma** (Candidate wish to Exit after the Second Year additional requirements of 4 credits summer internship)
 - **UG Degree** (Candidate wish to Exit after the Third Year)
 - **UG Honors Degree or UG Honors with Research Degree** (Candidate finishes all Four Years)
- Programme is designed with various categories of courses such as Major, Minor, Multidisciplinary, Ability Enhancement, Skill Enhancement, Value Added, Community engagement and service/NCC/NSS/Sports based on Choice Based Credit System(CBCS).
- Focus on student-centered learning.
- Problem-based learning and industry-relevant curriculum.
- Industry visits, seminars, workshops, and guest lectures by eminent researchers and industry practitioners.
- Active student clubs and bodies.
- The multi-cultural and vibrant teaching environment.

Total Credits of Programme (8 Semesters): 176

**TEACHING SCHEME AND EXAMINATION
SCHEME**

FOR

**BCA PROGRAMME
AS PER NEP-2020**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

BCA Semester-I

Course Code	Course Name	Theory/ Practical / Others	Marks (Theory)		Marks (Practical)		Credit	NEP - 2020 Classification
			CCE	SEE	CCE	SEE		
CAUC101	Foundation of Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUC102	Fundamentals of Web Designing	Practical	-	-	25	25	02	Major Core
CAUE101	(Select any one) 1. Computer Essentials and Information Technology	Theory	50	50	-	-	04	Minor
CAUE102	2. Business Organization and Principles of Management							
CAME101	3. Computer Application in Business							
CAME102	4. Basics of Digital Marketing							
CAUD101	Digital Electronics	Theory	50	50	-	-	04	MDC
CAUS101	Mathematics for Computer Science	Theory	25	25			02	SEC
CLUV101	Environmental Sciences	Practical	-	-	25	25	02	VAC
HSUA101	Communicative English	Practical	-	-	25	25	02	AEC
CUUV101	(Select any one) Community Engagement and Sustainable Development	Practical	-	-	25	25	02	VAC
CUUV102	Physical Education and Sports							

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)

*SEE- Semester –End- Evaluation

BCA Semester-II

Course Code	Course Name	Theory/ Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CAUC103	Fundamentals of Object Oriented Programming	Theory and Practical	50	50	25	25	06 (04- Theory) (02- Practical)	Major Core
CAUC104	Database Fundamentals	Practical	-	-	25	25	02	Major Core
CAUE103 CAUE104	(Select any one) 1. Fundamentals of E-Commerce 2. Business Economics	Theory	50	50	-	-	04	Minor
CAUD102	Data Communications and Networks	Theory	50	50	-	-	04	MDC
CAUV101	Fundamentals of Accounting	Theory	25	25	-	-	02	VAC
HSUS101- 117	(Select any one) A course on Liberal Arts HSUS101 – Painting HSUS102- Photography HSUS103- Sculpting HSUS104- Pottery and Ceramic Art HSUS105-Media and Graphic Design HSUS106-Art and Craft HSUS109- Dramatics HSUS110-Contemporary Dance HSUS111-Music (Vocal) HSUS112-Music (Instrumental)-Tabla HSUS113-Music (Instrumental)-Guitar HSUS114-Music (Instrumental)- Harmonium HSUS115-Music (Instrumental)- Flute HSUS116- Indian Classical Dance- Kathak HSUS117- Indian Classical Dance- Bharatnatyam	Practical	-	-	25	25	02	SEC
CAUA101	Presentation Skills	Practical	-	-	25	25	02	AEC
CAUI101	Summer Internship and Viva - I	VIVA	-	-	50	50	04	Exit Course

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)

*SEE- Semester –End- Evaluation

BCA Semester-III

Course Code	Course Name	Theory/ Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SSE		
CAUC201	Fundamentals of Data Structures and Algorithms	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUC202	Fundamentals of Operating Systems	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUS201 CAUS202	(Select any one) 1. Computer Oriented Management System 2. Computer Oriented Numerical Methods	Theory	50	50	-	-	04	SEC
CAUA201	Life Management	Theory	25	25	-	-	02	AEC
	University Elective-I	Practical	-	-	50	50	02	MDC
HSUV201	Creativity, Problem Solving and Innovation	Practical	-	-	25	25	02	VAC

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Vivaetc.)
*SEE- Semester -End- Evaluation

University Elective - I			
Sr. No.	Course Code	Course Name	Department / Faculty
1		Art of Programming	Engineering
2		Environmental Sustainability & Climate Change	Engineering
3		ICT Resources & Multimedia	Engineering
4		Engineering Drawing	Engineering
5		Fundamentals of Packaging	Pharmacy
6		Basic Laboratory Techniques	Applied Science
7		First Aid & Life Support	Nursing
8		Health Promotion & Fitness	Physiotherapy
9		Banking & Insurance	Management
10		Introduction to MATLAB Programming	Engineering
11		Astrophysics, Space and Cosmos-1	Applied Science
12		SDG Handprint Laboratory	Engineering
13		Python Programming	Engineering
14	CAUD201	Introduction to Web Designing	Computer Science

BCA Semester-IV

Course Code	Course Name	Theory/ Practical / Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SSE		
CAUC203	System Analysis and Design	Theory	50	50	-	-	04	Major Core
CAUC204	Programming the Internet	Practical	-	-	25	25	02	Major Core
CAUC205	Open Source Technology	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUE201 CAUE202	(Select any one) 1. Advanced Networking 2. Artificial Intelligence (AI) Fundamentals	Theory	50	50	-	-	04	Minor
CAUA202	Social Media and Blog Writing	Practical	-	-	25	25	02	AEC
	University Elective-II	Practical	-	-	50	50	02	MDC
HSUV203	Indian Knowledge System	Practical	-	-	25	25	02	VAC
CAUI201	Summer Internship and Viva - II	VIVA	-	-	50	50	04	Exit Course

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
*SEE- Semester -End- Evaluation

University Elective - II			
Sr. No.	Course Code	Course Name	Department / Faculty
1		Prototyping Electronics with Arduino	Engineering
2		Web Designing	Engineering
3		Basics of Environmental Impact Assessment	Engineering
4		Internet Technology & Web Design	Engineering
5		Material Science	Engineering
6		Cosmetics in Daily Life	Pharmacy
7		Life style Diseases & Management	Nursing
8		Occupational Health & Ergonomics	Physiotherapy
9		Health Care Management	Management
10		Astrophysics, Space and Cosmos-2	Applied Science
11		MATLAB Programming	Engineering
12		Maintenance of Household Apparatus	Engineering
13	CAUD202	Programming the Internet	Computer Science

BCA Semester-V

Course	Course Name	Theory/	Marks (Theory)	Marks (Practical)	Credit	NEP -
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Code		Practical/ Others	CCE	SEE	CCE	SEE		2020 Classification
CAUC301	Object Oriented Programming Using JAVA	Theory and Practical	50	50	25	25	06 (04-Theory) (02- Practical)	Major Core
CAUC302	Fundamentals of Visual Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02- Practical)	Major Core
CAUE301	Software Engineering	Theory	50	50	-	-	04	Minor
CAUE302	Python Programming	Practical	-	-	25	25	02	Minor
CAUE303	(Select any one) 1. Introduction to Data warehousing 2. Geographical Information System	Theory	25	25	-	-	02	Minor
CAUE304								
HSUS301	French	Practical	-	-	25	25	02	SEC
*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.) *SEE- Semester -End- Evaluation								

BCA Semester-VI

Course Code	Course Name	Theory/ Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CC	SEE	CCE	SSE		
CAUC303	Project Work	VIVA	150	150	-	-	12	Major Core
CAUE305 CAUE306	(Select any one) 1. Introduction to Data Science 2. Fundamentals of Digital Image Processing	Theory	50	50	-	-	04	Minor
CAUS301	Mobile Application Development	Theory and Practical	25	25	25	25	04 (02-Theory) (02-Practical)	SEC
HSUA302	Professional Communication, Soft Skills and Personality Development	Practical	-	-	25	25	02	AEC

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
*SEE- Semester -End- Evaluation

BCA Semester-VII

Course Code	Course Name	Theory/ Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CAUC401	Enterprise Computing using Java EE	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUC402	Advanced Database Technologies	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUE401 CAUE402 CAUE403	(Select any one) 1. Cloud Computing 2. Blockchain Essentials 3. Cryptography and Network Security	Theory	50	50	-	-	04	Minor
CAUP401 CAUR401	(Select any one) 1. OnJobTraining-I 2. Research Project-I	VIVA	-	-	75	75	06	Research Project / Dissertation

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
*SEE- Semester -End- Evaluation

BCA Semester-VIII

Course Code	Course Name	Theory/ Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CAUC403	Full Stack Web Development	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUC404	Advanced Mobile Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUE404	Web Development Using Open-Source Technologies	Practical	-	-	25	25	02	Minor
CAUE405 CAUE406 CAUE407	(Select any one) 1. Python Framework 2. HTTP Web service for Enterprise Applications 3. Game Development using Unity	Practical	-	-	25	25	02	Minor
CAUP402 CAUR402	(Select any one) 1. On Job Training-II 2. Research Project-II	VIVA	-	-	75	75	06	Research Project/Dissertation

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Vivaetc.)
 *SEE- Semester –End- Evaluation

DETAILED SYLLABUS

Faculty of Computer Science & Applications
Smt. Chandaben Mohanbai Patel Institute of
Computer Applications

**BCA PROGRAMME
AS PER NEP-2020**



**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**BCA PROGRAMME
(1st SEMESTER)
AS PER NEP 2020**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

BCA Semester-I

Course Code	Course Name	Theory/ Practical / Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CAUC101	Foundation of Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUC102	Fundamentals of Web Designing	Practical	-	-	25	25	02	Major Core
CAUE101	(Select any one) 1. Computer Essentials and Information Technology	Theory	50	50	-	-	04	Minor
CAUE102	2. Business Organization and Principles of Management							
CAME101	3. Computer Application in Business							
CAME102	4. Basics of Digital Marketing							
CAUD101	Digital Electronics	Theory	50	50	-	-	04	MDC
CAUS101	Mathematics for Computer Science	Theory	25	25			02	SEC
CLUV101	Environmental Sciences	Practical	-	-	25	25	02	VAC
HSUA101	Communicative English	Practical	-	-	25	25	02	AEC
CUUV101	(Select any one) Community Engagement and Sustainable Development	Practical	-	-	25	25	02	VAC
CUUV102	Physical Education and Sports							
*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.) *SEE- Semester -End- Evaluation								

CAUC101: Foundation of Programming

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/Contact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
02	Practical	04	60	40	100
Experiential Learning Components (Theory): Unit Tests, Assignments, Case Study etc.					
Experiential Learning Components (Practical): Lab Assignments, Practical Test, VIVA , certification courses, development of projects etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: In theory lectures, students will develop problem-solving skills through algorithms and flowcharts, understanding C programming's structure to create basic programs. The curriculum covers conditional and iterative statements, array manipulation, and user-defined functions, with advanced topics like pointers and structures. Emphasis is placed on hands-on experience, focusing on algorithmic thinking and creating flowcharts. Students will learn to write effective C code, mastering variables, input/output operations, and advanced concepts, promoting independent learning and real-world application.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Programming Basics	08
2	Introduction to C	12
3	Expressions and Control Statements	10
4	Arrays and Strings	10
5	Introduction to Functions	10
6	Pointers & Basic of the structures	10

Total Hours (Theory): 60
Total hours (Practical): 60
Total Contact Hours:120

Detail Syllabus:

Unit I: Programming Basics	Hours 08
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Introduction to algorithm, Key features of algorithm, Introduction to flow charts, Significance of flow chart, Advantages and limitation of flow chart, Introduction to programming languages, Introduction to editor, compiler, and translator.

Unit II: Introduction to C	Hours 12
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Introduction, characteristics of C, Structure of C Program, writing first C program, Files used in C program, Compiling and Executing C program. Basic data types in C, User define data types, Variables in C, Declaring and initializing variables in C, Constants, Input / Output statements in C, Operators - arithmetic, relational, logical, assignment, increment - decrement, conditional, Bitwise, comma operator, size-of operator, operator precedence chart.

Unit III: Expressions and Control Statements	Hours 10
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Arithmetic expressions, evaluation of expressions, type conversions in expressions, operator precedence and associativity, mathematical functions. Type conversion and casting; Introduction to decision control statements, Conditional and branching statements, loop, nested loop, Break, continue and go to statement.

Unit IV: Arrays and Strings	Hours 10
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Arrays: One-dimensional, two-dimensional, Handling of Character Strings: Declaring and initializing string variables, reading string from terminal, writing string to screen, string handling functions, table of strings.

Unit V: Introduction to Functions	Hours 10
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Need for user-defined functions, the form of c function, return values and their types, calling a function, category of functions, handling of non-integer functions, nesting of Functions, recursion, functions with arrays.

Unit VI Pointers & Basic of the structures	Hours 10
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Understanding the Computer's Memory, Introduction to Pointers, Declaring Pointer Variables, Pointer Expressions and Pointer Arithmetic, Null Pointers, Generic Pointers, passing arguments to Function using Pointers, Pointers and Arrays, passing an Array to a Function, Difference between Array name and Pointer, Pointers and Strings, Array of Pointers, defining a structure, declaring structure variables, accessing structure members, structure initialization.

Outline of the Course:

Week No	Practical	Description
1	Introduction to Programming and IDE	Overview of programming languages, algorithms, flowchart, Setting up the development environment, Introduction of development environment.
2-3	Basic of C programming	Structure of C Program, writing first C program, Files used in C program, Compiling and Executing C program; Basic data types in C. Variables in C, Declaring and initializing variables in C, Constants, Input / Output statements in C
4-5	Operators, Expressions evaluation & type conversions.	Operators - arithmetic, relational, logical, assignment, increment - decrement, conditional, Bitwise and special, comma operator, size-of operator, operator precedence chart. Arithmetic expressions, evaluation of expressions, type conversions.
6-7	Decision-making statements and looping statements	Decision-making statements (if, else if, else) and nested decision-making statements, Switch statement, Looping statements (for, while, do-while), nested looping statements Break and continue statements.
8-9	Arrays	Understanding arrays, one-dimensional array, two-dimensional arrays, practical exercises of one-dimensional and two-dimensional array.
10-11	String and String functions	Declaring and initializing string variables, reading string from terminal, writing string to screen, string-handling functions.
12-13	User defined functions	Introduction to functions, Function declaration, definition, and calling, Parameters and return values. Scope and lifetime of variables, Recursion.
14-15	Pointers & Structures	Introduction to pointers, Pointers and arrays, Pointer arithmetic, Defining and declaring structures, Accessing structure members

Core Books:

1. ReemaThareja: Computer Fundamentals and Programming in C, 2nd Edition, Oxford University press, 2017
2. PradipDey and Manas Ghosh. "Programming in C", Second Edition, Oxford University Press.
3. E. Balagurusamy: Programming in C, 7th Edition.

Reference Books:

1. Brian W. Kerighan and Dennis M. Ritchie : The C Programming Language,Prentice Hall.
2. PradipDey, Manas Ghosh: Programming in C, 4th Edition, Oxford University press.
3. Herbert Schildt: The complete reference C, Fourth edition, Tata McGraw Hill
4. YashwantKanetkar: Let us C, 13th Edition, BPB publication.

Web References:

1. <https://cprogrampracticals.blogspot.com/p/basic-concepts.html> [For basic c programing]
2. practical]
3. <https://www.programtopia.net/c-programming/docs/operators-expressions> [For operators and expressions in C]
4. <https://www.javatpoint.com/functions-in-c> [For functions]
5. <https://www.programiz.com/c-programming> [For basic c programing practical]
6. <https://www.javatpoint.com/c-pointers> [pointers in c]
7. <https://www.programiz.com/c-programming/c-structures> [structures in c]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Be able to solve problems using algorithms and flowcharts.
CO2 :	Learn about the structure of C program and able to develop simple programs using the C Programming language with data types, variables and constants.
CO3 :	Gain the knowledge of different conditional and iterative statements and expressions.
CO4 :	Explore the utilization and manipulation of numbers and characters arrays both.
CO5 :	Be able to understand user define function. Also, learn Programming-using Array with Pointer and Structure.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Programming Basics	√				
2	Introduction to C		√			
3	Expressions and Control Statements			√		
4	Arrays and Strings		√	√	√	
5	Introduction to Functions		√	√		√
6	Pointers & Basic of the structures		√			√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	3	2	2	1	2	2	2	1	1	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	2	2	3	3	2	2	2	2	1	1	1	3	2
CO4	3	3	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	2	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC102: Fundamentals of Web Designing

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/Contact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
02	Practical	04	60	40	100
Experiential Learning Components: Lab Assignments, Practical Test, VIVA					

Prerequisites: Basic concepts of web.

Methodology, Pedagogy & Andragogy: This course focuses on providing hands-on experience to students for design and develop entire web sites using several web designing tools and HTML scripting language.

Outline of the Course:

Week No	Practical	Description
1	Basic Construction of an HTML & HTML5 Page, HTML Text Editors, HTML Building blocks.	Learn basic concepts of web page design.
2	Basic HTML tags - Text formatting tags, Heading tags, paragraph tags, division tag, Span tags, Break line tag, Binding space in HTML.	Get familiar with different tags and attributes which is used to add the text in a web page.
3	Controlling Font size and color, Adding Table – Table tag.	Learn user interface designing using Table Layout, change font style, color etc.
4	Grouping and merging table rows and columns. Adding List – ordered, unordered and definition list.	Able to display the data in various formats and design different types of list in the table.
5	Adding Image, Adding links - Changing link colors, Email link.	Learn to add images and link in the web page.

6	Embedding audio and video, Adding Field sets.	Able to add multimedia in web page using internal and external methods.
7	Adding Form: Form tag, Action, Method. Basic form controls.	Learn basic form elements and when and where to apply it.
8	Textbox, Password field, Radio Button, Checkbox, Multiple line text area, file upload.	Use various types basic form controls with types of form input elements.
9	Various types of buttons – submit, reset, image, simple button.	Learn various types of buttons to make it more interactive.
10	HTML5 input elements - Color, Number, Date, Month.	Learn new input types in HTML5.
11	Week, Time, date time-local, Email, url, range, search.	Learn to add defining inputs and minimum and maximum range to make the form attractive.
12	Data list, output, progress, meter.	Learn to add list and provide progress horizontal view and range with output.
13	Regular expression, HTML5 new attributes – Placeholder, Required.	Learn HTML 5 form element to provide user side web form validation.
14	Pattern, Autocomplete, Autofocus, novalidate, form novalidate.	Learn HTML 5 new form properties.
15	Form action, form method, spellcheck, content editable.	Learn HTML 5 to user submit the form and redirect the form data to selective method.

Total hours: 60

Text Books:

1. Powel Thomas: HTML - The Complete Reference, 3rd Edition, McGraw-Hill Education – Europe,2018.
2. DT Editorial Services: HTML 5 Black Book,2nd Edition, Dreamtech Press, 2016
3. Matt West: HTML 5 Foundations, Wiley publication, 2013
4. Farrar: HTML Example book, BPB,2007.

Reference Books:

1. David DuRocher : HTML and CSS QuickStart Guide, Paperback,2021.
2. Laura Lemay, Rafe Colburn, Jennifer Kyrnin : Mastering Html, CSS & JavaScript Web Publishing, Paperback, 2016.
3. Whyte: Basic HTML, 2nd Edition, Payne-Gallway, Oxford, 2003.
4. Shelly Woods: HTML introductory concepts and techniques, 5th Edition, Course Technology,2009.
5. Jon Dukett: Beginning Web Programming with HTML, XHTML and CSS, Wrox Publication.

Web References:

1. www.w3schools.com/html [For HTML tutorials]
2. html.net/tutorials/html/ [For HTML tutorials]
3. www.htmlgoodies.com/ [For HTML resources]
4. <https://developer.mozilla.org/en-US/learn/html> [For HTML best practices]

Course Outcome: Upon successful completion of the course, student will:

CO1:	Able to understand basic construction of HTML & HTML5 document and started using basic tags.
CO2:	Able to Add content using various tags and format the content in table & list.
CO3:	Able to design links and multimedia elements such as image, audio, video.
CO4:	Able to design a web page form using HTML & HTML5.
CO5:	Able to apply validation using HTML5 attributes.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	2	1	3	2	2	1	1	-	1	1	1	1
CO2	-	1	2	3	1	3	1	-	-	2	2	2	2
CO3	1	1	2	3	1	3	1	-	-	2	2	2	2
CO4	1	1	2	3	1	1	1	1	-	1	-	1	1
CO5	2	2	3	3	2	3	3	2	1	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE101: Computer Essentials and Information Technology

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/Contact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: Operating System Concepts and Network Technology

Methodology, Pedagogy & Andragogy: During lectures covering these topics, students will: Understand computing's historical evolution and key figures. Grasp computer organization, architecture, and processor functions. Learn storage technologies and memory management for optimization. Acquire basics of input/output devices for computer interaction. Explore Internet and Web fundamentals and emerging trends. Facilitate discussions, integrate real-world examples, and encourage self-directed exploration of advanced computing concepts. Adapt teaching strategies to cater to diverse learning styles and levels of expertise in the rapidly evolving field of computing.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Computers: History and Evolution of Computing	10
2	Understanding of Computer Organization, Architecture and Processor	10
3	Computers Storage and Memory Management	11
4	Fundamentals of Input and Output Devices	11
5	Concepts of Internet and World Wide Web	10
6	Emerging Fundamentals of Computing Environment	08

Total Hours (Theory): 60

Total Contact Hours:60

Detail Syllabus:**Unit I: Introduction to Computers: History and Evolution of Computing** **Hours 10**

Introduction to computer, Simple model of a computer, Computer Hardware, Computer Software, Characteristics of computers, Evolution of computers, Generation of computers, Classification of computers, computing concepts, The computer System, Applications of computers.

Unit II: Understanding of Computer organization, Architecture and Processor **Hours 10**

Introduction to computer organization, Central Processing Unit, Introduction to processor, Internal communications, Inter connection of units, Processor to memory communication, I/O Devices to processor communication, The Bus, Instruction set.

Unit III: Computers Storage and Memory Management **Hours 11**

Introduction to computer storage, Memory cell, Memory organization and Memory Representation, Random access memory, Read only memory, Storage system, Magnetic storage system, Optical storage system, Magneto optical system, Solid-state storage system, Storage evaluation criteria, Memory Hierarchy.

Unit IV: Fundamentals of Input and Output Devices **Hours 11**

Introduction to Input device, Traditional computer I/O devices: Keyboard, Computer mouse, Display unit. Other Input devices: Touch pad, Touch Screen, Magnetic Ink Character Recognition (MICR), Optical Mark Reading and Recognition (OMR), Flatbed Scanner, Optical Character Recognizer, Bar Code. Computer Output Devices: Flat Panel Display Technology, E-ink Display, Printers, Inkjet Printers, Laser Printers, Dot Matrix Printers, Line Printers, Plotters. Digital Camera, Voice Recognition System.

Unit V: Concepts of Internet and World Wide Web **Hours 10**

Introduction to Internet, History of Internet, Internet applications, Understanding the World Wide Web, Browsing Internet, Using a Search Engine, Email Service. Web Concepts: Web Browser, HTML, Web Page, Website, Web Server, ISP, Hyperlink, DNS, URL. Internet Protocols: TCP/IP, SMTP, PPP, FTP, SFTP, HTTP and HTTPS, TELNET, POP3, IPV4, IPV6, ICMP, UDP, IMAP, SSH, Gopher.

Unit VI: Emerging Fundamentals of Computing Environment **Hours 08**

Overview of computing environment, Current computing scenario, Types of computing environment: Personal computing environment, Time-sharing computing environment, Client-Server computing environment, Distributed computing environment, Grid computing environment, Cloud computing environment, Cluster computing environment. Advantages and Disadvantage of various computing environment.

Core Books:

1. E Balagurusamy: Fundamentals of Computers: Tata McGraw Hill Education Private Limited
2. V.Rajaraman, Neeharika Adabala: Fundamentals of Computers: PHI, 2015.
3. Margaret Levine Young: The Complete Reference- Internet: Tata McGraw Hill Education Private Limited

Reference Books:

1. Computer Fundamentals: Pradeep K. Sinha & Priti Sinha" by Pradeep K. Sinha and Priti Sinha
2. Computers Made Easy: From Dummy to Geek" by James Bernstein
3. Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy

Web References:

1. <https://artoftesting.com/computer-fundamentals-tutorial>

Course Outcomes: Upon successful completion of the course, students will be,

C01 :	Students will gain an understanding of the historical progression and evolutionary milestones in computing.
C02 :	Students will comprehend computer organization, architecture, and processor functionalities.
C03 :	Students will learn about computer storage mechanisms and memory management techniques.
C04 :	Students will grasp the fundamentals of various input and output devices utilized in computing.
C05 :	Students will acquire knowledge about the concepts underlying the Internet and the World Wide Web.
C06:	Students will explore the emerging trends and principles shaping the contemporary computing environment.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes					
		C01	C02	C03	C04	C05	C06
1	Introduction to Computers: History and Evolution of Computing	√					
2	Understanding of Computer Organization, Architecture and Processor		√				
3	Computers Storage and Memory Management			√			
4	Fundamentals of Input and Output Devices				√		
5	Concepts of Internet and World Wide Web					√	
6	Emerging Fundamentals of Computing Environment						√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	-	3	3	2	2	-	-	1	-
CO2	3	1	1	-	3	1	3	1	2	2	1	3	2	-
CO3	3	2	1	2	1	3	3	2	2	2	-	3	2	-
CO4	3	3	2	3	1	3	3	2	2	2	3	-	1	-
CO5	3	3	3	3	1	3	3	3	2	2	2	-	3	1
CO6	3	2	3	1	2	3	-	2	2	3	3	2	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE102 : Business Organization and Principles of Management

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During theory lectures the emphasis will be given on the fundamentals of business organization and principles of management. Students will be introduced to business ownership, business services, emerging models of business, business ethics and its social responsibilities, and entrepreneurship development. Students will give practical exposure in form of case study and by visit to Entrepreneurship and Innovation Centre.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Forms of Business Ownership	09
2	Business Services	11
3	Emerging Modes of Business	09
4	Principles of Management	11
5	Business Ethics and its Social Responsibilities	09
6	Entrepreneurship Development	11

Total Hours (Theory): 60
Total Contact Hours:60

Detail Syllabus:**Unit I : Forms of Business Ownership** **Hours 09**

Sole proprietorship, Joint Hindu Family Business – meaning, features, merits and demerits, Partnership – meaning, types, registration, types of Partners, Co – Operative societies – types, merits and limitations, Company – Private Ltd, Public Ltd –merits, limitations, Starting a business – Basic factors, Choice of forms of business organizations.

Unit II : Business Services **Hours 11**

Nature and types of Business services – Banking, Insurance, Transportation, Warehousing, communication. Meaning, role, Functions of Banking, Insurance, Postal and Telecom services, Warehousing, Transport, Hospitality and Tourism Services.

Unit III : Emerging Modes of Business **Hours 09**

E – business – Meaning, Scope and benefits, Resource required for successful E –Business implementation, On – line transactions, payment mechanism, Security and safety of business transactions, Outsourcing – Concept, need and scope.

Unit IV : Principles of Management **Hours 11**

Definition and nature of management, purpose of management, managerial functions at different levels, management- art or science, planning, planning process & purpose, steps of planning, goal setting, decision making, organizing function, organizing process, formal and informal organizations, centralization and decentralization organization, staffing function, staffing process, recruitment, selection, training, performance appraisal, directing function, concepts of leading, motivating, communicating, qualities of leaders, controlling, control process, control techniques.

Unit V : Business Ethics and its Social Responsibilities **Hours 09**

Concept of social responsibility, cases for social responsibility, responsibility towards different interest groups, owners, investors, employees, consumers, government, community, public in general, business ethics – concept and elements, business and environmental protection.

Unit VI : Entrepreneurship Development **Hours 11**

The concept and introduction, personality and mindset of an entrepreneur, difference between an entrepreneur, intrapreneur and manager/executive, entrepreneurial ecosystem, types and functions of an entrepreneur- entrepreneurial motivation, entrepreneurship development programs, business idea generation, business plan and detailed project report, funding and support aspects.

Core Books:

1. Harold Koontz & Heinz Weihrich: Essentials of Management, Ninth Edition, Tata McGraw Hill Publishing, 2012.
2. Dr. F. C. Sharma, Dr. D. Chandra, Anju Agarwal: Business Organization, SBPD Publications, 2020.

Reference Books:

1. Tripathy & Reddy: Principles of Management, fifth edition, Tata McGraw Hill Publishing, 2015.
2. Robbins , Decenzo & Coulter: Fundamentals of Management, eighth edition, Pearson Education, 2013.
3. Y.K. Bhushan: Fundamentals of Business Organisation, Sultan Chand Publicatio, 2018.

Web References:

1. <https://www.dynamictutorialsandservices.org/2018/10/entrepreneurship-developmentnotes.html> [Entrepreneurship Development]
2. <https://leverageedu.com/blog/emerging-modes-of-business/> [Emerging Modes of Business]
3. <https://www.managementstudyguide.com/management-functions.htm> [Functions of Management]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will be able to understand different types of business proprietorship.
CO2 :	Students will get the knowledge of functionality of various online business services
CO3 :	Students will learn the important concepts of management.
CO4 :	To be able to understand the ethics and social responsibilities of business towards various entities
CO5 :	Students will learn the concepts required to be a good entrepreneur.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Forms of Business Ownership	√				
2	Business Services		√			
3	Emerging Modes of Business		√			
4	Principles of Management			√		
5	Business Ethics and its Social Responsibilities				√	
6	Entrepreneurship Development					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	1	3	-	-	-	2	2	-	1
CO2	-	2	-	2	1	3	2	-	-	2	2	-	2
CO3	-	2	-	-	1	3	-	2	1	3	2	-	2
CO4	-	-	-	-	2	2	-	-	3	3	-	-	2
CO5	-	-	-	-	-	3	-	-	-	2	2	-	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAME101 : Computer Application in Business

Description:

Credit and Week:

Teaching Scheme	Week	Marks	Credit
	12	100	3

About the course:

The main objective of this course is to familiarize the students with the application of computer in business and how it facilitates in business decision making.

Pre-requisites:

Basic knowledge of computers

Course layout:

Weeks	Video No.	Videos Title	Units
Week-1	Video-1	Introduction to Computers	Unit-1
	Video-2	Application in Computers	Unit-2
	Video-3	Web Application	Unit-3
	Video-4	Basic of Computer Software	Unit-4
Week-2	Video-5	Business Information System-	Unit-5
	Video-6	Database Management System	Unit-5
	Video-7	Business Process & Enterprises Application	Unit-5
	Video-8	GDPR	Unit-5
Week-3	Video-9	IT Securities Measures in Business	Unit-6
	Video-10	Internet Services and Email	Unit-7
	Video-11	Plastic Money, E-Wallet and Online Pay	Unit-8

Week-4	Video-12	Basics of Word Processing	Unit-9 & Unit-10
	Video-13	Tools using Word	Unit-11
	Video-14	Advance Tool using Word Processing	Unit-11
	Video-15	Making Business Documentation using word	Unit-12
Week-5	Video-16	Working with PowerPoint	Unit-13
	Video-17	PPT usages in Business and Corporate	Unit-13
Week-6	Video-18	Meaning of Multimedia	Unit-14
	Video-19	Animation & Presentation	Unit-14
	Video-20	Implementing multimedia tool in business	Unit-14
	Video-21	Meaning and Role of You Tube in Business	Unit-15
	Video-22	Video Impact in Excelling Business	Unit-15
Week-7	Video-23	Curtain raiser to Spreadsheet & its Utility in Business World	Unit-16
	Video-24	Spreadsheet concepts-1	Unit-16
	Video-25	Spreadsheet concepts-II	Unit-16
Week-8	Video-26	Formulas & Functions-I	Unit-17
	Video-27	Formulas & Functions-II	Unit-17
	Video-28	Formulas & Functions-III	Unit-17
	Video-29	Formulas & Functions-IV	Unit-17
	Video-30	Formulas & Functions-V	Unit-17
Week-9	Video-31	Graphical Presentation of Data Meaning and Intro	Unit-18
	Video-32	Graphical Presentation of Data using Spreadsheet	Unit-18
Week-10	Video-33	Advance Option in Spreadsheet-I	Unit-19
	Video-34	Advance Option in Spreadsheet-II	Unit-19
	Video-35	Advance Option in Spreadsheet-III	Unit-19
Week-11	Video-36	Google Workspace and Cloud	All Blocks (Unit 1-20)

	Video-37	Burgeoning & Contemporary Thought In business and Computers	All Blocks (Unit 1-20)
Week-12	Video-38	FAQ-I Computer application	All Blocks (Unit 1-20)
	Video-39	FAQ-II Business Application	All Blocks (Unit 1-20)
	Video-40	Terminology used in Computer Application in Business	All Blocks (Unit 1-20)

Books and references

Issue Date	Title	Authors and Contributors
2020	<u>Unit-4 Basics of Computer Software</u>	<u>Dhusia, D.K.</u>
2020	<u>Unit-3 Web Applications</u>	<u>Dhusia, D.K.</u>
2020	<u>Unit-2 Application of Computers</u>	<u>Dubey, Arvind Kumar</u>
2020	<u>Unit-1 Introduction to Computer</u>	<u>Kesharwani, Subodh</u>
2020	<u>Block-1 Fundamentals of Computers</u>	<u>Kesharwani, Subodh; Dubey, Arvind Kumar; Dhusia, D.K.; Kesharwani, Subodh</u>

Criteria to get a certificate:

Average assignment score = 25% of average of best 8 assignments out of the total 12 assignments given in the course.

Exam score = 75% of the proctored certification exam score out of 100

Final score = Average assignment score + Exam score

YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE >=10/25 AND EXAM SCORE >= 30/75. If one of the 2 criteria is not met, you will not get the certificate even if the Final score >= 40/100.

CAME102 : Basics of Digital Marketing

Description:

Credit and Week:

Teaching Scheme	Week	Marks	Credit
	12	100	3

About the course:

The course familiarize students with an understanding of how the digital media works and develop the critical insights necessary to succeed in e-commerce and digital and social media marketing. Enrich learner with the essential principles and practices of marketing in the digital economy by making this course, an indispensable part of their knowledge base. Companies that were non-existent a few short years ago, including Facebook, Whatsapp, LinkedIn, and Youtube, have dramatically changed how we interact, communicate and get from point A to B. Even Amazon and Google are relatively “young” by any measure. This course is also to serve as basic course for learners who wish to further study in the domain of Digital Media.

Pre-requisites:

Person who wish to study in the domain of Digital Media

Course layout:

Week 1	W1_L1 Introduction to Marketing W1_L2 Consumer Behavior W1_L3 Introduction to Digital Marketing
Week 2	W2_L1 Search Engine Optimization 1 W2_L2 Search Engine Optimization 2 W2_L3 Search Engine Optimization 3
Week 3	W3_L1 Search_Engine_Marketing : Part 1 W3_L2 Search_Engine_Marketing : Part 2 W3_L3 Display Advertising
Week 4	W4_L1 Social Media Marketing W4_L2 Social Media Marketing (Word of Mouth) W4_L3 Social Media Platforms Part 1 W4_L4 Social Media Platforms Part 2
Week 5	W5_L1 Online Reputation Management W5_L2 Mobile Marketing Part 1 W5_L3 Mobile Marketing Part 2 W5_L4 Website Planning & Creation
Week 6	W6_L1 Email Marketing Part 1 W6_L2 Email Marketing Part 2 W6_L3 Introduction to E Commerce Part 1

	W6_L4Introduction to E Commerce Part 2	
Week 7	W7_L1E-COMMERCE Strategy 1 W7_L2E-COMMERCE Strategy 2 W7_L3Content Marketing W7_L4Content Creation Process W7_L5Influencer Marketing	
Week 8	W8_L1Digital Marketing Strategy Part 1 W8_L2Digital Marketing Strategy Part 2a W8_L3Digital Marketing Strategy Part 2b W8_L4Digital Marketing Strategy Part 3a W8_L5Digital Marketing Strategy Part 3b	
Week 9	W9_L1Digital Analytics & Measurement Part - 1a W9_L2Digital Analytics & Measurement Part - 1b W9_L3Digital Analytics & Measurement Part - 2a W9_L4Digital Analytics & Measurement Part - 2b	
Week 10	W10_L1 Digital Analytics & Measurement Part - 3a W10_L2 Digital Analytics & Measurement Part - 3b W10_L3 Measuring Campaign Effectiveness : ROI – Return on Investment W10_L4 Measuring Campaign Effectiveness : CLV - Customer Lifetime Value W10_L5 Attribution Models	
Week 11	W11_L1 Digital Marketing Plan W11_L2 Case Study 1 : Email Marketing W11_L3 Case study 2 : Golf Tripz W11_L4 Case Study 3 : Golkonda Hotels W11_L5 Case Study 4 : Bhalaje Photography	
Week 12	W12_L1 New Technologies & Advancement in Digital Marketing Part 1 W12_L2 New Technologies & Advancement in Digital Marketing Part 2 W12_L3 Review of Digital Marketing Course Part 1 W12_L4 Review of Digital Marketing Course Part 2	

Books and references

1. Digital Marketing: Cases from India by Rajendra Nargundkar and Romi Sainy, Notion Press, Inc

2. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation by Damian Ryan, Kogan Page Publisher
3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler, Publisher Wiley
4. Digital Marketing by Seema Gupta, McGraw Hill Education
5. Fundamentals of Digital Marketing by Punit Singh Bhatia, Pearson
6. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns by Ian Dodson, Wiley Publisher

Criteria to get a certificate:

If You wish to get certified on this course you must register and write the proctored exam after payment of exam fee.

30 Marks will be allocated for Internal Assessment and 70 Marks will be allocated for end term proctored examination.

Securing 40% in both separately is mandatory to pass the course and get Credit Certificate.

CAUD101 : Digital Electronics

Credit	Component	Instruction/ Contact Hours (Per Week)	Instruction/ Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: In order to achieve the course objectives, students will be introduced to digital technologies. Various digital modules used to create digital computer devices like gates, flip flops, decoder, encoder etc. are to be studied. Mathematical base is created to understand the organization of digital computer.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Digital Systems and Binary Numbers	12
2	Boolean Algebra and Logic Gates	12
3	Combinational Circuit Designing	10
4	Sequential Circuit Designing	10
5	Memory Interfaces and Data Representation	08
6	The Arithmetic Logic Unit and Control Unit	08

Total Hours (Theory): 60

Total Contact Hours:60

Detail Syllabus:**Unit I: Digital Systems and Binary Numbers** **Hours 12**

Introduction and Evolution of Digital computers, Major components of digital computer, Interfaces and Buses, compiler, interpreter, Assembler, Introduction to various number systems (Decimal, Binary, Octal, Hexadecimal, BCD), Conversion of number system, Binary operations, signed binary numbers, 1's complement and 2's complement.

Unit II: Boolean Algebra and Logic Gates **Hours 12**

Fundamental concepts and rules of Boolean algebra, , Boolean Algebra Laws, Boolean expressions and its simplification with and without Truth Tables, Canonical form and standard form, D-Morgan's Theorem, Basic duality laws, Derivation of Boolean expressions, Introduction to logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR), Implementation of Boolean expressions using logic gates, Sum of product and Product of Sum forms, Universal gates, Implementation of other gates using universal gates, Karnaugh Map method for two, three, four and five variables, K-map with don't care conditions, Tabulation method, determination and selection of prime applicants.

Unit III: Combinational Circuit Designing **Hours 10**

Introduction to combinational circuits, Design procedures, Adders, Subtractors, code conversion circuits, Analysis procedures, Multilevel NAND circuits, Multilevel NOR circuits, EX-OR functions, Binary adder and Subtractors, Decimal adder and Subtractors, Magnitude comparator, Decoder and encoders, Multiplexer and de-multiplexer.

Unit IV: Sequential Circuit Designing **Hours 10**

Introduction to Sequential circuits, Concepts of Flip-flops, triggering flip-flops, Clock signals, Analysis of clock sequential circuits, State Reduction and assignments, Flip flop excitation table, Design procedure of asynchronous and synchronous counters (Ripple counter, Binary counter, BCD counter), Design of registers, Shift registers, Timing sequences.

Unit V: Memory Interfaces and Data Representation **Hours 08**

Memory, Types of ROM, Design of ROM, Types of RAM, Magnetic disc memory, Magnetic tape, Digital recording techniques, Linear-select memory organization, Types of digital codes (Gray code, 8421 code, Alphanumeric codes), Parity checking codes, Floating point representation, Fixed point representation.

Unit VI: The Arithmetic Logic Unit and Control Unit**Hours 08**

Basic operations of Arithmetic Logic Unit, Construction of the Arithmetic Logic Unit, Representation of Instruction word, Control registers, Instruction and execution cycles of Control registers, Sequence operation of Control Registers.

Core Books:

1. M. Morris Mano: Digital Logic and Computer Design, Third Edition, Pearson Education, 2016.
2. Thomas C. Bartee: Digital Computer Fundamentals, Sixth Edition, Tata McGraw Hill Publishing, 2012.
3. M. Morris Mano: Computer System Architecture, Third Edition, Pearson Education, 2011.

Reference Books:

1. Andrew S. Tanenbaum: Structured Computer Organization, Fourth Edition, Pearson Education, 2005.
2. Albert Paul Malvino and Jerald A. Brown: Digital Computer Electronics, Third Edition, Tata McGraw Hill Publishing, 2008.

Web References:

1. https://www.tutorialspoint.com/digital_circuits/index.htm [Digital Circuits Tutorial]
2. <https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/> [Digital Electronics and Logic Design Tutorials]
3. <https://studymaterialz.in/digital-logic-and-computer-design-by-morris-mano/> [Digital Logic and Computer Design book]
4. <https://cupola.gettysburg.edu/oer/1/> [Digital Circuit Projects]

Course Outcomes: Upon successful completion of the course, students will be,

C01 :	Able to get the idea about digital system and numbering system.
C02 :	Able to study logic gates for digital circuit designing.
C03 :	Able to learn to design various combinational circuits.
C04 :	Able to learn to design various sequential circuits.
C05 :	Able to learn memory design concepts and to study computer Arithmetic Logic Unit and Control Unit.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Digital Systems and Binary Numbers	√				
2	Boolean Algebra and Logic Gates		√			
3	Combinational Circuit Designing			√		
4	Sequential Circuit Designing				√	
5	Memory Interfaces and Data Representation					√
6	The Arithmetic Logic Unit and Control Unit					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	-	3	2	-	-	2	1	3	2
CO2	3	2	2	2	-	3	2	-	-	2	1	3	2
CO3	3	3	3	2	-	2	2	-	-	2	2	3	2
CO4	3	3	3	2	-	2	2	-	-	2	2	3	2
CO5	3	3	3	2	-	3	2	-	-	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUS101 : Mathematics for Computer Science

Credit	Component	Instruction/ Contact Hours(Per Week)	Instruction/ Contact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
02	Theory	02	30	25	55
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: Basic algebra and geometry, as well as a good understanding of logic and proofs, mathematical statistics.

Methodology, Pedagogy & Andragogy: During theory lectures the emphasis will be given on the fundamentals of mathematics and statistics. Problem solving: Students will demonstrate the ability to solve problems, including applications outside of mathematics. Mathematical communication: Students will demonstrate the ability to communicate mathematical ideas clearly. They will use correct mathematical terminology and proper mathematical notation.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Sets and functions	04
2	Vectors and Matrices	04
3	Measure of Central Tendency & Dispersion	06
4	Permutation & Combination	05
5	Probability	06
6	Graph Theory	05

Total Hours (Theory): 30
Total Contact Hours:30

Detail Syllabus:**Unit I : Sets and Functions****Hours 04**

Introduction to set theory, methods of representation of a set, operations on set, algebra of sets, De 'Morgan's law, function definition, domain, range, one-to-one function, onto function.

Unit II : Vectors and Matrices**Hours 04**

Definition of vector, addition and subtraction of vector, magnitude of a vector, unit vectors, dot product and cross product, definition of matrix, equal matrices, diagonal elements of matrix, row matrix, column matrix, Symmetric matrix, skew symmetric matrix, orthogonal matrix, diagonal matrix, identity matrix, operations on matrix.

Unit III : Measure of central tendency and dispersion**Hours 06**

Definition, Ungrouped Data, Grouped Data (Discrete and Continuous Grouped data). Mean: Arithmetic Mean, Geometric Mean and Harmonic Mean for ungrouped data, Combined Mean, Weighted Mean. Median, Quartiles, Deciles, Percentiles and Mode. Different measure of dispersion. Quartile Deviation, Mean Deviation, Standard Deviation, Combined Standard Deviation, Coefficient of Variation.

Unit IV : Permutation and Combination**Hours 05**

Meaning of permutation, Formula of permutation, Permutation of n different things, Permutation of similar things, Permutation of repeated things, Circular Permutation, Combination: Meaning of Combination, Formula of Combination.

Unit V : Probability**Hours 06**

Probability: Random Experiment, Sample Space, Event, Mutually exclusive event, Exhaustive event, Equally likely event, Probability Classical definition. (Simple examples of Probability).

Unit VI : Graph Theory**Hours 05**

Introduction to Graph, Graph Definition, Vertices, Edges, Loops, Parallel Edges, Simple Graph, Finite Graph, Adjacent vertices, Incidence between vertex and edge, Degree of a vertex, Isolated Vertex, Pendent Vertex, Null Graph. Isomorphism, Labeled Graph

Core Books:

1. D. C. Sancheti, V. K. Kapoor: Business Mathematics, Sultan Chand & sons.
2. Lipschutz & Marc Lipson: DISCRETE MATHEMATICS, Tata McGraw Hill
3. Narsingh Deo: Graph Theory with application to engineering and computer science, Prentice Hall of India Pvt. Ltd

Reference Books:

1. Gupta and Gupta: Business Statistics, Sultan Chand and Sons.

Web References:

1. <https://www.statlect.com/matrix-algebra/vectors-and-matrices>
2. <https://www.geeksforgeeks.org/permuations-and-combinations/>
3. <https://www.khanacademy.org/math/statistics-probability/probability-library/basic-theoretical-probability/a/probability-the-basics>

Course Outcomes: Upon successful completion of the course, students will be,

C01 :	Students will learn basics of sets and functions
C02 :	The students will be familiar with various linear algebra.
C03 :	Students will be well equipped to measure accurate description of data
C04 :	Students will be able to define a permutation and explain how to calculate probability
C05 :	Students will be able to understand and apply the fundamental concepts in graph theory

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		C01	C02	C03	C04	C05
1	Sets and Functions	✓				
2	Vectors and Matrices		✓			
3	Measure of central tendency and dispersion			✓		
4	Permutation and Combination				✓	
5	Probability				✓	
6	Graph Theory					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	2	1	-	-	-	-	2	-
CO2	3	3	3	2	-	2	1	-	-	-	-	2	-
CO3	3	3	3	2	-	2	1	-	-	-	-	2	-
CO4	3	3	3	2	-	2	1	-	-	-	-	2	-
CO5	3	3	3	2	-	2	1	-	-	-	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**BCA PROGRAMME
(2nd SEMESTER)
AS PER NEP 2020**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

BCA Semester-II

Course Code	Course Name	Theory/ Practical/Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CAUC103	Fundamentals of Object Oriented Programming	Theory and Practical	50	50	25	25	06 (04- Theory) (02- Practical)	Major Core
CAUC104	Database Fundamentals	Practical	-	-	25	25	02	Major Core
CAUE103 CAUE104	(Select any one) 1. Fundamentals of E-Commerce 2. Business Economics	Theory	50	50	-	-	04	Minor
CAUD102	Data Communications and Networks	Theory	50	50	-	-	04	MDC
CAUV101	Fundamentals of Accounting	Theory	25	25	-	-	02	VAC
HSUS101-117	(Select any one) A course on Liberal Arts HSUS101 – Painting HSUS102- Photography HSUS103- Sculpting HSUS104- Pottery and Ceramic Art HSUS105-Media and Graphic Design HSUS106-Art and Craft HSUS109- Dramatics HSUS110-Contemporary Dance HSUS111-Music (Vocal) HSUS112-Music (Instrumental)-Tabla HSUS113-Music (Instrumental)-Guitar HSUS114-Music (Instrumental)-Harmonium HSUS115-Music (Instrumental)- Flute HSUS116- Indian Classical Dance-Kathak HSUS117- Indian Classical Dance-Bharatnatyam	Practical	-	-	25	25	02	SEC
CAUA101	Presentation Skills	Practical	-	-	25	25	02	AEC
CAUI101	Summer Internship and Viva - I	VIVA	-	-	50	50	04	Exit Course

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)

*SEE- Semester -End- Evaluation

CAUC103: Fundamentals of Object Oriented Programming

Credit	Component	Instruction/ Contact Hours (Per Week)	Instruction/ Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
02	Practical	04	60	50	110
Experiential Learning Components (Theory): Unit Tests, Assignments, Case Study etc.					
Experiential Learning Components (Practical): Lab Assignments, Practical Test, VIVA					

Pre-requisite: Foundation of Programming

Methodology, Pedagogy & Andragogy: The theory sessions will use real-world examples to demonstrate how object-oriented programming (OOP) enhances problem-solving, covering concepts such as classes, objects, inheritance, polymorphism, and exception handling. Students will engage in self-directed learning through case studies, assignments, and unit tests to assess their progress. During practical sessions, students will apply these OOP concepts through various assignments and case studies, further developing their understanding of how OOP efficiently addresses complex problems. Independent learning will be emphasized to ensure students grasp and progress in their comprehension of OOP principles.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Object Oriented Programming	08
2	Classes and Objects	11
3	Polymorphism	10
4	Inheritance	13
5	Exception Handling and Type cast operators	10
6	Managing I/O formats and operations	08

Total Hours (Theory): 60
Total Contact Hours:60

Detailed Syllabus:**Unit - I: Introduction to Object Oriented Programming** **Hours: 08**

Structured programming vs. object oriented programming, Introduction to C++: structure of a C++ program Tokens, inline function, pass by reference, default arguments, OOP characteristics.

Unit - II: Classes and Objects **Hours: 11**

Define class, objects, visibility modes, static members, friend function, Constructors and Destructors, Default Constructor, Copy constructors, Parameterized Constructor, this keyword.

Unit - III: Polymorphism **Hours: 10**

Introduction of Static Binding, Function Overloading and ambiguity raised in function overloading, Operator overloading through member function and friend functions, type conversions from primitive to class, class to primitive and class to class.

Unit - IV: Inheritance **Hours: 13**

Objective of Inheritance, types of inheritance, impact of access modes during inheritance, Virtual base classes, Dynamic Binding, Virtual functions, Pure virtual functions, Abstract class, Early vs. Late binding.

Unit - V: Exception Handling and Type Cast Operators **Hours: 10**

Introduction to Exception handling, catching class types, using multiple catch statements, exception handling options, creating custom exceptions, introduction to cast operators, const cast, static cast, reinterpret cast, dynamic cast.

Unit - VI: Managing I/O Formats and Operations **Hours: 08**

Understand and apply concepts from various header files like iostream, iomanip, fstream, etc. opening and closing file, reading and writing text files and binary files, performing random access on files, handle command line arguments.

Core Books:

1. Herbert Schildt: C++: A Beginner's Guide, 2nd Edition Paperback, McGraw-Hill,2003.
2. E Balagurusamy: Object Oriented Programming with C++ Paperback, McGraw Hill India,2017.

Reference Books:

1. Yashavant Kanetkar: Let Us C++, Paperback, BPB Publications,2020.

2. Robert Lafore: Object Oriented Programming in C++, 4th Edition, Sams Publications,2002.
3. Bruce Eckel:Thinking in C++, Volume 1, 2nd Edition, Pearson Education,2006.

Web References:

1. <https://www.geeksforgeeks.org/c-plus-plus/> [For Entire Syllabus]
2. <https://google.github.io/styleguide/cppguide.html> [For coding standards and concepts]
3. http://www.tutorialspoint.com/cplusplus/cpp_basic_input_output.htm [For Practicals]

Course Outcomes: Upon successful completion of the course, the students will:

C01 :	Understand the basic structure of C++ program and understand the concept of object oriented programming characteristics.
C02 :	Understand the concept of Constructor and Destructor and able to create class and objects.
C03 :	Understand the need of Polymorphism and implement static polymorphism
C04:	Understand the purpose of Inheritance, identify relations between classes, implement inheritance and perform dynamic binding.
C05:	Able to handle the runtime errors or exceptions in C++ and use type cast operators. Able to read input from device, file, command line arguments and apply formats to input and output.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		C01	C02	C03	C04	C05
1	Introduction to Object Oriented Programming	✓				
2	Classes and Objects		✓			
3	Polymorphism			✓		
4	Inheritance				✓	
5	Exception Handling and Type cast operators					✓
6	Managing I/O formats and operations					✓

Course Articulation Matrix:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
CO1	2	2	2	2	2	2	2	2	2	2	2	3	2
CO2	3	3	3	2	2	2	3	2	2	2	2	3	2
CO3	3	2	3	2	2	2	3	2	2	2	2	3	2
CO4	3	3	3	2	2	2	3	2	2	2	2	3	2
CO5	3	2	3	2	2	2	2	2	2	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC104: Database Fundamentals (Practical)

Credit	Component	Instruction/ Contact Hours (Per Week)	Instruction/ Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
02	Practical	04	60	40	100
Experiential Learning Components: Lab Assignments, Practical Test, VIVA , certification courses, development of projects etc.					

Prerequisites: Basic knowledge of working with computer

Methodology, Pedagogy & Andragogy: Learn about computer data. Understand what data is, learn its meaning, examine the types of data sources, and see the difference between data and information. The database applications used in the real world will be discussed with necessary examples. During the laboratory hours' students' will implement the concepts. Apply SQL commands to mine data from databases and data visualization techniques to address organization information needs.

Outline of the Course:

Week No	Practical	Description
1	Introduction to Database System	Overview of data, information, file, database, database systems, DBMS, Purpose of DBMS over file system.
2-3	Data modelling and architecture	Various data models: ER model and Relational model, Three level architecture, structure of DBMS and database actors and workers
4-5	Database Design Methodology	CODD Rules, Functional Dependency and Normalization for Database Informal Design Guidelines for Relational Schemas, Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF, 4NF, 5NF)
6-7	Schema Definition, Constraints, Queries – I	Basic Data types, Create Table Command, Modifying the structure of tables, renaming table, truncating table, destroying table, Insert, Delete and Update Statements in SQL

8	Schema Definition, Constraints, Queries – II	Data Constraints and Functions: - Pseudo columns, Null values, TAB table, DUAL table Operators, Data constraints, Type of data constraints, modifying constraints, working with data dictionary and use of USER_CONSTRAINTS Functions introduction
9	Inbuilt functions	Merits and demerits of functions, Types of functions: Numeric functions, Character functions, Date functions, Conversion functions, Aggregate functions
10-11	Querying the data	Different operators: logical range, searching and pattern matching, Viewing Data in the tables, sorting
12-13	Advanced Query Processing-I	Co-related Nested Queries, Group By clause, having clause
14-15	Advanced Query Processing-II	Joins (Inner Join, Outer Join, Self-Join, Equi Join, Cross Join), Creation and manipulation of database objects indexes, views, sequences and synonym.

Total hours: 60

Text Books:

1. Ivan Bayross : SQL, PL/SQL The programming Language Oracle.
2. Ramkrishnan, Gehrke : Database Management Systems, 3 rd Edition, McGrawHill Publication.
3. RamezElmasri, Shamkant B. Navathe : Fundamentals of Database Systems , 5th Edition, , Pearson Publication.

Reference Books:

1. Silberschatz, Korth, Sudarshan : Database System Concepts, 5th Edition, McGraw Hill.
2. C.J.Date, a Kannan, S Swaminathan : An Introduction to Database Systems, 8th Edition, Pearson Education,(Equivalent Reading).
3. Scoot Urban : Oracle 9i, PL/SQL Programming, Oracle Press.
4. S. K. Singh : Database Systems: Concepts, Design and Applications, Pearson Education
5. Peter Rob, Carlos Coronel: Database Systems: Design, Implementation and Management, 7th Edition, Cengage Learning, 2007.
6. Leon and Leon : Database management Systems, Vikas Publication.

Web References:

1. <https://www.javatpoint.com/er-model-vs-relational-model> [For difference of ER and Relational model]
2. http://www.microsoftvirtualacademy.com/trainingcourses/databasefundamentals#?fbid=tbZ92pOp_Tt [For overall subject]
3. http://www.ntu.edu.sg/home/ehchua/programming/sql/Relational_Database_Design.html [for relational database design]
4. http://docs.oracle.com/cd/A97335_02/apps.102/a81358/05_dev1.htm [For ER Diagram]

Course Outcome: Upon successful completion of the course, student will:

C01:	Understand basic concepts regarding data, database systems and various data models.
C02:	Understand various data modeling techniques and entity relationship models.
C03:	Learn about relational data model and related concepts.
C04:	Gain insights into database design, SQL and normalization concepts.
C05:	Advanced query processing

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	1	1	-	3	-	-	-	-	-	2	-
CO2	1	3	3	3	-	3	1	-	-	-	-	1	3
CO3	3	3	3	3	-	3	2	-	-	2	-	2	
CO4	-	3	3	3	-	3	3	-	-	3	3	-	3
CO5	2	3	3	3	2	3	3	-	-	-	3	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE103: Fundamentals of E-Commerce

Credit	Component	Instruction/ Contact Hours (Per Week)	Instruction/ Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours

04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During theory lectures the emphasis will be given on the fundamentals of E-commerce. Students will be introduced to E-Commerce, E-Marketing, E-Security and E-Payment, Mobile Commerce, CRM and ERP, and E-Commerce Applications. Students will give practical exposure in form of case study and by visit to E-commerce / Digital Marketing company and/or supply chain Centre.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to E-Commerce	09
2	E-Marketing	11
3	E-Security and E-Payment	09
4	Mobile Commerce	11
5	CRM and ERP	09
6	E-Commerce Applications	11

Total Hours (Theory): 60
Total Contact Hours:60

Detail Syllabus:

Unit I : Introduction to E-Commerce	Hours 09
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Emergence and use of Internet, origin of web and world wide web, advantages and disadvantages of E-commerce, Features of E-Commerce, Electronic Commerce over the Internet, Types of Ecommerce.

Unit II : E-Marketing	Hours 11
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Traditional Marketing, Online Marketing, E-advertising, Internet Marketing Trends and strategies, E-branding.

Unit III : E-Security and E-Payment	Hours 09
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Security on the Internet, E-Business risk management issues, Digital token based E-Payment System, Properties of Electronic Cash, Digital Signature.

Unit IV : Mobile Commerce	Hours 11
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definition of M-Commerce, Features of M-Commerce, Advantages and Disadvantages of M-Commerce, Areas of M-Commerce Applications, Payment Systems and Models in M-Commerce.

Unit V : CRM and ERP	Hours 09
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Customer Relationship Management, CRM capabilities and Customer life cycle, Introduction to ERP, Reasons for the growth of the ERP Market, Advantages and Disadvantages of ERP.

Unit VI : E-Commerce Applications	Hours 11
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Retail and Wholesale, Finance, Manufacturing, Online Booking, Online Publishing, Digital Advertising, Digital Shopping, Digital Media, Auctions, A case study need to be discussed for these application. Hands-on experience in setting up and managing an e-commerce store. Developing a business plan for an ecommerce start-up.

Core Books:

1. P.T.Joseph, S.J.: E-Commerce- An Indian Perspective, 3rd Edition, PHI learning Private Limited.
2. Kamlesh K. Bajaj, Debjani Nag: E-Commerce, The Cutting Edge of Business, 2nd Edition, McGraw-Hill Education.

Reference Books:

1. Anita Rosen: The e-commerce Question and Answer Book: A Survival Guide for Business Managers, 2nd Edition, Amacom.
2. Janice Reynolds: The Complete E-Commerce Book: Design, Build & Maintain a Successful Web-based Business, 2nd Edition, CRC Press.
3. By Philippe Humeau&Matthieu Jung : The White Book of Ecommerce Solutions, NBS System.
4. IshitaLahiri and Sujit Kumar Ghose : Principles of Marketing and E-Commerce

Web References:

1. <http://www.ecommercetutorial.net/> [For Tutorial]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	To understand basic of Electronic Commerce and its Application
CO2 :	Getting knowledge of E-marketing and its Strategies.
CO3 :	Learn E-security and E-Payment in Detail and its term. Also, learn Encryption and decryption in basic
CO4 :	To gain understanding of Mobile Commerce and its Application through real life examples.
CO5 :	To learn concepts of Customer Relationship Management and various solutions of E-Commerce (Software and Framework).

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to E-Commerce	√				
2	E-Marketing	√	√			
3	E-Security and E-Payment		√	√		
4	Mobile Commerce		√	√		
5	CRM and ERP				√	
6	E-Commerce Applications					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	3	2	2	1	2	2	2	1	1	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	2	2	3	3	2	2	2	2	2	1	1	3	2
CO4	3	3	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	2	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE104: Business Economics

Credit	Component	Instruction/ Contact Hours (Per Week)	Instruction/ Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During theoretical lessons, real-world examples will be used to discuss economic topics such as demand, supply, production, cost function, market structure, factor pricing, and microeconomics. Students will be offered appropriate case studies in order to provide actual exposure to theoretical economic ideas.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Fundamentals of Economics	09
2	Basic Elements of Demand and Supply	10
3	Theory of Production and Cost	11
4	Analysis of Revenue	11
5	Market Failures and Price Regulation	09
6	Macro-Economic Environment and National Income Accounting	10

Total Hours (Theory): 60
Total Contact Hours:60

Detail Syllabus:**Unit I: Fundamentals of Economics** **Hours 09**

Fundamentals of Economics, Needs, wants, nature of economics, scope of economics, business economics, laws of economics, business cycle, difference between Micro and Macro Economics.

Unit II: Basic Elements of Demand and Supply **Hours 10**

Demand and supply, types of demand, determinants of demand and supply, law of demand and supply, balance between demand and supply, demand and supply schedule, demand function.

Unit III: Theory of Production and Cost **Hours 11**

Theory of Production- Factors of Production, Basic Concepts, Production Function, Producer's Equilibrium Least-Cost Factor Combination and Output Maximization for a given Level of Outlay. Theory of Costs- Basic Concepts, Short-run Total Cost, Short-run Average and Marginal Cost, Relationship between Average and Marginal Cost, Average and Marginal Cost in the Long-run.

Unit IV: Analysis of Revenue **Hours 11**

Basic Concepts of Revenue, Revenue, Relationship between Average and Marginal Revenue, Concept of Market and Main Forms of Market; Equilibrium of the Firm- Meaning, Objectives of the Firm, Monopoly and its features, Monopolistic Competition and Oligopoly.

Unit V: Market Failures and Price Regulation **Hours 09**

Market failures and need for regulation, Regulations and market structure, Firm behaviour, Price regulation.

Unit VI: Macro-Economic Environment and National Income Accounting **Hours 10**

Basic macro- economic concepts -aggregate, demand aggregate supply, money, income employment consumption savings and investment. National Income Accounting- concepts and methods of national income, different methods of national income accounting.

Core Books:

1. P.L Mehta: Managerial Economics, Sultan Chand and Sons Publication, 2014
2. Keat Paul, K Young Philip , Erfle Steve, Banerjee Sreejata: Managerial Economics, seventh edition, Pearson Education, 2017.
3. N. Gregory Mankiw: Principles of Economics, sixth edition, South-Western, Cengage Learning, 2012.

Reference Books:

1. Geetika, Ghosh & Choudhury: Managerial Economics, third edition, Mc Graw Hill Education, 2005.
2. Mote V.L., Samuel Paul and G.S. Gupta: Managerial Economics Concepts and Cases, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2001.
3. G. S. Gupta: Macro Economics Theory and Applications, Second Edition, Tata McGraw Hill, 2006.

Web References:

1. <https://www.sciencedirect.com/topics/economics-econometrics-and-finance/economic-law> [Economic Law]
2. <https://www.toppr.com/guides/business-economics-cs/basic-elements-of-demand-and-supply> [Basic Elements of Demand and Supply]
3. <https://corporatefinanceinstitute.com/resources/knowledge/economics/national-incomeaccounting/> [National Income Accounting]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Able to Interpret the various basic economic principles.
CO2 :	Able to understand theory of demand and supply.
CO3 :	Able to deal with balancing between cost and revenue.
CO4 :	Able to learn the causes and solution of market failures.
CO5 :	Able to understand the basics of macroeconomics and accounting.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Fundamentals of Economics	√				
2	Basic Elements of Demand and Supply		√			
3	Theory of Production and Cost			√		
4	Analysis of Revenue			√		
5	Market Failures and Price Regulation				√	
6	Macro-Economic Environment and National Income Accounting					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	1	-	-	2	-	-	1	-	2	2	1
CO2	3	1	2	-	-	2	-	-	1	-	2	2	1
CO3	3	1	2	-	-	2	-	-	1	-	2	2	1
CO4	3	1	2	-	-	2	-	-	1	-	2	2	1
CO5	3	1	1	2	-	2	-	-	1	-	2	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUD102 : Data Communications and Networking

Credit	Component	Instruction/ Contact Hours (Per Week)	Instruction/ Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study, Certification courses, etc.					

Pre-requisite: Basic knowledge of computers and their working.

Methodology, Pedagogy & Andragogy: During the lecture sessions, the students will learn about role of computer network in modern communication systems, underlying principles of network communication, need for standardization through network reference model. The teacher will also discuss communication issues at different layers and concepts related to network security. The students will adopt the latest certification courses from reputed and recognized platforms. Furthermore, the students will be engaged in problem-solving, emphasizing real-world applications and relevance.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Computer Networks	10
2	Basics of network communication	08
3	Network reference model	11
4	Data Link Layer Functions and Protocol	12
5	Network Layer Functions and Protocol	10
6	Network security	09

**Total Hours (Theory):60
Total Contact Hours:60**

Detail Syllabus:

Unit I: Introduction to computer network Hours 10

Definition of computer network, aim and objective of computer network: applications of computer network, merits & demerits of computer network, examples of computer network, components of computer network, types of networks, network topologies, network devices: hub, switch, repeater, router, gateway, bridge.

Unit II: Basics of network communication **Hours 08**
Parallel & serial communication, synchronous & asynchronous communication, modes of communication: simple, half-duplex, full-duplex, multiplexing, de-multiplexing: frequency division multiplexing (FDM), time division multiplexing (TDM), communication media: guided media, unguided media, switching techniques: circuit switching, message switching, packet switching.

Unit III: Network reference model **Hours 11**
Need for network reference model, history of TCP/IP and OSI model, layers of OSI and TCP/IP model, comparison between TCP/IP and OSI model, Protocol Hierarchy, Network Protocols: Simple Mail Transfer Protocol (SMTP), File Transfer Protocol (FTP), Multiple Internet Mail Extension (MIME), Post Office Protocol (POP), Telnet, Domain Name Service (DNS), Dynamic Host Configuration Protocol (DHCP), Address Resolution Protocol (ARP), Reverse Address Resolution Protocol (RARP).

Unit IV: Data Link Layer Functions and Protocol **Hours 12**
Definition of Framing, framing methods, Error detection techniques, Error correction techniques, Flow control mechanisms- Simplex protocol, Stop and Wait ARQ, Go-Back-N ARQ, Point to Point protocol.

Unit V: Network Layer Functions and Protocol **Hours 10**
Connection oriented vs Connectionless services, Definition of Routing, Routing algorithms, IP protocol, IP addresses, ARP, RARP

Unit VI: Network security **Hours 09**
Introduction to cryptography, symmetric key and public key encryption systems, digital signature and key management concepts, communication security.

Core Books:

1. Andrew S. Tanenbaum: Computer Networks, 6th edition, Pearson Publication: 2021.
2. Behrouz Forouzan: Data communications and networking, 4th Edition, McGraw Hill, 2018.
3. William Stallings: Data and computer communication: 5th Edition, Pearson Publication, 2019.

Reference Books:

1. James F. Kurose, Keith W. Ross: Computer networking – A top-down approach: 3rd Edition: Pearson Publication: 2017
2. Narsimha Karumanchi: Elements of computer networking: An Integrated Approach: 1st Edition: Careermonk Publication: 2014
3. Ed Tittel: Computer networking: 1st Edition, Schum's Publication: 2020

Web References:

1. <https://computer.howstuffworks.com/computer-networking-channel.htm> [How Stuff Works]
2. [https://learn.microsoft.com/en-us/previous-versions/windows/it-pro/windows-server-2012-R2-and-2012/dn313100\(v=ws.11\)?redirectedfrom=MSDN](https://learn.microsoft.com/en-us/previous-versions/windows/it-pro/windows-server-2012-R2-and-2012/dn313100(v=ws.11)?redirectedfrom=MSDN) [Microsoft Networking]
3. https://help.sap.com/docs/SAP_COMMERCE/d0224eca81e249cb821f2cdf45a82ace/8c74877b866910148cc9ba5f39a2fd28.html?version=6.7.0.0 [For multicast and unicast]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Student will be able to understand role of computer network in digital communication
CO2 :	Student will grasp underlying concepts related with network communication
CO3 :	Student will understand role of reference models in standardizing communication
CO4 :	Students will learn about intra and inter network communication and technology behind it.
CO5 :	Students will learn about different aspects of network security.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Computer Networks	√				
2	Basics of network communication		√			
3	Network reference model			√		
4	Data Link Layer Functions and Protocol				√	
5	Network Layer Functions and Protocol				√	
6	Network security					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	2	1	-	1	1	1	-	-	1	2	-
CO2	2	3	3	2	-	1	1	1	-	-	1	3	1
CO3	3	3	3	2	-	1	1	1	1	-	1	3	3
CO4	1	3	3	2	-	1	1	1	1	-	1	3	2
CO5	3	3	3	2	-	1	1	1	1	-	1	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUV101: Fundamentals of Accounting

Credit	Component	Instruction/ Contact Hours (Per Week)	Instruction/ Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
02	Theory	02	30	20	50
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During the classroom sessions, the emphasis will be given on the fundamentals of accounting. Students will be introduced to book keeping systems in modern accounting, financial accounting, and cost accounting. Students will prepare financial statements such as journal, ledger, trial balance, trading and profit and loss account, and balance sheet. Students will also get hands on exposure in make or buy decisions in cost accounting. Same concepts will be made concrete through assignments, case studies, and unit tests.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Accounting	05
2	Book Keeping System	05
3	Financial Accounting - I	05
4	Financial Accounting - II	07
5	Cost Accounting - I	04
6	Cost Accounting - II	04

Total Hours (Theory): 30
Total Contact Hours:30

Detail Syllabus:

Unit I : Introduction to Accounting	Hours 05
Introduction and users of Accounting, Branches of Accounting, Objectives, Accounting Concepts and Conventions, Accounting Terms.	
Unit II : Book Keeping System	Hours 05
Single and Double Entry Book Keeping Systems, Advantages of Double Entry Book Keeping System, Limitations of Double Entry Book Keeping System, Types of Accounts: Personal, Real, and Nominal, Terms of Book Keeping Systems.	
Unit III : Financial Accounting - I	Hours 05
Stages of Accounting Cycle, Types of Transactions, Forms of Economic Transactions, Cash and Credit Transactions, Introduction to Journal, Journal Entries.	
Unit IV : Financial Accounting – II	Hours 07
Introduction to Ledger, Relationship Between Journal and Ledger, Rules of Ledger Posting, Balancing of the Accounts in Ledger, Trial Balance, Objectives of Preparing Trial Balance, Trading and Profit and Loss Account, Balance Sheet, Different between Trial Balance and Balance Sheet.	
Unit V : Cost Accounting – I	Hours 04
Introduction to Cost Accounting: Cost, Costing, and Cost Accounting, Limitations of Financial Accounting, Difference Between Cost Accounting and Financial Accounting, Objectives of Cost Accounting.	

Unit VI : Cost Accounting – II	Hours 04
Elements of Cost: Material Cost, Labor Cost, and Expenses, Techniques of Costing, Marginal Costing, Make or Buy Decision, Breakeven Analysis	

Core Books:

1. Dr. S. N. Maheshwari: Principles of Management Accounting, Sultan Chand Publication.
 - a. Eighteenth Edition, 2021
2. M. Pande: Financial Management, Vikas Publishing House, 2015
3. M.N. Arora: Cost Accounting, Vikas Publishing House, 2013

Reference Books:

1. Dr. S.N. Maheshwari: Advanced Accountancy, Volume 1, Eleventh & Revised Edition, Vikas Publishing House, 2017

Web References:

- <https://www.accountingtools.com/articles/basics-of-accounting.html>
[For Basics of Accounting]
- https://www.youtube.com/watch?v=vuetn_PQ0vM
[For Journal Entries - 1]
- <https://www.youtube.com/watch?v=3xCzh3-bm4o&list=RDCMUCNh1egMomGI3hjJ0DHExdUg&index=3>
[For Journal Entries - 2]
- https://www.youtube.com/watch?v=z_KO49Pk3DM
[For Ledger Posting & Trial Balance]
- <https://www.youtube.com/watch?v=Y4azRCTTw0U>
[For Trading A/c & Profit & Loss A/c]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will get basic understanding of the field of Accounting
CO2 :	Students will be familiar with Accounting Book Keeping Systems
CO3 :	Students will learn concepts of financial accounting and different types of accounts with rules of debit and credit
CO4 :	Students will be able to generate Journal, Ledger, Trial Balance, and Final Accounts
CO5 :	Students will get basic understanding of the field of Cost Accounting

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Accounting	✓				
2	Book Keeping System		✓			
3	Financial Accounting – I			✓		
4	Financial Accounting – II				✓	
5	Cost Accounting – I					✓
6	Cost Accounting – II					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1	-	-	2	2	3	1	2	1	1	1	1
CO2	1	2	-	-	2	2	3	1	2	1	1	-	-
CO3	3	3	2	1	1	2	3	-	2	2	1	2	-
CO4	3	3	3	1	1	2	3	-	2	2	1	2	-
CO5	2	3	2	1	3	2	3	1	2	3	1	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUA101: PRESENTATION SKILLS

Credit	Component	Instruction/ Contact Hours (Per Week)	Instruction/ Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
02	Practical	02	30	20	50
Experiential Learning Components: Lab Assignments, Practical Test, VIVA					

Prerequisites: Basic computer skills and knowledge of English.

Methodology, Pedagogy & Andragogy: The aim of this course is to develop effective presentation skills in students. Students will be taken systematically through the key stages of giving presentations, from planning and introducing to concluding and handling questions. The topics for the presentation will range from academic presentations to research presentations.

Outline of the Course:

Week No	Practical	Description
1	Introduction	Knowing the Purpose, Knowing the Audience, Internal and External Presentation, Presentation to Heterogenic Group, Greetings, Introducing self and peers, Asking and sharing information
2	ICT tools for presentation – Brief introduction	Microsoft PowerPoint, Canva, Prezi, AI-powered presentation tools
3	Presentation using Canva	Introduction to Canva, Creating, presenting, sharing and downloading presentation
4	Presentation design in Canva	Templates, layouts, Presenter Notes, Duration, Timer
5	Basic design elements in Canva	Shapes, Graphics, Charts, Tables
6	Advanced design elements in Canva	Photos, Videos, Audio, Frames, Grids, Stickers

7	Intermediate features of PowerPoint	Using Screenshot, Inserting objects, video and audio in presentation, Screen recording
8	Advanced features of PowerPoint	Using Hyperlink and Action, Slide Show Set-up, Presenter View, Master views
9	Cloud-based presentation using Google Slides	Creating a new presentation, importing slides, Sharing, Printing, Downloading in different formats, Version History
10	Basic features of Google Slides	Slideshow, Motion, Theme Builder, Inserting image, audio, video, shape
11	Advanced features of Google Slides	Spell-check, Linked objects, Q-A History, Notification Settings, Accessibility, Activity Dashboard
12	Engaging audience using feedback-gathering tools	Use of menitimeter for Word Clouds, Live Polls, Scales, Ranking and Pin It
13	Ethical practices	Using Citations/References for texts, images and other type of information, Plagiarism check
14	AI and Presentation	Use of Generative AI tools such as ChatGPT, CoPilot etc. in presentations
15	Select case-study	Examples of best presentations.
		Total hours: 30

Text Books:

1. The Presentation Book : How to Create It, Shape It and Deliver It! Improve Your Presentation Skills Now, 2nd Edition, Pearson Education.
2. Beginners Guide for Canva 2024, by Karla J Kane. ISBN: 979-8875801853

Reference Books:

1. Microsoft PowerPoint Guide for Success by Kevin Pitch, Top Notch International. ISBN:978-1915331489
2. Getting Started With Google Slides: A Practical Guide to Cloud-Based Presentations by Scott La Counte, SL Editions ISBN:978-1629179513

Web References:

1. <https://www.canva.com/education/students/>
2. <https://support.microsoft.com/en-us/powerpoint>
3. <https://support.google.com/a/users/answer/9282488>
4. <https://www.mentimeter.com/features>

Course Outcome: Upon successful completion of the course, student will be able to:

C01:	understand key elements of an effective presentation and ICT tools for presentation.
C02:	acquire in-depth knowledge of one of the popular presentation tools.
C03:	develop intermediate and advanced skills in alternative presentation tool.
C04:	familiarize with cloud-based presentation tool.
C05:	create effective presentation with ethical practices and enhance it with AI tools.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	3	-	2	1	-	-	2	-	-
CO2	2	-	3	-	2	1	-	-	2	2	3	1	1
CO3	-	3	-	2	-	1	3	2	-	-	-	3	2
CO4	2	1	2	2	2	1	2	-	2	-	2	3	2
CO5	-	2	2	3	1	-	2	2	2	2	-	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUI101 : Summer Internship and Viva – I

Objective and Scope:

Students who choose to exit the programme after the completion of the first two semesters must undertake internships, community engagement programmes and field based learning/minor projects during the summer term. This internship, worth 4 credits, is a requirement for the award of the Undergraduate Certificate. Students have to undergo internship in reputed Tech Companies, Software Development Firm, IT services companies, Research Institutions and Lab etc. This provision ensures that students gain valuable practical experience and industry exposure, complementing their academic learning and enhancing their career prospects. Following are the intended objectives of internship training:

- **Practical Experience:** Provide hands-on experience with real-world projects to apply theoretical knowledge gained during the course.
- **Skill Development:** Enhance technical skills, such as programming, software development, database management, and other relevant IT skills.
- **Industry Exposure:** Familiarize students with the working environment of the IT industry, including understanding company culture, workflows, and professional practices.
- **Professionalism:** Instil a sense of professionalism and work ethic, including adhering to deadlines, following instructions, and working collaboratively.
- **Transition to Employment:** Facilitate a smoother transition from academic life to professional careers by bridging the gap between theory and practice.

Guidelines of Internship:

The Summer Internship shall be of 15 (Minimum 60 hours) duration and will be undertaken during the Summer Vacation. Students have to undergo internship in reputed Tech Companies, Software Development Firm, IT services companies, Research Institutions and Lab etc. It is mandatory for the students to seek written approval from the coordinator about the topic and the organization before commencing the Summer Internship. During Summer Internship students are expected to take necessary guidance from the faculty guide allotted by the Institute. To do it effectively they should be in touch with their guide through e-mail or phone. Students must maintain regular reports detailing the work completed, challenges faced, and learning experiences. Students must submit a final report and presentation summarizing the internship experience, project outcomes, and key learnings to guide. The technical specifications for report preparation is as under:

Technical details:

1. The report shall be printed on A-4 size white paper.
2. 12 pt. Times New Roman font shall be used with 1.5-line spacing for typing the report.
3. 1" margin shall be left from all the sides.
4. Considering the environmental issues, students are encouraged to print on both sides of the paper.
5. The report shall be spiral bound as per the standard format of the cover page given by the Institute.
6. The report should include a Certificate (on company's letter head) from the company duly signed by the competent authority with the stamp.
7. The report shall be signed by the respective guide(s) & the Principal of the Institute 10 (Ten) days before the viva-voce examinations.
8. Student should prepare two hard bound copies of the Summer Internship Project Report and submit one copy in the institute. The other copy of the report is to be kept by the student for their record and future references.

Evaluation:

The evaluation of Internship will be done as per the following criteria:

Sr. No.	Evaluation Criteria	Marks
1	Summer Internship Report	50
2	Presentation and Viva-voce examination	50
TOTAL MARKS		100

Students must secure 36% passing marks in both components to qualify for the Certificate.

Internship and Exit:

Any student intending to exit the course must complete the summer internship (Including scoring at least 36% marks in the evaluation) before exit. A student intending to exit shall have to submit an application to Principal through Counsellor before even semester university theory examination. However, any such student desiring to withdraw the exit option may do that before the last paper of theoretical examinations of even semester.

**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**BCA PROGRAMME
(3rd SEMESTER)
AS PER NEP 2020**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

BCA Semester-III

Course Code	Course Name	Theory/ Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SSE		
CAUC201	Fundamentals of Data Structures and Algorithms	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUC202	Fundamentals of Operating Systems	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUS201 CAUS202	(Select any one) 1. Computer Oriented Management System 2. Computer Oriented Numerical Methods	Theory	50	50	-	-	04	SEC
CAUA201	Life Management	Theory	25	25	-	-	02	AEC
	University Elective-I	Practical	-	-	50	50	02	MDC
HSUV201	Creativity, Problem Solving and Innovation	Practical	-	-	25	25	02	VAC

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
 *SEE- Semester –End- Evaluation

University Elective - I			
Sr. No.	Course Code	Course Name	Department / Faculty
1		Art of Programming	Engineering
2		Environmental Sustainability & Climate Change	Engineering
3		ICT Resources & Multimedia	Engineering
4		Engineering Drawing	Engineering
5		Fundamentals of Packaging	Pharmacy
6		Basic Laboratory Techniques	Applied Science
7		First Aid & Life Support	Nursing
8		Health Promotion & Fitness	Physiotherapy
9		Banking & Insurance	Management
10		Introduction to MATLAB Programming	Engineering
11		Astrophysics, Space and Cosmos-1	Applied Science
12		SDG Handprint Laboratory	Engineering
13		Python Programming	Engineering
14	CAUD201	Introduction to Web Designing	Computer Science

CAUC201: Fundamentals of Data Structures and Algorithms

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
02	Practical	04	60	40	100
Experiential Learning Components (Theory): Unit Tests, Assignments, Case Study etc.					
Experiential Learning Components (Practical): Lab Assignments, Practical Test, VIVA					

Pre-requisite: Foundation of C and C++ Programming, Fundamentals of Object Oriented Programming.

Methodology, Pedagogy & Andragogy: Theory lectures focus on fundamental concepts of data structures and algorithms, emphasizing the selection of the most efficient structures for various applications. Andragogical principles are integrated to promote self-directed and practical learning for learners. For practical teaching of Data Structures and Algorithms, the approach combines hands-on programming exercises with real-world case studies to reinforce the selection of efficient structures for various applications. This blended method enhances both theoretical understanding and practical skills, ensuring learners can effectively apply concepts in real-world scenarios.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1.	Fundamentals of Data Structures and Algorithms	06
2.	Arrays and Linear Data Structures	10
3.	Advanced Dynamic Data Structures	12
4.	Tree-Based Data Structures	11
5.	Graph Theory and Applications	11
6.	Sorting and Searching Techniques	10

**Total Hours (Theory) : 60
Total hours (Practical) : 60
Total Contact Hours : 120**

Detail Syllabus:**Unit I: Fundamentals of Data Structures and Algorithms** **Hours 06**

Atomic and composite data, Data type, Data object, Data Structure, Abstract Data type, Types of Data Structures, Introduction to Algorithms, Relationship among Data, Data Structures and Algorithms, Analysis of Algorithms, space and time complexity algorithm

Unit II: Arrays and Linear Data Structures **Hours 10**

Linear Data Structures using sequential organization, Representation of Stacks using sequential organization, Applications of Stack, Application of Recursion, Concepts of Queues, Realization of Queues using sequential organization, circular queue, Multiqueue, Deque, Priority Queue, Applications of Queue.

Unit III: Advanced Dynamic Data Structures **Hours 12**

Linked list, Comparison of sequential and linked organizations, Dynamic Memory Management, types of link list , Applications of linked list, operation on link list.

Unit IV: Tree-Based Data Structures **Hours 11**

Basic Terminologies, Definition and concepts, Representation of Binary Tree, Operations on Binary Tree and algorithms, Types of Binary Trees , AVL trees,

Unit V: Graph Theory and Applications **Hours 11**

Graph Terminology, Representation of Graph, Operations on Graph, Applications of Graph Structure, minimum spanning tree.

Unit VI: Sorting and Searching Techniques **Hours 10**

Sorting Notations and Concepts, Sorting Techniques, Sequential Searching, Binary Searching, Search Trees.

Outline of the Course (Practical):

Week No	Practical	Description
1	Basic of C and C++	foundational concepts in C and C++.
2	Two dimension array	Understand and utilize arrays effectively.
3	Stack	Implement stack operations including push, pop, and peek.
4	Stack and its application	Cover infix, prefix, and postfix notations.
5	Queue and Circular queue	Implement queue operations such as insert, delete, and display.
6	Linear and Binary Search	Apply various searching techniques on arrays.
7	Merge sort, Bubble Sort	Implement and compare different sorting techniques to sort data.
8	Selection sort , Insertion Sort,	
9	Quick sort	
10	Single Link List	Perform insert and delete operations at the beginning, end, and middle of link list data structures.
11		
12	Double Link List	
13		
14	Circular Single Link List	
15	Circular Double Link List	

Core Books:

4. Jean-Paul Tremblay, Paul G. Sorenson: An introduction to data structures with applications, 2nd Edition, Tata McGraw Hill Publications, 1991.
5. D. Samanta: Classic Data Structures, 2 Edition, PHI Publications, 2002.

Reference Books:

5. Varsha h. Patil : Data Structures Using ndC++, 1st Edition, Oxford University Press, 2012.
6. Yashvant Kanethkar : Data structures through C++, 2nd Edition, BPB Publications,2003.

7. Mark Allen Weiss: Data Structures and Algorithm Analysis in C++, 3rd Edition, Pearson Education, 2009.
8. Reema Thareja: Data Structures using C, 1st Edition, Oxford University Press, 2012.

Web References:

1. https://www.cs.auckland.ac.nz/~jmor159/PLDS210/ds_ToC.html [For materials of Data Structures and Algorithms]
2. <http://www.cs.usfca.edu/~galles/visualization/> [For Data Structures Visualization]
3. <https://www.cs.auckland.ac.nz/~jmor159/PLDS210/mst.html> [For Graph Data Structures]
4. <http://interactivepython.org/runestone/static/pythonds/Trees/trees.html> [For Tree Data Structures]
5. https://www.cs.auckland.ac.nz/~jmor159/PLDS210/niemann/s_man.pdf [For Sorting and Searching Cookbook]
6. <http://www.cs.princeton.edu/~rs/AlgsDS07/10Hashing.pdf> [For Hashing Materials]
7. <http://nptel.ac.in/video.php?subjectId=106102064> [For Data Structures videos]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Understand and explain the basic concepts and importance of data structures and algorithms.
CO2 :	Implement and utilize array-based and linear data structures effectively.
CO3 :	Analyze and apply advanced dynamic data structures such as linked lists.
CO4 :	Construct and manipulate various tree data structures including binary trees and AVL trees.
CO5 :	Apply graph theory concepts to solve complex problems and understand real-world applications.
CO6:	Implement and compare different sorting and searching algorithms for optimal performance.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes					
		CO1	CO2	CO3	CO4	CO5	CO6
1	Fundamentals of Data Structures and Algorithms	√					
2	Arrays and Linear Data Structures		√				
3	Advanced Dynamic Data Structures			√			
4	Tree-Based Data Structures				√		
5	Graph Theory and Applications					√	
6	Sorting and Searching Techniques						√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	-	1	3	1	-	-	1	1	2	1
CO2	3	2	3	1	1	3	1	-	-	1	2	2	1
CO3	3	2	3	1	1	3	1	-	-	1	2	2	1
CO4	3	2	3	1	1	3	1	-	-	1	2	2	1
CO5	3	2	3	1	1	3	1	-	-	1	2	2	1
CO6	3	2	3	1	1	3	1			1	3	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC202 : Fundamentals of Operating Systems

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
02	Practical	04	60	40	100
Experiential Learning Component (Theory): Unit Tests, Assignments, Case Study etc.					
Experiential Learning Components (Practical): Lab Assignments, Practical Test, VIVA					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: In order to achieve the course objectives, students will be introduced to the basic operating system concepts and basic functions. Students will be offered appropriate case studies in order to provide actual exposure to theoretical operating system ideas. During the practical session, student will commence the learning from MS-DOS commands in windows environment. The student will also get hands on working with basic Linux commands. Finally using base of Linux commands, shell scripts would be written to demonstrate operating system programming.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Operating System Fundamentals	09
2	Memory Management	11
3	Processor Management	11
4	Device Management	10
5	File Management	10
6	Introduction to Shell Script	09

Total Hours (Theory): 60
Total hours (Practical): 60
Total Contact Hours:120

Detail Syllabus:**Unit I: Operating System Fundamentals** **Hours 09**

What is an operating system, Brief history of an operating system, Pyramid structure of an operating system, Operating system hardware and software, Evolution of an operating system, types of operating system, Batch system, Interactive system, Real time system, Hybrid system, Shell, compiler, assembler, interpreter.

Unit II: Memory Management **Hours 11**

Memory management of early system, Fixed partition, Dynamic partition, Re-locatable dynamic partition, Best fit and first fit allocation method, De-allocation, Paged memory allocation, Demand paging allocation, Segmented memory allocation, Virtual memory, cache memory, Associative memory, Page replacement policies.

Unit III: Processor Management **Hours 11**

What is job and Process, Multiprogramming concept, Process scheduler, Job scheduler, various process states, Thread control, Process Control Block (PCB), Processor scheduling policies, FCFS, SJN, SRT, RR, EDF, Multiple level queues.

Unit IV: Device Management **Hours 10**

Types of devices, dedicated device, Virtual device, shared device, I/O devices in cloud, Sequential Access Storage Media, Direct access storage media, Device handler seek strategies, FCFS, SSTF, SCAN and LOOK strategies, disk storage.

Unit V: File Management **Hours 10**

Fundamentals of File management, File naming conventions, Fixed length and variable length records, Physical file organization, Physical storage allocation, File access methods, File control matrix, File compression.

Unit VI: Introduction to Shell Script **Hours 09**

Shell Script, Shell environment, Making Script interactive, Command Line Argument, Evaluating Expression, Operator, Control Statement, Looping statement.

Outline of the Course:

Week No	Practical	Description
1	Disk operating system -Commands	Introduction to MS DOS environment with basic commands
2	Introduction to Linux Editor	Introduction to Cygwin as Linux Editor along with its usage
3	Linux Operating System-Commands	Using basic commands of Linux
4	Linux Operating System-Advanced Commands	Implementation of advanced Linux commands used in industry
5	Vi editor-Create Text file	Practice of writing and modifying various files in Vi editor
6	Introduction of Shell Programming-Create .sh file and Execute file	Creating simple shell script to get introduced with operating system programming
7	Variable and Rules for variable	Creating and using variables, and constants in shell scripts
8	Interactive Shell Script, Working with Command Line Arguments	Practicing shell scripts which are responsive to the user input
9	Working with expression	Arithmetic expressions in shell script
10	Conditional statement-IF, Working with Operator	Learning conditional statements such as if, elif, case. Using arithmetic, relational, and logical operators.
11	Looping Statement-While	Writing shell scripts with while loops with real life examples
12	Looping Statement-Until, For	Writing shell scripts with until and for loops with real life examples

Core Books:

1. Ann McIver McHoes, Ida M Flynn: Understanding Operating System, 7 Edition, Cengage Learning, 2014.
2. William Stallings: Operating Systems Internals and Design Principles, 5th Edition, PHI, 2005.
3. Sumitabha Das: Unix concepts & application, 4th Edition, Tata McGraw Hill, 2010.
4. Kenneth Rosen, Douglas Host, James Farber and Richard Rosinski: The Complete Reference, Tata McGraw Hill, 1999.

Reference Books:

1. Silberschatz: Operating System Concepts, 5th Edition, John Wiley & Sons (ASIA) Ltd., 2008.
2. Mark G. Sobell: A Practical Guide to Linux, Pearson Education, 1997.
3. KJ. George, Operating System Concepts and Principles, Sroff Publishers, 2003.

Web References:

1. <https://study.com/learn/operating-system.html> [Operating System Video Lessons]
2. <https://www.studytonight.com/operating-system/> [Operating System Tutorial]
3. <http://www.ics.uci.edu/~ics/43/lectures.html> [Lecture notes of OS]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	To understand the fundamental concepts of an operating System
CO2 :	To understand memory allocation and de-allocation methods
CO3 :	To study fundamentals of processor and its scheduling policies
CO4 :	To study various supported device and file access technologies
CO5 :	Learning basic shell programming

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Operating System Fundamentals	√				
2	Memory Management		√			
3	Processor Management			√		
4	Device Management				√	
5	File Management				√	
6	Introduction to Shell Script					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	1	1	2	2	-	2	2	-	1	1	-	3	2
C02	3	2	2	2	-	2	2	-	1	1	-	3	2
C03	3	2	2	2	-	2	2	-	1	1	-	3	2
C04	3	2	2	2	-	2	2	-	1	1	-	3	2
C05	2	2	3	3	-	2	3	-	1	1	-	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUS201: Computer Oriented Management System

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: The theory sessions will emphasize real-time systems. To enhance comprehension, we will provide illustrations using actual data across various systems. The sessions will meticulously explain the system's functionality through detailed flow descriptions. To bridge the gap between theoretical knowledge and practical application, we have to schedule industrial visits. These visits are designed to offer students a tangible correlation between their studies and real-world practices. Students should be assigned case studies to facilitate the practical application of their acquired knowledge. These case studies aim to deepen understanding and foster the ability to apply theoretical concepts to real-world scenario.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Basics of Information System	09
2	Architecture and Design of Information System	08
3	Transaction Processing System	09
4	Management Information System	06
5	Decision Support System & Executive Support System	18
6	Introduction to ERP and trending technologies	10

Total Hours (Theory): 60
Total Contact Hours:60

Detail Syllabus:

Unit I : Basics of Information System	Hours 09
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Role of data and information, Types of Systems, Types of information, Quality of Information, what is an Information System, Functions of Information System, classification of an Information System, Major Types of Information Systems, Interrelationship of Information Systems

Unit II : Architecture and Design of Information System	Hours 08
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Meaning of Architecture, development and maintenance of information system, centralized and decentralized systems, factors of success and failure in information system and risk involved with information system

Unit III : Transaction Processing System	Hours 09
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Introduction of Transaction Processing System (TPS), Transaction Processing System (TPS) Architecture, Transaction Processing System (TPS) Life cycle, Methods of Transaction Processing System (TPS), Information System Availability Control, Illustrations and live demonstration of TPS such as Banking System, Railway reservation system etc.

Unit IV : Management Information System	Hours 06
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Introduction to Management: Approaches of Management, Function of Management, System from Functional Perspective, Reports of Management Information System, A business perspective of MIS, Dimensions of MIS, contemporary Approaches to Information System.

Unit V : Decision Support System and Executive Support System	Hours 18
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Business value of Improved Decision making, Types of Decision, Decision making Process, The difference between MIS and DSS, Components of DSS, System for Decision Support Group Decision Support System, Business value of GDSS. Important Dimensions of knowledge, Organizational learning and Knowledge Management, The Knowledge Management value chain, Overview of different types of Knowledge Management Systems, Characteristics of ESS, The Role of ESS in the Firm, Business value of ESS, Monitoring Corporate Performance, Working Examples of ESS.

Unit VI : Introduction to ERP and trending technologies	Hours 10
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An overview of ERP, Basic ERP Concepts, Risk and Benefits of ERP, ERP and Related Technologies, Business Intelligence, Some case studies on ERP or Information system

Core Books:

1. K. C. Laudon and J. P. Laudon: Management Information Systems, 12th Edition, Pearson Education.
2. Alexis Leon: ERP Demystified, Second Edition, Tata McGraw-Hill.

Reference Books:

1. W.S. Jawadekar: Management Information Systems, 2nd Edition, Tata McGraw-Hill.

Web References:

1. <http://www.slideshare.net/NorazilaMat1/laudon-mis12-ppt01-16595885> [Function of Information system, A business perspective of MIS, Dimensions of MIS, Contemporary Approaches to Information System]
2. <http://www.uh.edu/~mrana/try.htm> [Types and Functions of Information system]
3. <http://bisom.uncc.edu/courses/info2130/Topics/istypes.htm> [Types of Information system]
4. <http://kalyan-city.blogspot.com/2011/05/levels-of-management-top-middle-and.html> [classification of information system]
5. http://my.safaribooksonline.com/book/management/9780470916803/operational-planning-and-control-systems/management_levels_comma_functions_comm [classification of information system]
6. <http://ambarwati.dosen.narotama.ac.id/files/2011/05/FIS-2011-w2.pdf> [Transaction processing system]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	To understand basic of data & information, types of information system, function of information system and its quality.
CO2 :	To understand designing and architecture of information system
CO3 :	To understand transaction processing concepts and its working.
CO4 :	Learning Management Information system, its types and its implementation. To gain understanding of Decision Support Systems.
CO5 :	To learn Knowledge Management, Executive Support Systems, ERP and its technology.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Basics of Information System	✓				
2	Architecture and Design of Information System		✓			
3	Transaction Processing System			✓		
4	Management Information System				✓	
5	Decision Support System & Executive Support System				✓	
6	Introduction to ERP and trending technologies					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	3	1	-	3	-	1	2	3	3	-	1	1
CO2	1	3	1	-	2	1	-	2	3	3	2	-	1
CO3	1	3	1	1	3	3	-	2	3	3	-	-	1
CO4	1	2	1	-	2	3	1	2	2	2	1	1	1
CO5	1	3	1	-	3	3	-	1	3	3	1	-	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUS202: Computer Oriented Numerical Methods

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: The course covers key topics like finding roots of equations, solving linear equations, interpolation, and solving differential equations. Teaching includes lectures, interactive problem-solving, and project-based assessments with continuous feedback. The focus is on practical applications and real-world problems, using flexible and engaging teaching methods. The aim is to make the content relevant and useful for students' careers and interests.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Numerical Methods	08
2	Interpolation	09
3	Numerical Integration and Differentiation	10
4	Solution of Linear Equation	12
5	Solution of Differential Equations	11
6	Solution of Partial Differential Equations	10

Total Hours (Theory): 60
Total Contact Hours: 60

Detailed Syllabus:**Unit - I: Numerical Methods** **Hours: 08**

Introduction to Numerical Methods, Various methods such as Bisection, False-Position and Newton Raphson methods

Unit - II: Interpolation **Hours:09**

What is an interpolation, Difference tables, Newton forward and backward Interpolation formula, Lagrange's formula, Newton's Divided Difference Formula?

Unit - III: Numerical Integration and Differentiation **Hours:10**

Numerical Integration, Trapezoidal rule, Differentiating Continuous function (Two point and Three-point formula), Tabulated function and its maxima and minima.

Unit - IV: Solution of Linear Equation **Hours:12**

Solution of Linear Equation, Gauss-Jordan Elimination methods, Gauss - Seidal and Gauss Jacobi Interactive methods

Unit - V: D Solution of Ordinary Differential Equations **Hours:11**

Solution of Ordinary Differential Equations, Taylor Series and Euler Methods, Runge-Kutta Methods.

Unit - VI: Solution of Partial Differential Equations: **Hours:10**

Review and examples of partial differential equations, classification of partial differential equations, Difference equation, Laplace's equation and Poisson's equation

Core Books:

1. D. N. Datta: Computer Oriented Numerical Methods, Vikas Pub. House, 2012.
2. S.S. Sastry : Introductory methods of Numerical Analysis, Prentice Hall of India,4th edition 2006

Reference Books:

1. V. Rajaraman Computer Oriented Numerical Methods, 3rd Edition, Prentice-Hall of India Pvt.Ltd, 3 rd edition, 2016
2. M. Ray, Har Swarup Sharma, Sanjay Chaudhary: Mathematical Statistics, Ram Prasad and sons, 11th edition
3. B S Grewal: Numerical Methods In Engineering & Science (With Programs In C, C++ And MATLAB), Khanna Publishers, 10th edition, 2014

Course Outcomes: Upon successful completion of the course, students will be,

CO1	Able to use Numerical methods in computer technology
CO2	To learn Interpolation
CO3	To Learn the concepts of Numerical Integration and Numerical Differentiation
CO4	To understand linear equations
CO5	To learn techniques to solve ordinary differential and partial differential equations

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Numerical Methods	√				
2	Interpolation		√			
3	Numerical Integration and Differentiation			√		
4	Solution of Linear Equation				√	
5	Solution of Differential Equations					√
6	Solution of Partial Differential Equations					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	-	2	-	-	-	2	-	2	1
CO2	3	3	2	1	-	2	-	-	-	2	-	2	1
CO3	3	3	2	1	-	2	-	-	-	2	-	2	1
CO4	3	3	2	1	-	2	-	-	-	2	-	2	1
CO5	3	3	2	1	-	2	-	-	-	2	-	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUA201: Life Management

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	02	30	25	55
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During theory lectures the emphasis will be given on the fundamentals of life management. Students will be introduced life styles and its basic, time management, work efficiency, yoga, physical health management, stress and mental health management, and personality skills. Students will give experimental learning exposure in form of assignment and case study.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Life Style and its Basics	06
2	Work Efficiency	04
3	Personality Skills	06
4	Time Management for students	05
5	Physical health management	04
6	Stress and mental health management	05

**Total Hours (Theory):30
Total Contact Hours:30**

Detail Syllabus:

Unit I : Life Style and its Basics Hours 06

Purpose of life and its dimensions, Importance of Self-Evaluation; (Daily routine, Food habits, Dressing Sense, Habit formation, Company, Etiquettes), Duties and Commitment of Self, Family and Society, Adjustment with Self and Environment

Unit II : Work Efficiency Hours 04

Positive way of thinking, Tools & techniques for Positive thinking, Karma and Karma Phal
Sidhanta, Behavioral Skill

Unit III : Personality Skills **Hours 06**

Self-Assessment Techniques, Adjustment Skills, Art of Positive Thinking, Developing Self Confidence,

Unit IV : Time Management for students **Hours 05**

Importance, Steps, Barriers and solutions of Time Management, Reading and Writing Skill, Making Notes and Conceptual Clarity of Subject topic.

Unit V : Physical health management **Hours 04**

Importance of physical health and exercise, importance of yoga, physical problems, exercise for health improvements

Unit VI : Stress and mental health management **Hours 05**

Importance of mental health, spirituality, improving concentration, importance of Dhyan, Memory problem and Memory Boosting techniques, causes and effects of stress, importance of Prathana, Upasna, Sadhna, and Aradhna

Core Books:

1. Time Management, McGraw-Hill, 2003
2. How To Manage Your Life, Vishal Tatwaved, 2012.

Reference Books:

1. Living Stress Free - The Secret of How to Manage Stress and Live Life Fully, Sonali Perera, SP MEDIA MARKETING.
2. TIME MANAGEMENT, BRIAN TRACY, American Management Association, 2013.

Web References:

8. Life management: a holistic approach to make the most of your life, Dr. Hannah Rose <https://nesslabs.com/life-management>
9. Life Management, <https://www.sciencedirect.com/topics/computer-science/life-management>
10. <https://edynamiclearning.com/course/health-1-life-management-skills/>

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will learn basics of life managements
CO2 :	The students will be familiar with various styles
CO3 :	Students will get the knowledge of time management and stress management
CO4 :	Students will get various aspects of physical and mental health
CO5 :	They will be able to develop personality and good habits

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Life Style and its Basics	✓				
2	Work Efficiency		✓			
3	Personality Skills					✓
4	Time Management for students			✓		
5	Physical health management				✓	
6	Stress and mental health management				✓	

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	3	1	-	3	-	1	2	3	3	-	1	1
CO2	1	3	1	-	3	1	-	1	3	3	1	-	1
CO3	1	3	1	1	3	3	-	2	3	3	-	-	1
CO4	1	2	1	-	2	3	1	2	2	2	1	1	1
CO5	1	3	1	-	3	3	-	1	3	3	1	-	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUD201: Introduction to Web Designing

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
02	Practical	04	60	40	100

Experiential Learning Components: Lab Assignments, Practical Test, VIVA

Prerequisites: Basic concepts of web.

Methodology, Pedagogy & Andragogy: This course focuses on providing hands-on experience to students for design and develop entire web sites using several web designing tools and HTML scripting language.

B. Outline of the Course:

Week No	Practical	Description
1	Basic Construction of an HTML & HTML5 Page, HTML Text Editors, HTML Building blocks.	Learn basic concepts of web page design.
2	Basic HTML tags - Text formatting tags, Heading tags, paragraph tags, division tag, Span tags, Break line tag, Binding space in HTML .	Get familiar with different tags and attributes which is used to add the text in a web page.
3	Controlling Font size and color, Adding Table – Table tag.	Learn user interface designing using Table Layout, change font style, color etc.
4	Grouping and merging table rows and columns. Adding List – ordered, unordered and definition list.	Able to display the data in various formats and design different types of list in the table.
5	Adding Image, Adding links - Changing link colors, Email link.	Learn to add images and link in the web page.

6	Embedding audio and video, Adding Field sets.	Able to add multimedia in web page using internal and external methods.
7	Adding Form: Form tag, Action, Method. Basic form controls.	Learn basic form elements and when and where to apply it.
8	Textbox, Password field, Radio Button, Checkbox, Multiple line text area, file upload.	Use various types basic form controls with types of form input elements.
9	Various types of buttons – submit, reset, image, simple button.	Learn various types of buttons to make it more interactive.
10	HTML5 input elements - Color, Number, Date, Month.	Learn new input types in HTML5.
11	Week, Time, date time-local, Email, url, range, search.	Learn to add defining inputs and minimum and maximum range to make the form attractive.
12	Data list, output, progress, meter.	Learn to add list and provide progress horizontal view and range with output.
13	Regular expression, HTML5 new attributes – Placeholder, Required.	Learn HTML 5 form element to provide user side web form validation.
14	Pattern, Autocomplete, Autofocus, novalidate, formnovalidate.	Learn HTML 5 new form properties.
15	formaction, formmethod, spellcheck, contenteditable.	Learn HTML 5 to user submit the form and redirect the form data to selective method.

Total hours: 60

Text Books:

1. Powel Thomas: HTML - The Complete Reference, 3rd Edition, McGraw-Hill Education – Europe,2018.
2. DT Editorial Services: HTML 5 Black Book,2nd Edition, Dreamtech Press, 2016
3. Matt West: HTML 5 Foundations, Wiley publication, 2013
4. Farrar: HTML Example book, BPB,2007.

Reference Books:

1. David DuRocher : HTML and CSS QuickStart Guide, Paperback,2021

2. Laura Lemay, Rafe Colburn, Jennifer Kyrnin : Mastering Html, CSS & JavaScript Web Publishing, Paperback, 2016.
3. Whyte: Basic HTML, 2nd Edition, Payne-Gallway, Oxford, 2003.
4. Shelly Woods: HTML introductory concepts and techniques, 5th Edition, CourseTechnology, 2009.
5. Jon Dukett: Beginning Web Programming with HTML, XHTML and CSS, Wrox Publication.

Web References:

1. www.w3schools.com/html [For HTML tutorials]
2. html.net/tutorials/html/ [For HTML tutorials]
3. www.htmlgoodies.com/ [For HTML resources]
4. <https://developer.mozilla.org/en-US/learn/html> [For HTML best practices]

Course Outcome: Upon successful completion of the course, student will:

CO1:	Able to understand basic construction of HTML & HTML5 document and started using basic tags.
CO2:	Able to Add content using various tags and format the content in table & list.
CO3:	Able to design links and multimedia elements such as image, audio, video.
CO4:	Able to design a web page form using HTML & HTML5.
CO5:	Able to apply validation using HTML5 attributes.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	1	2	1	3	2	2	1	1	-	1	1	1	1	CO1
CO2	-	1	2	3	1	3	1	-	-	2	2	2	2	CO2
CO3	1	1	2	3	1	3	1	-	-	2	2	2	2	CO3
CO4	1	1	2	3	1	1	1	1	-	1	-	1	1	CO4
CO5	2	2	3	3	2	3	3	2	1	2	2	3	2	CO5

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**BCA PROGRAMME
(4th SEMESTER)
AS PER NEP 2020**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

BCA Semester-IV

Course Code	Course Name	Theory/ Practical / Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CC	SEE	CCE	SSE		
CAUC203	System Analysis and Design	Theory	50	50	-	-	04	Major Core
CAUC204	Programming the Internet	Practical	-	-	25	25	02	Major Core
CAUC205	Open Source Technology	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CAUE201 CAUE202	(Select any one) 1. Advanced Networking 2. Artificial Intelligence (AI) Fundamentals	Theory	50	50	-	-	04	Minor
CAUA202	Social Media and Blog Writing	Practical	-	-	25	25	02	AEC
	University Elective-II	Practical	-	-	50	50	02	MDC
HSUV203	Indian Knowledge System	Practical	-	-	25	25	02	VAC
CAUI201	Summer Internship and Viva - II	VIVA	50	50			04	Exit Course
*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.) *SEE- Semester –End- Evaluation								

University Elective - II			
Sr. No.	Course Code	Course Name	Department / Faculty
1		Prototyping Electronics with Arduino	Engineering
2		Web Designing	Engineering
3		Basics of Environmental Impact Assessment	Engineering
4		Internet Technology & Web Design	Engineering
5		Material Science	Engineering
6		Cosmetics in Daily Life	Pharmacy
7		Life style Diseases & Management	Nursing
8		Occupational Health & Ergonomics	Physiotherapy
9		Health Care Management	Management
10		Astrophysics, Space and Cosmos-2	Applied Science
11		MATLAB Programming	Engineering
12		Maintenance of Household Apparatus	Engineering
13	CAUD202	Programming the Internet	Computer Science

CAUC203 : System Analysis and Design

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None.

Methodology & Pedagogy: During theory lectures emphasis will be given on understanding how Information Systems are designed and constructed and how major modifications are made to existing systems, analyze business needs for information and develop an appropriate strategy to solve a particular business problem, understand the issues associated with physical design, utilize some of the tools used by systems analysts in the design of Information Systems, a significant portion of the course will deal with computer aided system engineering (CASE) tools and techniques in the context of a case study.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to System Development	08
2	Classical Systems Development Methodology	11
3	Structured Systems Development Methodology	11
4	Prototype Development Methodology and Tools	11
5	Systems Design	10
6	Systems Implementation & Maintenance	09

Total Hours (Theory): 60
Total Contact Hours:60

Detailed Syllabus:**Unit I: Introduction to System Development** **Hours: 08**

Concept of system, Basic components, Information systems categories, Business Information Systems, Examples of real-life systems, System analyst – meaning, role and need, Users, Need of information system development, Application development portfolio, Integration of portfolio, Controlling and monitoring committees.

Unit II: Classical Systems Development Methodology **Hours: 11**

Classical Systems Development Life Cycle (SDLC) method, Requirement determination, Fact finding techniques, Modern methods for determining systems requirements, Joint Application Development Program, Tools for documenting procedures and decisions, Tools for systems development, understanding the format of system requirement specification.

Unit III: Structured Systems Development Methodology **Hours: 11**

Structured Analysis Development Strategy, Data Flow Diagrams (DFDs) for analysis and design, Physical and logical DFDs, Data Dictionary.

Unit IV: Prototype Development Methodology and Tools **Hours: 11**

Purpose of Application Prototyping, steps in prototype method, Use of prototypes, Tools for prototyping, Strategies for prototype development, misconceptions about prototyping, Role of tools, Categories and use of automated tools, using a CASE tool

Unit V: Systems Design **Hours: 10**

Analysis to design transition, Design of output system, Design of input system, Design of security and control, Design of user interface and Design of Database Interaction.

Unit VI: Systems Implementation & Maintenance **Hours: 09**

Designing reliable and maintainable systems, design of software, software design and documentation tools, managing quality assurance, user training, training methods and conversion.

Core Books:

1. James A Senn : Analysis and Design of Information System, McGraw Hill International, 2003.
2. Kendall and Kendall: Systems analysis and Design, 5th Edition, Prentice-Hall of India Private Limited, 2003.

Reference Books:

1. V. Rajaraman: Analysis and Design of Information Systems, Prentice-Hall of India Private Limited, 2003.
2. Jeffrey L. Whitten, Lonnie D. Bentely and Kevin C. Dittman : Systems Analysis and Design Methods, Tata McGraw Hill Publishing Co. Ltd., 2001.
3. Tuthill and Leavy: Knowledge Based Systems: Managers Perspectives: Tab professional and Reference Books, 1991.

Web references:

1. <http://lecture-notes-forstudents.blogspot.in/2010/04/system-analysis-and-design-sad.html>
2. <http://www.slideshare.net/aroravinay/1-introduction-to-ado-infosys>
3. <http://bcastuff.blogspot.in/p/sad-notes.html#.U6uW-ZzWle0>
4. <http://www.eis.mdx.ac.uk/staffpages/geetha/bis2030/DFD.html>
5. <http://faculty.washington.edu/ytan/is460/notes/LN11.pdf>

Course Outcomes: Upon successful completion of the course, students will be,

C01	Understand the basics of system, type of information systems, system analyst meaning, role and need, portfolio development of the system, the methods or ways to review and select the project.
C02	Understand the concept of SDLC, the fact finding techniques, detailed study of modern methods for collecting the requirements of system to be developed, Decision and procedure documentation and a brief introduction to the SRS document.
C03	Learn the concept of structured analysis, detail study of DFD and its types and the study of data dictionary.
C04	Gain understanding of prototypes, its uses and tools for development, clarification of the misconception about the prototype and categories of tools including the use of automated tools like case tools.
C05	Be able to learn objective of collecting data, methods to collect data for designing the input and output interface, the concept and objective of database design
C06	Study the designing of reliable and maintainable systems, documentation tool, quality assurance management and need for user training.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes					
		C01	C02	C03	C04	C05	C06
1.	Introduction to System Development	√					
2.	Classical Systems Development Methodology		√				
3.	Structured Systems Development Methodology			√	√		
4.	Prototype Development Methodology and Tools					√	
5.	Systems Design						√
6.	Systems Implementation & Maintenance						√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	3	2	2	1	2	2	2	2	2	3	3
C02	3	3	3	3	3	3	3	3	3	3	3	3	3
C03	3	3	3	3	3	3	3	3	3	2	3	3	2
C04	3	3	3	2	3	2	3	2	2	2	2	3	2
C05	1	2	2	2	3	3	3	2	1	2	2	3	2
C06	1	2	2	2	3	3	3	2	1	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC204: Programming the Internet

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
02	Practical	04	60	40	100
Experiential Learning Components: Lab Assignments, Practical Test, Case Study					

Prerequisites: CAUC103 – Fundamentals of Web Designing

Methodology, Pedagogy & Andragogy: This subject focuses on hands-on experiments to create dynamic and interactive web sites using HTML5, CSS3 and JavaScript.

Outline of the Course:

Week No	Practical	Description
1	CSS Styling the web - Applying CSS Building blocks -CSS Selectors, Cascade & inheritance, CSS Properties, CSS Box model.	Student can apply various types of CSS with its basic properties.
2	Creating Layout - Header, footer, navigation menu, and sub-navigation. Floats.	Student can create different layout using semantic elements of HTML5 & CSS classification properties.
3	Creating Layout - Flexbox, Introduction to Flexbox, Flex Container and Flex Items, Flexbox Properties and Layout Techniques.	Student can create flexible and responsive web layouts. Its ability to distribute space and align items effectively makes it a vital part of modern web design.
4	Creating Layout - Introduction to CSS Grid Layout- Grid Container and Grid Items, multi column layout	Student can Understand its properties and axes can significantly improve the adaptability and aesthetics of your web pages.
5	Creating Image Gallery and Animation - 2D/3D Transformation, Transitions and Animation,	Student can create layout image gallery & animation.

6	CSS Media Query	<i>Student can create different layouts depending on the size of the viewport.</i>
7	JavaScript – Adding Internal & External JavaScript	Student can write script for basic Programs.
8	,Working with variables, datatype – Number, String, Boolean.	Student can write script for basic programs using different datatypes.
9	datatype –Array, Object, Operators, Conditional statements, Looping statements	Student can write script for basic programs using array and object, condition, Loop.
10	Adding Dialog boxes in HTML page – Alert, Confirm and Prompt.	Student can able to use dialog boxes to make website alive.
11	Creating user defined function.	Student can able to use in-build and user defined functions of JavaScript.
12	Adding Mouse and Keyboard Event in HTML page, Manipulating String and Date.	Students can make user interaction using various Events.
13	JavaScript Document Object Model hierarchy – Create find and manipulate HTML Element using Objects and methods	Student can explore the DOM Hierarchy.
14	Form validation, Applying Style using JavaScript.	Student can able to use form validations.
15	Creating New window, Accessing & manipulating History of HTML Pages.	Student can apply various objects to make web page dynamic with user interactions.

Total hours: 60

Text Books:

1. Julie C. Meloni, Jennifer Kyrnin : HTML, CSS, and JavaScript All in One, 3rd Edition, Pearson,2018.
2. Joseph R. Lewis, Meitar Moscovitz : AdvancED CSS, W3C CSS Working Group, Apress, 2020.
3. Peter Gasston: The Book of CSS3: A Developer's Guide to the Future of Web Design, No Starch Press, April 2011.
4. MArjin Haverbeke : Eloquent Javascript – A modern Introduction to JavaScript, 3rd Edition,2018
5. Michael Morrison: Head First JavaScript, O'Reilly, 2014

Reference Books:

1. Andy Budd, Emil Björklund: CSS Mastery 3rd Edition, Apress - Advance Web Standard Solutions.
2. Karl Barksdale, Shane Turner: HTML and Java Scripts Basics, 4th Edition, Course Technology, 2006.
3. Jon Dukett: Beginning Web Programming with HTML, XHTML and CSS, Wrox Publication.
4. Richard York: Beginning CSS: Cascading Style sheets for Web Design, Wrox Press (Wiley Publishing), 2005.

Web References:

1. https://www.tutorialspoint.com/css/css3_tutorial.htm [For CSS Basics]
2. <https://www.tutorialrepublic.com/css-tutorial/> [For CSS3 BOX Model & Animation]
3. <https://javascript.info/> [For modern JavaScript tutorials]
4. <https://www.tutorialsteacher.com/javascript/javascript-hoisting> [JavaScript Basics]

Course Outcome: Upon successful completion of the course, student will:

CO1:	Able to apply CSS & its basic properties in web pages.
CO2:	Able to create HTML, CSS layout.
CO3:	Able to apply the transition, transformation and animation in web page.
CO4:	Able to write client side script – JavaScript to perform basic program
CO5:	Able to use DOM objects for dynamic web pages

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
CO1	1	2	3	3	2	1	2	1	1	2	1	1	1	CO1
CO2	1	3	3	3	2	2	1	1	1	2	3	2	1	CO2
CO3	1	2	2	3	2	1	1	1	1	2	2	1	1	CO3
CO4	2	2	3	3	2	1	1	1	2	1	2	1	1	CO4
CO5	2	2	3	3	2	1	2	1	2	1	2	2	2	CO5

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUC205 : Open Source Technology

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction /Contact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
02	Practical	04	60	40	100
Experiential Learning Components (Theory): Unit Tests, Assignments, Case Study etc.					
Experiential Learning Components (Practical): Lab Assignments, Practical Test, VIVA					

Pre-requisite: Working knowledge of HTML and basic knowledge of MYSQL.

Methodology, Pedagogy & Andragogy: During theory and practical sessions, students able to install & configure PHP and prerequisite software(s). Also, students will be emphasized to develop dynamic web applications.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Web Development and Open Source Technology	08
2	PHP Basics	10
3	Array and Functions	10
4	Handling Form Data	10
5	Database Connectivity with MYSQL	12
6	PHP Utilities	10

Total Hours (Theory): 60

Total hours (Practical): 60

Total Contact Hours:120

Detail Syllabus:**Unit I: Introduction to Web Development and Open Source Technology** **Hours 8**

Introduction of open source software, Development philosophy of open source software, pros and cons of open source software, open source vs. close source software, Community support in open source, Version Control, Introduction to Webpage and Website, Static and Dynamic Website, Client & Server Side Scripting, Web Hosting: Shared / Cloud / VPS / Dedicated.

Unit II: PHP Basics **Hours 10**

Introduction to PHP, Installation of Apache, MySQL and PHP (OOP approach), How PHP code is parsed, Embedding PHP and HTML, Executing PHP and viewing in Browser, Comments in PHP, PHP variables: static and global variables, Data types, Operators, Conditional Statements, Looping Structure.

Unit III: Array and Functions **Hours 10**

Array, Types of Array, Array Functions, Miscellaneous Functions: define, constant, include, require, header, die, exit, Overview of built in functions of PHP: String functions, Date and Time, Math functions, File handling functions, User Defined Functions.

Unit IV: Handling Form Data **Hours 10**

HTML Form element & its attributes, Send Form data using GET Method & POST Method, Receive Form data using \$_GET, \$_POST & \$_REQUEST variables, Super Global Variables, PHP form validations.

Unit V: Database Connectivity with MYSQL **Hours 12**

OOPs Concepts, PHP Data Objects (PDO), Introduction to MYSQL DB, CRUD operations, Handling Errors, State Management Techniques: PHP Sessions, starting session, modifying session variables, Un-registering and deleting session variable, PHP Cookies, Types of Cookies.

Unit VI: PHP Utilities **Hours 10**

File Uploading: Upload Single and Multiple file using PHP script, Understanding HTTP requests, Exploring and modifying HTTP responses, getting information from web server, Sending mails.

Outline of the Course:

Week No	Practical	Description
1	Student registration page using HTML and CSS	Revised the concepts of HTML and CSS.
2	Installation of XAMPP & generating basic PHP scripts	Get familiar with echo() and print(). Able to create basic business logic.
3	Variables, Data Types and Casting	Able to work with variables, data types and able perform type casting.
4	User Inputs and Conditional Statements	Deal with user inputs. Use of conditional statements.
5	Looping Structures	Able to work with Looping structures like: for, while, do..while and foreach
6	Inbuilt Functions: string, math and date & time	Use various built-in functions available in PHP.
7	PHP Forms	Creating Forms using GET and POST methods. Also use the super global variables \$_GET, \$_POST and \$_REQUEST.
8	PHP Forms & Validations	Creating Forms with server side validations
9	PHP Array	How to create an array? Array Functions
10	Database Connectivity	Understand MYSQL Dashboard. Implement Database connectivity using PDO (PHP Data Object).
11	Database Connectivity	Implement Database connectivity using PDO (PHP Data Object).
12	File Upload and Download	Able to upload, download and view various kind of files and store path into database using \$_FILES.
13	State Management: Session	Creating Session, modifying session variables, Unregistering and deleting session variable.
14	State Management: Cookies. Super Global Variables	Creating Cookies and learning various super global variables like \$_SERVER, \$GLOBALS and \$_ENV
15	PHP Mail	Sending mail using PHP mail() & PHPMailer

Core Books:

1. Josh Lockhart, Modern PHP, O'Reilly, 2015.

2. Kevin Tatroe, Peter Macintyre, Programming PHP, 4e: Creating Dynamic Web Pages, 4th Edition, O'Reilly, 2020.

Reference Books:

1. Urva Patel, Kaushal Gor, Sanskruti Patel, PHP Hand Book: Crafting Dynamic Web Application, Notion Press Publication, 2024.
2. Matt Zandstra, PHP 8 Objects, Patterns, and Practice: Mastering OO Enhancements, Design Patterns, and Essential Development Tools, Apress, 2021.
3. Luke Welling, Laura Thomson, PHP and MYSQL Web Development, 5th Edition, Pearson Education, 2016.

Web References:

1. <https://www.php.net/> [Official website of PHP]
2. <https://www.geeksforgeeks.org/php-tutorials/> [Lecture notes of PHP]
3. <https://www.w3schools.com/php/default.asp> [Lecture notes of PHP]
4. <https://github.com/PHPMailer/PHPMailer> [PHPMailer Code]

Course Outcomes: Upon successful completion of the course, students will be,

C01	:Gain the skills and knowledge for Open Source and Web Hosting.
C02	:To utilize knowledge and skills for basics of PHP and configuration of MYSQL Server.
C03	:Learn the array and built-In functions in PHP.
C04	:Gain understanding of Form handing and utilities in PHP.
C05	:Be able to develop dynamic web based application using PHP and MySQL with state management techniques.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		C01	C02	C03	C04	C05
1	Introduction to Web Development and Open Source Technology	√				

2	PHP Basics			√			
3	Array and Functions				√		
4	Handling Form Data					√	
5	Database Connectivity with MYSQL						√
6	PHP Utilities					√	

Course Articulation Matrix:

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	3	3	2	3	-	1	-	1	2	-	-	2	-
C02	3	3	3	3	-	1	-	1	1	-	-	3	-
C03	3	3	3	3	-	1	-	1	1	-	-	3	-
C04	3	3	3	3	-	1	-	1	1	-	-	3	-
C05	3	3	3	3	2	1	1	1	2	1	1	3	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE201 Advanced Networking

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study, Certification courses, etc.					

Pre-requisite: Basics of Computer Networks, Topologies.

Methodology, Pedagogy & Andragogy: The methodology for teaching Advanced Networking integrates a blend of theoretical instruction and practical application, employing both pedagogy and andragogy to cater to diverse learning needs. Pedagogically, the course leverages structured lectures, and formative assessments to provide foundational knowledge and skills to less experienced learners. Concurrently, andragogical techniques are employed to engage adult learners, emphasizing experiential learning, problem-solving, and critical thinking. This includes case studies, real-world simulations, collaborative projects, and research-based assignments that draw on the students' existing knowledge and professional experiences. The dual approach ensures a comprehensive understanding of advanced networking concepts, fostering both technical proficiency and strategic thinking necessary for complex network management and innovation.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Basic Network Concepts	07
2	Networking Device, media connection and network model	11
3	Network Virtualization	12
4	Adhoc Networking	11
5	Wireless Sensor networks	10
6	Fundamental of Network Security	09

Total Hours (Theory): 60
Total Contact Hours:60

Detail Syllabus:**Unit I: Basic Network Concepts** **Hours 07**

Introduction to Computer Networks, Element of Network, Type of Network: LAN, MAN, WAN, Network Topologies: Bus, Star, Mesh, Ring, etc, Data communication & Representation, Network Operating System.

Unit II: Networking Device, media connection and Network Model **Hours 11**

Common LAN Media: STP, UTP, Coaxial Cable, Optical Fiber, Making and Testing Cable, straight thru cable, Cross over Cable, Connector, Jack, Patch Panels, NIC, Repeater and Hub & its type, Bridges and its Types, Switch and Router. Description of Seven Layers of OSI Model, TCP/IP Model, Comparison of OSI & TCP/IP Model, Physical and Data link Layer, Network and Transport Layer, Presentation and Session Layer, Application Layer

Unit III: Network Virtualization **Hours 12**

Need for Virtualization, The Virtual Enterprise, Transport Virtualization- VNs, Central Services Access: Virtual Network Perimeter, A Virtualization Technologies primer: theory, Network Device Virtualization, Data-Path Virtualization, Control-Plane Virtualization, Routing Protocols.

Unit IV: Adhoc Networking **Hours 11**

Introduction, application of MANET, challenges, Routing in Ad hoc networks, topology & position-based approaches, Routing protocols: topology based, position based, Broadcasting, Multicasting, & Geocasting, Wireless LAN, Transmission techniques, MAC protocol issues, Wireless PANs, The Bluetooth technology

Unit IV: Wireless Sensor networks **Hours 10**

Need and application of sensor networks, sensor networks design considerations, empirical energy consumption, sensing and communication range, design issues, localization scheme, clustering of SNs, Routing layer, Sensor networks in controlled environment and actuators, regularly placed sensors, network issues, RFID as passive sensors.

Unit VI: Market Failures and Price Regulations **Hours 09**

Market failures and need for regulation, Regulations and market structure, Firm behavior, Price regulation. More on Externalities, and role of government, importance of competition in market failure and price regulations.

Core Books:

1. Computer Networking: A Top-Down Approach 6th edition, James F. Kurose, Keith W. Ross, Pearson (2012).
2. Network Virtualization, Victor Moreno, Kumar Reddy, Cisco Press (2006).
3. Ad Hoc and Sensor Networks: Theory and Applications 2nd edition; Carlos de Moraes Cordeiro, Dharma Prakash Agrawal, World Scientific Publishing Company; 2 edition (2011)

Reference Books:

1. TCP/IP Protocol Suite 4 edition, Behrouz Forouzan, McGraw-Hill Science (2009)
2. Mobile Ad Hoc Networks: Current Status and Future Trends, Jonathan Loo, Jaime Lloret Mauri, Jesús Hamilton Ortiz, CRC Press(2011)
3. Fundamentals of Sensor Network Programming: Applications and Technology, S. Sitharama Iyengar, Nandan Parameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye, Wiley-IEEE Press (2010).

Web References:

1. <https://www.ping.fm/ip/>
2. <https://www.edynamiclearning.com/course/advanced-networking-1a-introduction/>
3. <https://aws.amazon.com/training/learn-about/advanced-networking/>

Course Outcomes: Upon successful completion of the course, students will be,

C01 :	Demonstrate comprehensive understanding of basic network concepts, including networking devices, media connections, and network models, and their roles in network architecture.
C02 :	Analyze and implement network virtualization techniques, assessing their benefits and challenges in various networking environments.
C03 :	Design and manage ad hoc networking solutions, addressing the unique requirements and challenges of decentralized network configurations.
C04:	Develop and optimize wireless sensor networks, leveraging their capabilities for data collection and transmission in diverse applications.
C05 :	Evaluate and apply fundamental network security principles to protect network infrastructures from potential threats and vulnerabilities, ensuring robust and secure communication channels.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Basic Network Concepts	✓				
2	Networking Device, media connection and network model		✓			
3	Network Virtualization			✓		
4	Adhoc Networking				✓	
5	Wireless Sensor networks					✓
6	Fundamental of Network Security					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	1	2	2	-	-	-	1	-	2	1	1
CO2	-	2	2	-	3	2	-	-	1	1	2	2	2
CO3	-	2	3	1	2	2	-	-	-	1	2	3	3
CO4	1	2	2	2	3	3	1	-	1	-	3	2	3
CO5	1	3	3	2	2	3	-	1	-	2	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUE202 : Artificial Intelligence (AI) Fundamentals

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: The theory sessions will be focused on basics of Artificial Intelligence, problem solving paradigms, and search strategies. Areas of application such as Expert Systems, Software Agents, knowledge representation, natural language processing, expert systems, robotics will be explored.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Artificial Intelligence	08
2	Problem-solving by Search and constraint satisfaction	11
3	Knowledge representation and reasoning	11
4	Expert Systems	11
5	Agents	10
6	Introduction to AI Techniques and Application Areas	09

Total Hours (Theory): 60
Total Contact Hours:60

Detail Syllabus:**Unit I: Introduction to Artificial Intelligence** **Hours 08**

Concepts and definitions of Artificial Intelligence (AI) – Brief history of AI – AI and related fields – The AI problems and underlying assumptions, AI approaches: Cognitive Science, Turing Test.

Unit II: Problem solving by Search and constraint satisfaction **Hours 11**

Problem spaces; brute-force search; best-first search; two-player games; constraint satisfaction

Unit III: Knowledge representation and reasoning **Hours 11**

Review of propositional and predicate logic; resolution and theorem proving; non-monotonic inference; probabilistic reasoning; Bayes theorem, reasoning under uncertainty.

Unit IV: Expert Systems **Hours 11**

Introduction – Representing and using domain knowledge – Knowledge acquisition and representation – General structure of Expert Systems – Expert System Shell – Advantages and disadvantages of Expert Systems, Applications of Expert Systems

Unit V: Agents **Hours 10**

Definition of agents; successful applications and state-of-the-art agent-based systems; software agents, personal assistants, and information access; multi-agent systems.

Unit VI: Introduction to AI Techniques and Application Areas **Hours 09**

Introduction to fuzzy logic – Introduction to various application areas of AI like Natural Language Processing (NLP), Learning, Speech Recognition, Computer Vision, Game Playing, Robotics.

Core Books:

1. Norvig, Peter, *Paradigms of AI Programming*, Morgan Kauffman, 1992.
2. S. Russell and P. Norvig, *Modern Approach to Artificial Intelligence*, Prentice Hall of India Ltd., 2006.
3. Rich & Knight, *Artificial Intelligence*, 2nd edition, TMH, 1991.

Reference Books:

1. R.Akerkar and P. S. Sajja, Knowledge-Based Systems, Jones and Bartlettes, MIT, 2010.
2. George Luger, Artificial Intelligence, 5th Edition, Addison Wesley, 2004.

Web References:

1. http://www.tutorialspoint.com/artificial_intelligence/ [Basics of AI]
2. <http://intelligence.worldofcomputing.net/ai-branches/expert-systems.html> [Expert Systems]
3. <http://pages.cs.wisc.edu/~bolo/shipyard/neural/local.html> [Neural Network]

Course Outcomes: Upon successful completion of the course, students will be,

C01 :	To understand basic problems of AI and history of AI.
C02 :	Getting deep knowledge of searching algorithms and its applications in AI.
C03 :	Learning Knowledge Representation and reasoning techniques.
C04 :	To gain understanding Expert System and Agent Based Systems.
C05 :	To explore various application areas of AI.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Artificial Intelligence	✓				
2	Problem solving Search and constraint satisfaction		✓			
3	Knowledge representation and reasoning			✓		
4	Expert Systems				✓	
5	Agents				✓	
6	Introduction to AI Techniques and Application Areas					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	PSO1	PSO2
CO1	-	2	2	2	1	-	-	-	-	-	-	1	2
CO2	3	2	2	3	2	2	-	3	-	-	-	2	2
CO3	-	-	3	3	2	-	-	-	-	-	-	1	-
CO4	3	2	2	-	2	2	-	3	-	-	-	1	2
CO5	2	-	-	-	2	-	3	3	-	-	-	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUA202: Social Media and BLOG Writing

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C contact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
02	Practical	04	60	40	100
Experiential Learning Components: Lab Assignments, Practical Test, VIVA					

Prerequisites: None.

Methodology, Pedagogy & Andragogy: This course focuses on providing hands-on experience to students for understanding social media marketing strategies and BLOG writing skills.

Outline of the Course:

Week No	Practical	Description
1	Introduction to Social Media <ul style="list-style-type: none"> • Platforms for social media marketing • Roles of social media in digital marketing 	Learn basics of Social Media
2	Optimizing for Social Media Platforms <ul style="list-style-type: none"> • Facebook • Instagram • X (formerly Twitter) 	Learn about various social media platforms and optimizing for them.
3	Content Calendar for Social Media <ul style="list-style-type: none"> • Creating content calendar with different focus 	
4	Content creation and Management in Meta Business Suite <ul style="list-style-type: none"> • Understanding and Managing Meta Business Suite 	Understanding Search Engine Result Page, and learn about On-the-Page and Off-the-Page Optimization
5	Paid Marketing in Meta Platforms – I <ul style="list-style-type: none"> • Understanding Ads Manager • Understanding Billing 	Understanding paid marketing in Meta platforms
6	Paid Marketing in Meta Platforms – II <ul style="list-style-type: none"> • Brand awareness campaign • Traffic campaign • Engagement campaign 	Understanding paid marketing in Meta platforms with different objectives

7	Paid Marketing in Meta Platforms – III <ul style="list-style-type: none"> • Lead generation campaign • Conversion campaign 	Understand to embed Social Media with website
8	Getting data from Social Media Paid Advertisement using Meta Pixel	For custom audiences and lookalike audiences
9	Introduction to BLOG <ul style="list-style-type: none"> • What is BLOG? • Importance of BLOG 	-
10	Popular Blogging Platforms <ul style="list-style-type: none"> • WordPress • Blogger 	-
11	Using SEO in Blogging <ul style="list-style-type: none"> • Using AI in Blogging • Understanding SEO in Blogging 	-
12	Using Blogger for Blogging	-
13	Using WordPress for Blogging	-
14	Case Study – I (Social Media)	-
15	Case Study – II (Blogging)	-
		Total hours: 60

Text Books:

1. Damian Ryan and Calvin Jones: Understanding Digital Marketing, Kogan Page, 2014
2. Stephanie Diamond: Digital Marketing All-in-One for Dummies, Wiley Publication, 2019
3. Amy Lupold Bair, Blogging for Dummies, 7th Edition, Wiley Publication, 2020

Reference Books:

1. Philip Kotler, Hermawan Kartajaya, and Iwan Setiawan: Marketing 4.0: Moving from Traditional to Digital, Wiley Publication, 2016
2. Jan Zimmerman and Deborah Ng: Social Media Marketing All-in-One for Dummies, Wiley Publication, 2017

Web References:

1. <https://www.simplilearn.com/tutorials/digital-marketing-tutorial>
2. https://www.tutorialspoint.com/digital_marketing/index.htm
3. <https://intellipaat.com/blog/digital-marketing-tutorial/>
4. <https://www.javatpoint.com/digital-marketing>

5. <https://www.javatpoint.com/blog>

Course Outcome: Upon successful completion of the course, student will:

CO1:	Able to understand digital marketing and its importance.
CO2:	Able to create and manage content using social media platforms
CO3:	Able to understand paid advertisements on social media platforms
CO4:	Able to blogging and its importance in digital marketing.
CO5:	Able to use generative AI in Digital Marketing.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	2	1	3	2	2	1	1	-	1	1	1	1
CO2	-	1	2	3	1	3	1	-	-	2	2	2	2
CO3	1	1	2	3	1	3	1	-	-	2	2	2	2
CO4	1	1	2	3	1	1	1	1	-	1	-	1	1
CO5	2	2	3	3	2	3	3	2	1	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUD202: Programming the Internet

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
02	Practical	04	60	40	100
Experiential Learning Components: Lab Assignments, Practical Test, Case Study					

Prerequisites: CAUD201 – Introduction to Web Designing

Methodology, Pedagogy & Andragogy: This subject focuses on hands-on experiments to create dynamic and interactive web sites using HTML5, CSS3 and JavaScript.

Outline of the Course:

Week No	Practical	Description
1	CSS Styling the web - Applying CSS Building blocks -CSS Selectors, Cascade & inheritance, CSS Properties, CSS Box model.	Student can apply various types of CSS with its basic properties.
2	Creating Layout - Header, footer, navigation menu, and sub-navigation. Floats.	Student can create different layout using semantic elements of HTML5 & CSS classification properties.
3	Creating Layout - Flexbox, Introduction to Flexbox, Flex Container and Flex Items, Flexbox Properties and Layout Techniques.	Student can create flexible and responsive web layouts. Its ability to distribute space and align items effectively makes it a vital part of modern web design.
4	Creating Layout - Introduction to CSS Grid Layout- Grid Container and Grid Items, multi column layout.	Student can Understand its properties and axes can significantly improve the adaptability and aesthetics of your web pages.
5	Creating Image Gallery and Animation - 2D/3D Transformation, Transitions and Animation.	Student can create layout image gallery & animation.

6	CSS Media Query.	<i>Student can create different layouts depending on the size of the viewport.</i>
7	JavaScript – Adding Internal & External JavaScript	Student can write script for basic Programs.
8	Working with variables, datatype – Number, String, Boolean.	Student can write script for basic programs using different datatypes.
9	datatype – Array, Object, Operators, Conditional statements, Looping statements.	Student can write script for basic programs using array and object, condition, Loop.
10	Adding Dialog boxes in HTML page – Alert, Confirm and Prompt.	Student can able to use dialog boxes to make website alive.
11	Creating user defined function.	Student can able to use in-build and user defined functions of JavaScript.
12	Adding Mouse and Keyboard Event in HTML page, Manipulating String and Date.	Students can make user interaction using various Events.
13	JavaScript Document Object Model hierarchy – Create find and manipulate HTML Element using Objects and methods	Student can explore the DOM Hierarchy.
14	Form validation, Applying Style using JavaScript.	Student can able to use form validations.
15	Creating New window, Accessing & manipulating History of HTML Pages.	Student can apply various objects to make web page dynamic with user interactions.

Total hours: 60

Text Books:

1. Julie C. Meloni, Jennifer Kyrnin : HTML, CSS, and JavaScript All in One, 3rd Edition, Pearson, 2018.
2. Joseph R. Lewis, Meitar Moscovitz : AdvancED CSS, W3C CSS Working Group, Apress, 2020.
3. Peter Gasston: The Book of CSS3: A Developer's Guide to the Future of Web Design, No Starch Press, April 2011.
4. MArjin Haverbeke : Eloquent Javascript – A modern Introduction to JavaScript, 3rd Edition, 2018
5. Michael Morrison: Head First JavaScript, O'Reilly, 2014

Reference Books:

1. Andy Budd, Emil Björklund: CSS Mastery 3rd Edition, Apress - Advance Web Standard Solutions.
2. Karl Barksdale, Shane Turner: HTML and Java Scripts Basics, 4th Edition, Course Technology, 2006.
3. Jon Dukett: Beginning Web Programming with HTML, XHTML and CSS, Wrox Publication.
4. Richard York: Beginning CSS: Cascading Style sheets for Web Design, Wrox Press (Wiley Publishing), 2005.

Web References:

1. https://www.tutorialspoint.com/css/css3_tutorial.htm [For CSS Basics]
2. <https://www.tutorialrepublic.com/css-tutorial/> [For CSS3 BOX Model & Animation]
3. <https://javascript.info/> [For modern JavaScript tutorials]
4. <https://www.tutorialsteacher.com/javascript/javascript-hoisting> [JavaScript Basics]

Course Outcome: Upon successful completion of the course, student will:

CO1:	Able to apply CSS & its basic properties in web pages.
CO2:	Able to create HTML, CSS layout.
CO3:	Able to apply the transition, transformation and animation in web page.
CO4:	Able to write client side script – JavaScript to perform basic program.
CO5:	Able to use DOM objects for dynamic web pages.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
C01	1	2	3	3	2	1	2	1	1	2	1	1	1	C01
C02	1	3	3	3	2	2	1	1	1	2	3	2	1	C02
C03	1	2	2	3	2	1	1	1	1	2	2	1	1	C03
C04	2	2	3	3	2	1	1	1	2	1	2	1	1	C04
C05	2	2	3	3	2	1	2	1	2	1	2	2	2	C05

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CAUI201 : Summer Internship and Viva – II

Objective and Scope:

Students who choose to exit the programme after the completion of the first two semesters must undertake internships, community engagement programmes and field based learning/minor projects during the summer term. This internship, worth 4 credits, is a requirement for the award of the Diploma. Students have to undergo internship in reputed Tech Companies, Software Development Firm, IT services companies, Research Institutions and Lab etc. This provision ensures that students gain valuable practical experience and industry exposure, complementing their academic learning and enhancing their career prospects. Following are the intended objectives of internship training:

- **Practical Experience:** Provide hands-on experience with real-world projects to apply theoretical knowledge gained during the course.
- **Skill Development:** Enhance technical skills, such as programming, software development, database management, and other relevant IT skills.
- **Industry Exposure:** Familiarize students with the working environment of the IT industry, including understanding company culture, workflows, and professional practices.
- **Professionalism:** Instil a sense of professionalism and work ethic, including adhering to deadlines, following instructions, and working collaboratively.
- **Transition to Employment:** Facilitate a smoother transition from academic life to professional careers by bridging the gap between theory and practice.

Guidelines of Internship:

The Summer Internship shall be of 15 (Minimum 60 hours) duration and will be undertaken during the Summer Vacation. Students have to undergo internship in reputed Tech Companies, Software Development Firm, IT services companies, Research Institutions and Lab etc. It is mandatory for the students to seek written approval from the coordinator about the topic and the organization before commencing the Summer Internship. During Summer Internship students are expected to take necessary guidance from the faculty guide allotted by the Institute. To do it effectively they should be in touch with their guide through e-mail or phone. Students must maintain regular reports detailing the work completed, challenges faced, and learning experiences. Students must submit a final report and presentation summarizing the internship experience, project outcomes, and key learnings to guide. The technical specifications for report preparation is as under:

Technical details:

1. The report shall be printed on A-4 size white paper.
2. 12 pt. Times New Roman font shall be used with 1.5-line spacing for typing the report.
3. 1" margin shall be left from all the sides.
4. Considering the environmental issues, students are encouraged to print on both sides of the paper.

5. The report shall be spiral bound as per the standard format of the cover page given by the Institute.
6. The report should include a Certificate (on company's letter head) from the company duly signed by the competent authority with the stamp.
7. The report shall be signed by the respective guide(s) & the Principal of the Institute 10 (Ten) days before the viva-voce examinations.
8. Student should prepare two hard bound copies of the Summer Internship Project Report and submit one copy in the institute. The other copy of the report is to be kept by the student for their record and future references.

Evaluation:

The evaluation of Internship will be done as per the following criteria:

Sr. No.	Evaluation Criteria	Marks
1	Summer Internship Report	50
2	Presentation and Viva-voce examination	50
TOTAL MARKS		100

Students must secure 36% passing marks in both components to qualify for the Diploma.

Internship and Exit:

Any student intending to exit the course must complete the summer internship (Including scoring at least 36% marks in the evaluation) before exit. A student intending to exit shall have to submit an application to Principal through Counsellor before even semester university theory examination. However, any such student desiring to withdraw the exit option may do that before the last paper of theoretical examinations of even semester.

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY, CHANGA															
Smt. Chandaben Mohanbai Patel Institute of Computer Applications															
FACULTY OF COMPUTER SCIENCE AND APPLICATIONS															
BCA, B Sc(IT), MCA, M Sc (IT) Programmes (ODD Semester)															
Academic Calendar (2024-2025)															
Week No	Month	M	T	W	T	F	S	S	Activity						
1	June	<u>24</u>	25	26	27	28	29	<u>30</u>	Commencement of New Academic Sessions of BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT-III Bridge Course for BCA-I, B.Sc.IT-I (Online Mode)						
2	July-August	<u>1</u>	2	3	4	5	6	<u>7</u>	Teaching Bridge Course for MCA-I, M.Sc.IT-I (Online Mode) Commencement Celebration for BCA-I, B.Sc.IT-I (Offline Mode)						
3		<u>8</u>	9	10	11	12	<u>13</u>	<u>14</u>	Teaching Bridge Course for MCA-I, M.Sc.IT-I(Online Mode) Commencement of Acedemic sessions for BCA-I, B.Sc.IT-I						
4		<u>15</u>	16	<u>17</u>	18	19	20	<u>21</u>	Teaching Commencement Celebration for MCA-I, M.Sc.IT-I(Offline Mode) Muharram						
5		22	23	24	25	26	<u>27</u>	<u>28</u>	Teaching Commencement of Acedemic sessions for MCA-I, M.Sc.IT-I	Expert Session					
6		29	30	<u>31</u>	1	2	3	<u>4</u>	Teaching	Expert Session					
7	August-September	5	<u>6</u>	<u>7</u>	8	<u>9</u>	10	<u>11</u>	Teaching	Workshop on Current Trends	Aarohan Club Activity				
8		<u>12</u>	13	14	<u>15</u>	16	17	<u>18</u>	Teaching	Independence Day	Vastuvit Club Activity				
9		<u>19</u>	20	21	22	<u>23</u>	<u>24</u>	<u>25</u>	Teaching	(Online Mode)	Rakshabandhan	Samarpan Club Activity			
10		<u>26</u>	27	<u>28</u>	29	30	31	<u>1</u>	Teaching	Janmashtami	Samvardhan Club Activity				
11		<u>2</u>	3	4	5	6	<u>7</u>	<u>8</u>	Teaching	Industrial Visit Samvatsari(Ganesh Chaturthi)					
12	September-October	9	<u>10</u>	11	12	<u>13</u>	<u>14</u>	<u>15</u>	Teaching	Expert Session	Tarkmanthan Club Activity				
13		16	17	<u>18</u>	19	<u>20</u>	21	<u>22</u>	Teaching	Expert Session	Vignatma Club Activity				
14		23	24	25	26	27	<u>28</u>	<u>29</u>	Teaching	Aavishkar Club Activity					
15		30	1	<u>2</u>	3	4	5	<u>6</u>	Teaching	Gandhi Jyanti					
16		7	<u>8</u>	<u>9</u>	10	11	<u>12</u>	<u>13</u>	Teaching	Workshop on Current Trends					
17	October-November	<u>14</u>	15	16	17	18	19	<u>20</u>	Teaching	Sessional Examination (BCA-III,V, B.Sc.IT-III,V,MCA-III,M.Sc.IT-III)					
18		<u>21</u>	<u>22</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	DIWALI VACATION						
19		<u>28</u>	<u>29</u>	<u>30</u>	<u>31</u>	<u>1</u>	<u>2</u>	<u>3</u>							
20		<u>4</u>	<u>5</u>	<u>6</u>	7	8	<u>9</u>	<u>10</u>	Teaching (Online Mode)	University Practical Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT- III)					
21	November - December	<u>11</u>	12	13	14	<u>15</u>	16	<u>17</u>	Teaching MCA-I, M.Sc.IT-I	University Practical Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT-III) (Continue) Sessional Examination(BCA-I, B.Sc.IT-I) Guru Nanak Jayanti					
22		18	19	20	21	22	<u>23</u>	<u>24</u>	Teaching MCA-I, M.Sc.IT-I	University Theory Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT-III) Sessional Examination(BCA-I, B.Sc.IT-I)					
23		<u>25</u>	26	27	28	29	30	<u>1</u>	University Theory Examination (BCA-III,V,B.Sc.IT-III,V, M.Sc.IT-III, MCA-III) (Continue) University Practical Examination(BCA-I,B.Sc.IT-I)						
24		<u>2</u>	3	4	5	6	<u>7</u>	<u>8</u>	Sessional Examination(MCA-I, M.Sc.IT-I)						
25	December	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	13	<u>14</u>	<u>15</u>	University Practical Examination(MCA-I,M.Sc.IT-I)	University Theory Examination (BCA-I, B.Sc.IT-I) (Continue)					

								icSoftComp2024 International Conference Remedial Examination of BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT-III
26		16	17	18	19	20	21	22 University Theory Examination(MCA-I,M.Sc.IT-I) Teaching Commencement of New Academic Sessions of BCA-IV,VI, B.Sc.IT-IV,VI, MCA-IV,M.Sc.IT-IV Remedial Examination for BCA-III,V, B.Sc.IT-III,B.Sc.IT-V, MCA-III and M.Sc.IT-III (Continue) AGNITIO
27		23	24	25	26	27	28	29 University Theory Examination(MCA-I,M.Sc.IT-I) Chritsmas Teaching Commencement of New Academic Sessions of BCA-II, B.Sc.IT-II Remedial Examination for BCA-I, B.Sc.IT-I
28	December-January	30	31	1	2	3	4	5 Commencement of New Academic Sessions of MCA-II,M.Sc.IT-II Teaching Remedial Examination for BCA-I, B.Sc.IT-I (Continue)

SECTION - 2

VARIOUS ADMINISTRATIVE PROCESS

Payment of tuition fees or other charges

Step : 1

- Visit University web-portal click on Pay Fees :
<https://www.charusat.ac.in/student-corner> or visit
<https://charusat.edu.in:912/FeesPaymentApp/>

Step : 2

- Enter your Student ID and Pay your Fees

Step : 3

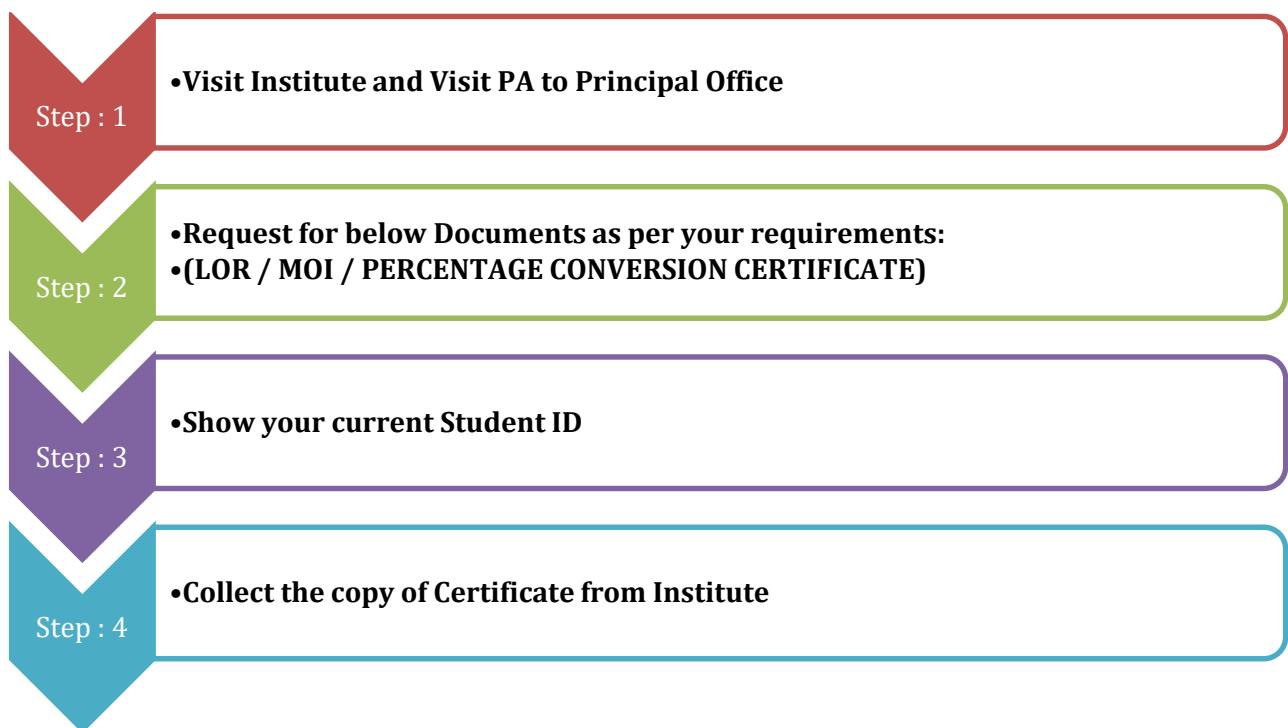
- After Successfull payment download your fees receipt

Process of Acquiring WIFI Access

To access the Wi-Fi on the Charotar University of Science and Technology (CHARUSAT) campus, students can use the following:

- **Wi-Fi enabled campus:** The entire CHARUSAT campus is Wi-Fi enabled.
- **Computers with internet:** All computers on campus have internet access.
- **Dedicated bandwidth:** Students are given a large bandwidth for internet surfing.
- **Ring connectivity:** The campus has ring connectivity to provide uninterrupted network access.

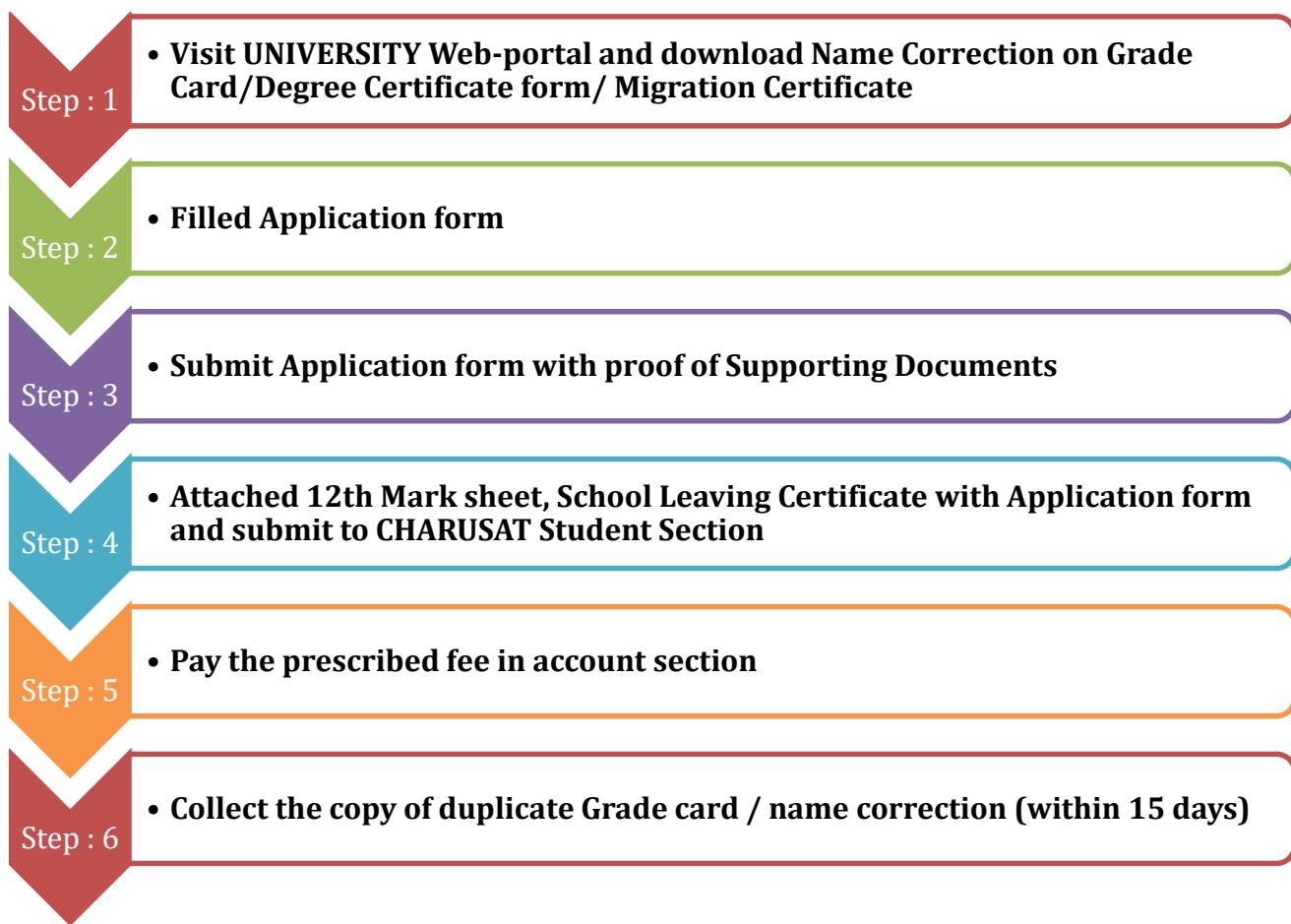
Process to obtain required Certificate from the institute



Process to obtain required Certificate from the University

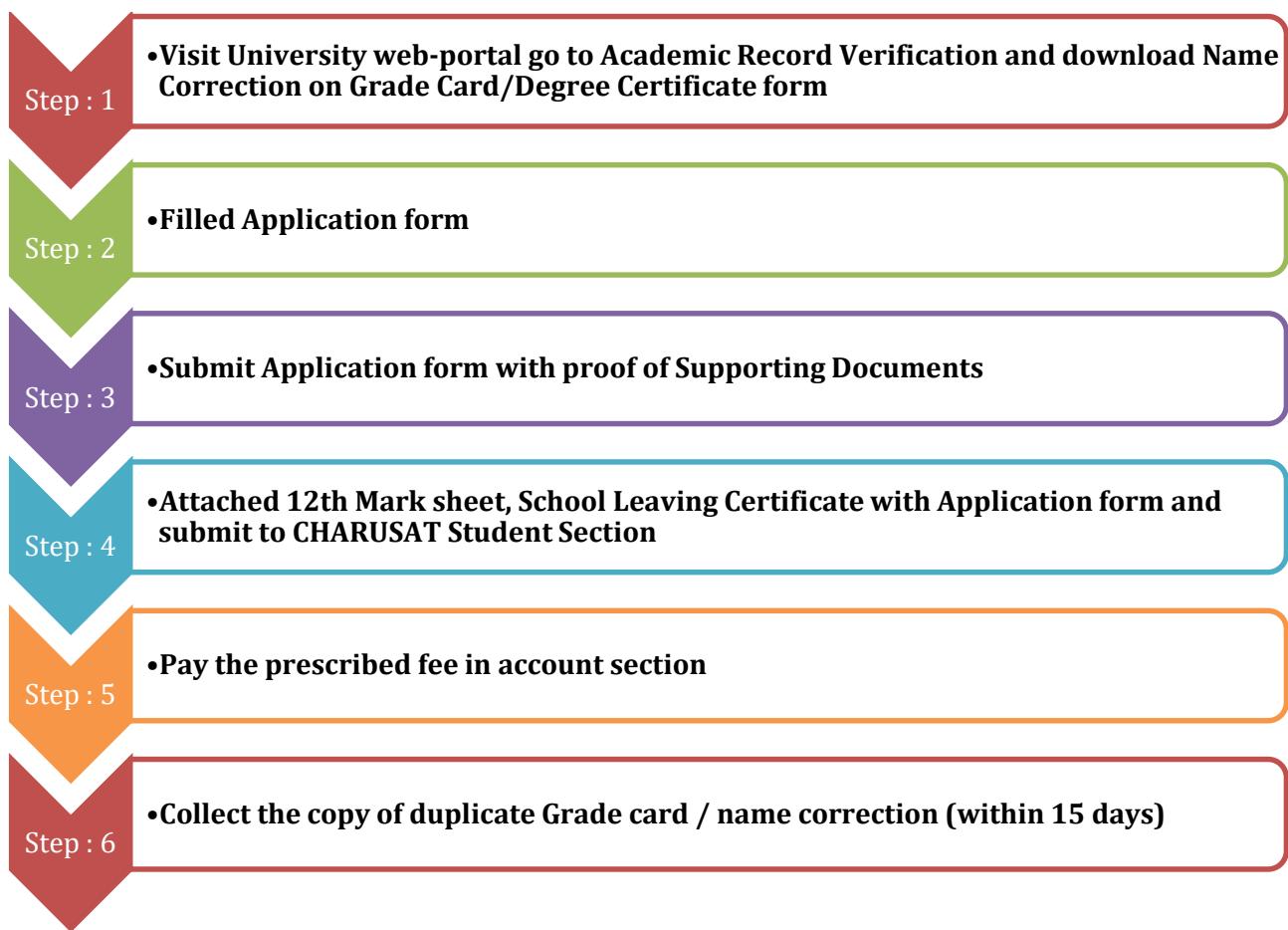
In order to obtain the required certificate at the University Level, students need to visit the Student Corner of the CHARUSAT University website. They can choose to apply online or offline and should ensure to include all necessary enclosures with their application. The application must be submitted to the Student Section of the University and should be duly attested by the relevant institute's HoD/ Principal/ Dean. Once all the necessary procedures are completed, the certificate will be issued at the University office.

Process to obtain Duplicate Grade Card/ Name correction in Grade Card/ Migration certificate

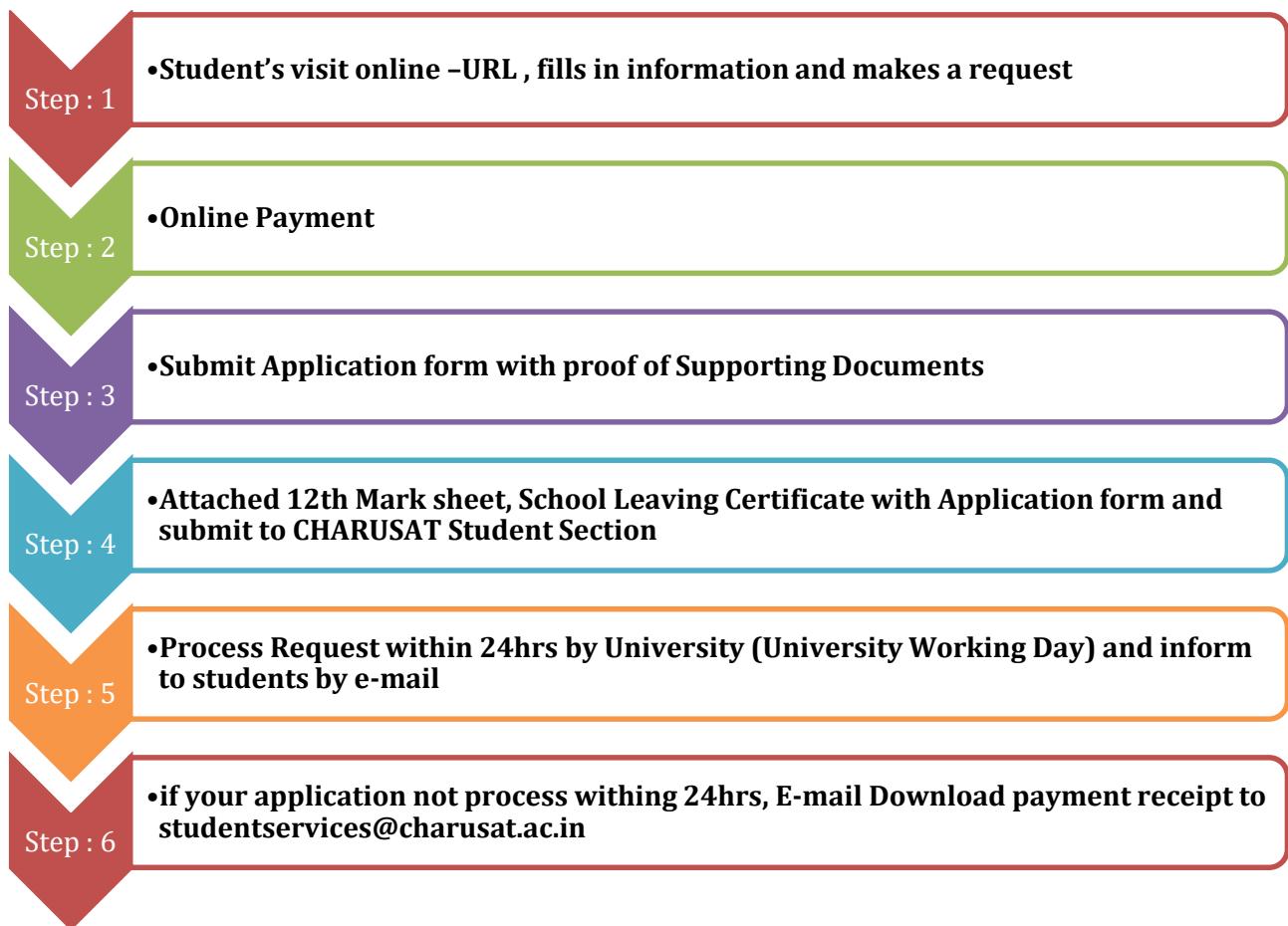


Initiator	Task
Student	Online Application Request through CHARUSAT Web Portal https://www.charusat.ac.in/student-corner Select Transcript / Duplicate Grade Card / Migration Certificate Select Document Type Migration Certificate Transcript/E-Transcript / WES Duplicate Grade Card Enter CHARUSAT Student ID Make Online Payment
Student	Pay fees at online Download Payment Receipt (for further Communication)
University Admin Office	University will get request after successful Payment (Time is depend on clearing of payment)
Entire process time duration: 24hrs after payment done	

Process for Academic Document Verification by External Agency



Work flow



SECTION – 3

UNDERTAKINGS AND DECLARATIONS

UNDERTAKING
(Observing Rules and Regulations of the University)

Roll No. _____

I, _____ Mr. /Ms. son/daughter of _____ have secured admission at the Smt. Chandaben Mohanbhai Patel Institute of Computer Applications of CHARUSAT University in the academic year for the _____ Programme. We hereby confirm that we have gone through the academic rules and regulations of the Institute very carefully and we assure you that we will abide by the same.

Student Signature : _____

Name of the Parent/Guardian : 1. _____
2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

DECLARATION
(Code of Conducts and Disciplinary Rules)

I bearing roll no. admitted in (programme) of the Institute of....., CHARUSAT University, Changa do hereby declare and undertake that I will abide by the Code of Conduct, including rules for misconduct/indiscipline by the students, provisions like dress code on the campus, rules for maintaining vehicles on the campus, public display of affection (PDA), etiquette on the campus etc.

I will abide by all the rules and regulations as and when intimated by the university and if I am found violating any rules then, I shall be subjected to the major/minor penalties as may deemed fit by the university.

Signature : _____

Name of the Parent/Guardian : 1. _____
2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

UNDERTAKING
(Observing Rules & Regulations of the Examination)

I, Roll No..... studying in the First year of programme at Institute of, CHARUSAT University, Changad hereby undertake that I have read and understood all the Rules & Regulations related to Academic Dishonesty at examinations/tests/assignments and punishment in case of using unfair means, I have also gone through the Academic Regulations related to Granting of Term and Cancellation of admission, and I shall observe, follow and abide by all these rules and regulations.

I shall abide by all the rules and regulations and if I am found violating any rules then, I shall be subjected to the necessary action/penalties as per provision of rules/regulations of the university.

Signature : _____

Name : _____

Address : _____

Signature of the Parent/Guardian : 1. _____ 2. _____

UNDERTAKING
(To Refrain from Consumption of Drugs and Alcohol)

I, _____ bearing Roll No._____ admitted in _____ (programme) at Institute of _____ do hereby declare and undertake that I will refrain myself from possession / consumption of Drugs and Alcohol.

I know that the use/possession of narcotics drugs and alcohol is a punishable offence under the law of the Government of Gujarat and if I am found guilty of using such thing/s, then it will amount to a criminal offence and I am liable for the appropriate penalty as per laws and also liable to cancel my admission from the university.

I hereby give an undertaking to the Institute that I will refrain myself from possession or consumption of Drugs and Alcohol in and around the campus.

Date :

Place :

Signature of Student

I undertake that I will take utmost care to see that my ward does not get involved in any such incident.

Name of the Parent/Guardian : 1. _____

2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____
Address of Parent/ Guardian : _____

Contact no of Parent/ Guardian : 1. _____ 2. _____

4. IMPORTANT CONTACTS

+91-02697-265011 (Last 4 digits: Extension number)

Name and Designation	Extension number & Email-id
Dr. Sanskruti Patel Dean - Faculty of Computer Application	5243 Dean.fca@charusat.ac.in
Dr. Dharmendra Patel Principal	5241 Principal.cmpica@charusat.ac.in
Mr. Harikrushna Patel P.A to Principal	5242 Haripatel.mba@charusat.ac.in
Mr. Suresh Patel Librarian	5255 sureshsolanki.mca@charusat.ac.in
Mr. Harikrushna Patel Student Section	5242 Haripatel.mba@charusat.ac.in
Shri Mukesh Yadav Dy. Registrar, Academic Section	5008 dipenpatel.rnd@charusat.ac.in
Shri Bhavdip Patel Dy. Accounts Officer, Accounts Section	5024 bhavdippatel.acc@charusat.ac.in
Dr. Abhilash Shukla Examination Section	8222 abhilashshukla.mca@charusat.ac.in
Dr. Ritesh Patel Coordinator, E-governance	5251 coordinator.egov@charusat.ac.in
Shri Ritesh Bhatt WIN Cell Coordinator	5106 riteshbhatt.win@charusat.ac.in
Mr. Sujal Dadhaniya Corporate Development & Placement Cell	5213 tpo@charusat.ac.in,tnp@charusat.ac.in
Dr. Dilip Gosai Head, Charusat Rural Education Development Programme	5160 head.credp@charusat.ac.in
Dr. Gayatri Dave Chairperson, Women Development Cell	5192 gayatridave.bt@charusat.ac.in
Dr. Mrunali Patel Chairperson, Internal Complaint Committee	5163 chairperson.icc@charusat.ac.in
Dr. Vijay Panchal Head, Equal Opportunity Cell	5081 vijaypanchal.cv@charusat.ac.in
Mr. Kautilya Pandya, Member-Secretary Student Grievance Redressal Cell	5112 kautilpandya.adm@charusat.ac.in
Dr. Vijaykumar Chaudhary Convenor, Anti-ragging Cell	5221 / vijaychaudhary.me@charusat.ac.in



CHARUSAT[®]
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

STUDENT INFORMATION BOOKLET

VOLUME – 2:

Bachelor of Science in Information Technology

Smt. Chandaben Mohanbhai Patel Institute of
Computer Applications

CHARUSAT UNIVERSITY
Off. Nadiad-Petlad Highway, Changa - 388 421
Anand, Gujarat, India

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PREAMBLE

The Handbook (Student's Information Booklet) for Students, printed in two volumes contain General Information Respectively about the CHARUSAT University anddetailed information about Smt. Chandaben Mohanbhai Patel Institute of Computer Applications.

Handbook Volume-I contains information about general rules to be followed by the students on campus. It gives information about the general facilities and support available for the students on campus. It gives insight about the discipline and conduct rules of the University.

This Handbook (Student's Information Booklet) is for the purpose of providing information to the students about the University and its programmes and is not a Regulation book of the University. Hence, no claim can be made based on the information given in the book.

The University / Institute reserves the right to amend the rules and regulations mentioned in the Handbook without any prior notice. The decision of the University shall be final on all matters. For any clarification, the Student Section may be contacted.Handbook Volume-II (Student's Information Booklet) contains academic information about the Institute, which includes the Academic Rules and Regulations regarding academic requirements and academic conduct of the students at the University including different policies and forms. Besides, it includes important information on registration, grading system, academic standards, attendance norms, discipline and the like. The students shall abide by these rules and shall, at all times, conduct in a manner so as to bring credit to the University and enhance its prestige in the society.

It is prime responsibility of the students to get familiar (themselves) with the rules and regulations.

ABOUT INSTITUTE

Smt. Chandaben Mohanbhai Patel Institute of Computer Applications (CMPICA) is a constituent institute of CHARUSAT. It is offering a MCA, M.Sc. (IT), BCA, B.Sc.(IT), Online BCA, Online MCA and Ph. D. programmes. The vision of the institute is to become one of the leading institutions in the country by imparting state-of-the-art education to the students in the field of computer applications and by contributing in the nation's efforts of computerizing public systems for the benefit of the masses. It is committed to excel in both teaching and research. Institute is reacting rapidly to the changing technological landscape by adapting quickly. The Institute is also committed to adapt industry practices.

The institute has received numerous prestigious awards from various organizations, including AICTE, the Government of India, and the Government of Gujarat. Additionally, it has been awarded a five-star rating in the Gujarat State Institutional Rating Framework (GSIRF) by the Government of Gujarat.

ACADEMIC REGULATIONS

&

SYLLABUS 2024 -25

Faculty of Computer Science & Applications
Smt. Chandaben Mohanbhai Patel Institute of
Computer Applications
Bachelor of Science in Information Technology
(BSc-IT) Programme
(as per NEP-2020)



Charotar University of Science and Technology (CHARUSAT)
CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad, District: Anand
Phone: 02697-247500, Fax: 02697-247100, Email: info@charusat.ac.in
www.charusat.ac.in

ACADEMIC RULES

To ensure uniform system of education, duration of under graduate programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

1. System of Education

The Semester system of education should be followed across the Charotar University of Science and Technology (CHARUSAT) at Bachelor's levels. Each semester will be at least 90 working days' duration. The Curriculum and Credit Framework for Undergraduate Programmes (CCFUP) is based on the University Grants Commission's (UGC) guidelines, with a student-centric focus, flexible choice-based credit system, and a multidisciplinary approach. This framework also provides multiple entry and exit options, facilitating students to align their education with their career aspirations by choosing subjects/fields of their interest. Every enrolled student will be required to take a specified load of course work in the chosen course of specialization and also complete a project/dissertation if any.

2. Certification and Duration of Study with Multiple Entry Multiple Exit (MEME)

The undergraduate degree will have a flexible duration of either three or four years, with multiple exit options during this period. The table below outlines the various certifications a student can earn at different stages of their undergraduate study:

Table-1 Certification and Duration on MEME

Duration of Study	Semesters Completed	Certification Earned
4 Years	Eight Semesters(4 Academic Years)	Bachelor's Degree (Honours)
		Bachelor's Degree (Honours with Research)
3 Years	Six Semesters(3 Academic Years)	Bachelor's Degree
2 Years	Four Semesters(2 Academic Years)	Undergraduate Diploma
1 Year	Two Semesters(1 Academic Year)	Undergraduate Certificate

In consonance with the National Education Policy (NEP) 2020 and the guidelines of the University Grants Commission (UGC), Charotar University of Science and Technology(CHARUSAT) implements the Multiple Entry and Multiple Exit (MEME) scheme in their Bachelor of Science in Information Technology(BSc-IT) programme. This structure provides students with the flexibility to enter, exit, and re-enter the programme at various stages, each with its corresponding certification mentioned above in Table-1.

Table 2: Multiple Entry Multiple Exit options

NCrF Credit Levels	Qualification Title	Credit Requirement	Programme Exit	Additional Requirement	Re-entry to Degree Programme
4.5	UG Certificate	48	After Year 1	Completion of one 4- credit of summer internship in core specific NSQF defined course during summer vacation of Year 1	Within three years of exit
5	UG Diploma	92	After Year 2	Completion of one 4- credit of summer internship in core specific NSQF defined	Within three years of exit

				course during summer vacation of Year 2	
5.5	Three Year Bachelor Degree	132	After Year 3	Compliance with minimum credit requirements specified in regulations	Within three years of exit
6	Bachelor's Degree with Honors	176	After Year 4	Compliance with minimum credit requirements specified in regulations	NA
6	Bachelor's Degree with Honors with Research	176	After Year 4	Compliance with credit requirements as specified in regulations	NA

Students who are opting for exit at any level, shall re-enter the institution to complete the UG Degree, where they had left off. They can re-enter within three years of exit and complete the degree programme within the stipulated maximum period of seven years from the date of admission to UG programme.

3. CREDIT FRAMEWORK FOR BSc-IT(Bachelor of Science in Information Technology)

Arrangement of Credit Distribution Framework for three/four years Honors/Honors with Research Degree Programme with Multiple Entry and Exit Options.

(As per GR No: KCG/admin/2023-24/0607/kh.1, Sachivalaya, Gandhinagar, Date- 11/07/2023).

Sr.No .	Categories of Courses	Credit Requirement for each Category				
		Certificate (1 Year)	Diploma (2 Years)	3-Year UG	4-Year UG (Honors)	4-Year UG (Honors+Research)

1	Major - Core Courses	16	40	64	88	88
2	Minor-Discipline Specific Electives	8	12	24	32	32
3	Multidisciplinary Courses Open Electives	8	10	12	12	12
4	Ability Enhancement Courses(AEC)	4	8	10	10	10
5	Skill Enhancement Courses(SEC)	4	10	14	14	14
6	Value Added Courses (VAC)	4	8	8	8	8
7	Summer Internship/ Research Project /Dissertation	-	-	-	12	12
8	Exit Courses	4	4	-	-	
Total		48	92	132	176	176

4. Structure of BSc-IT (Bachelor of Science in Information Technology)

NCrF Credit Level	Semester	Major Core	Minor	Multi/Interior Disciplinary	Ability Enhancements Courses(AEC)	Skill Enhancement Courses(SEC)	Value Added Courses(VAC)/IKS	Research Project/Dissertation	Total	Qualification/Certificate
4.5 First Year	I	8	4	4	2	2	2	-	22	UG Certificate
	II	8	4	4	2	2	2	-	22	
1st Year Credit Total		16	8	8	4	4	4	-	44	
Exit 1: Award of UG certificate in Major course with 44 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for the next NCrF credit level										
NCrF Credit Level	Semester	Major Core	Minor	Multi/Interior Disciplinary	Ability Enhancements Courses(AEC)	Skill Enhancement Courses(SEC)	Value Added Courses(VAC)/IKS	Research Project/Dissertation	Total	Qualification/Certificate
5.0 Second Year	III	12	-	2	2	4	2	-	22	
	IV	12	4	2	-	2	2	-	22	

2nd Year Credit Total	24	4	6	2	6	4	-	44	UG Diploma
Grand Total 1st and 2nd Year Credit	40	12	12	6	10	8	-	88	

Exit 2: Award of UG Diploma in Major course with 88 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for the next NCrF credit level

NCrF Credit Level	Semester	Major Core	Minor	Multicellular Disciplinary	Ability Enhancements Courses(AEC)	Skill Enhancement Courses(SEC)	Value Added Courses(VAC)/IKS	Research Project/Dissertation	Total	Qualification/Certificate
5.5 Third Year	V	12	8	-	-	2	-	-	22	UG Degree
	VI	12	4	-	2	4	-	-	22	
3rd Year Credit Total	24	12	-	2	6	-	-	-	44	
Grand Total 1st to 3rd Year Credit	64	24	12	08	16	8	-	-	132	

Exit 3: Award of UG Degree in Major course with 132 credits.

NCrF Credit Level	Semester	Major Core	Minor	Multicellular Disciplinary	Ability Enhancements Courses(AEC)	Skill Enhancement Courses(SEC)	Value Added Courses(VAC)/IKS	Research Project/Dissertation	Total	Qualification/Certificate
6 Fourth Year	VII	12	4	-	-	-	-	6(OJT)	22	UG Honors Degree
	VIII	12	4	-	-	-	-	6(OJT)	22	
4th Year Credit Total	24	8	-	-	-	-	-	12	44	

Award of UG Honors Degree in Major course with 176 credits.

6 Fourth Year	VII	12	4	-	-	-	-	6(RP)	22	UG Honors With Research Degree
	VIII	12	4	-	-	-	-	6(RP)	22	
4th Year Credit Total	24	8	-	-	-	-	-	12	44	
Grand Total 1st to 4th Year Credit	88	32	12	08	16	8	12	176		

Award of UG Honors with Research Degree in Major course with 176 credits.

*OJT – On the Job Training
Courses Only

* RP – Research Project With Major Core

2 credit course on Community Service/NSS/NCC/Sports as a compulsory course to be undertaken by students during the initial two years of the study. This course will not affect the overall SGPA/CGPA of the students.

5. Eligibility & Mode of Admissions

Eligibility of a candidate and mode of admission to the programme will be according to the regulations for admission committee decided by Government of Gujarat from time to time.

6. Programme structure and Credits

A student admitted to a program should study the course and earn credits specified in the course structure.

7. Attendance

7.1 All activities prescribed under these regulations and listed by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student from attendance except on account of serious personal illness or accident or family calamity that may genuinely prevent a student from attending a particular session or a few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Dean/Principal.

7.2 Student attendance in a course should be 80%.

8. Course Evaluation

8.1 The performance of every student in each course will be evaluated as follows:

- 8.1.1** Continuous and Comprehensive Evaluation using various components such as Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc. by the course faculty member(s). The weightage of these components is 50% of the marks for the course; and
- 8.1.2** Semester-End-Evaluation by the University through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these, for 50% of the marks for the course.

8.2 University Examination

- 8.2.1** The final examination by the University for 50% of the evaluation for the course will be through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these.
- 8.2.2** In order to earn the credit in a course a student has to obtain grade other than FF.
- 8.2.3** Performance of Continuous and Comprehensive Evaluation(CCE) and Semester-End-Examination(SEE) Examination will be done on the grading system.

9. Grading

The student's performance in any semester will be assessed by the Semester Grade Point Average (SGPA). Similarly, his performance at the end of two or more consecutive semesters will be denoted by the Cumulative Grade Point Average (CGPA). The SGPA and CGPA are defined as follows:

Grading Scheme	96.0-100	86.0-95.9	76.0-85.9	66.0-75.9	56.0-65.9	46.0 - 55.9	36.0 – 45.9	Below 36.0	Absent
Letter Grade	O (Outstanding)	A+ (Excellent)	A (Very Good)	B+ (Good)	B (Above Average)	C (Average)	P (Pass)	F (Fail)	Ab (Absent)
Grade Point	10	9	8	7	6	5	4	0	0

$SGPA = \sum CiGi / \sum Ci$ where Ci is the number of credits of course i Gi is the Grade Point for the course i and $i = 1$ to n , n = number of courses in the semester.

$CGPA = \sum CiGi / \sum Ci$ where Ci is the number of credits of course i Gi is the Grade Point for the course and $i = 1$ to n , n = number of courses of all semesters up to which CGPA is computed

The minimum passing marks for each pattern of evaluation are 36% .

10. Detention Rule

A student will be promoted to next year only if he/she has cleared all the courses of the year he/she is studying in. Awards of Degree.

10.1 Every student of the programme who fulfils the following criteria will be eligible for the award of the degree:

10.1.1 He should have earned at least minimum required credits as prescribed in course structure; and

10.1.2 He should have cleared all evaluation components in every course;

11. Award of Class

The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:

Distinction:	CGPA ≥ 7 & ≤ 10
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First class:	CGPA ≥ 6.0 & <7
Second Class:	CGPA ≥ 5.0 & <6.0
Pass Class:	CGPA <5.0

12. Transcript

The transcript issued to the student at the time of leaving the University will contain a consolidated record of all the courses taken, credits earned, grades obtained, SGPA, CGPA, class obtained, etc.

Choice of Courses

Undergraduate students will make course selections from the various lists and that will fall into categories as outlined below:

Major Course:

This is the primary subject area a student wishes to delve into during their undergraduate course. It is the area of study that the student is most passionate about and may wish to pursue as a career.

Minor Course:

This is a secondary area of study that complements the student's chosen Major. Students who complete a sufficient number of courses in a discipline or an interdisciplinary area of study other than their chosen Major will qualify for a Minor in that discipline or interdisciplinary area.

Multidisciplinary Course:

All undergraduate students are required to complete three introductory-level courses relating to any of the broad disciplines. These courses aim to broaden the student's intellectual experience and form part of liberal arts and science education.

Ability Enhancement Course (AEC):

These are Modern Indian Language (MIL) & English language courses focused on enhancing language and communication skills. The courses aim to enable students to acquire and demonstrate core linguistic skills, including critical reading and expository and academic writing skills. The courses also emphasize the development and enhancement of skills such as communication, and the ability to participate in/conduct discussion and debate.

Skill Enhancement Courses (SEC):

These courses aim to impart practical skills, hands-on training, soft skills, etc., to enhance the employability of students. The institution may design courses as per the students' needs and available institutional resources.

Value Added Course (VAC):

These courses are designed to provide extra skills or knowledge beyond the standard curriculum, often tailored towards enhancing employability, promoting entrepreneurship, or developing personal and professional skills.

The choice based credit system provides flexibility in designing curriculum and assigning credits based on the course content and hour of teaching. The choice based credit system provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective and open elective courses. The CBCS provides a cafeteria type approach in which the students can take courses of their choice and adopt an interdisciplinary approach to learning. The courses shall be evaluated on the grading system, which is considered to be better than the conventional marks system.

Core Courses

A Course which shall compulsorily be studied by a candidate to complete the requirements of a degree / diploma in a said programme of study is defined as a core course. Following core courses are incorporated in CBCS structure:

A. University Core Courses(UC):

University core courses are compulsory courses which are offered across university and must be completed in order to meet the requirements of programme.

B. Programme Core Courses(PC):

Programme core courses are compulsory courses offered by respective programme owners, which must be completed in order to meet the requirements of programme.

Elective Courses

Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline of study or which provides an extended scope or which enables an exposure to some other discipline / domain or nurtures the candidates proficiency / skill is called an elective course. Following elective courses are incorporated in CBCS structure:

A. University Elective Courses(UE):

The pool of elective courses offered across all faculties / programmes.

B. Institute Elective Course (IE)

Institute elective courses are those courses which any students of the University/Institute of a Particular Level (PG/UG) will choose as offered or decided by the University/Institute from time-to-time irrespective of their Programme /Specialization.

C. Programme Elective Courses(PE):

The programme specific pool of elective courses offered by respective programme.

Credit Hour Allocation for Different Course Types

Definition and Standardization

The workload associated with a course will be measured in terms of credit hours. One credit hour is equivalent to one hour of instructional time per week over the duration of a semester (minimum 15 weeks).

Types of Course Components

Courses can be comprised of one or more of the following components:

1. Lecture
2. Practicum
3. Seminar/Internship/ Studio Activities/Field Practice/ Projects / Engagement and Service.

Credit Hours per Course Component

The weekly and semester-wise instructional hours associated with each credit for different components are as follows:

Credit Hours per Course Component

Course Component	Weekly Hours per Credit	Total Hours in a 15-week Semester
Lecture	1 Hour	15 Hours
Practicum	2 Hours	30 Hours
Internship, Field Practice/Projects, Community Engagement and Service/NCC/NSS/Sports	2 Hours	30 Hours

Course Categories

Courses in the study program are categorised based on the nature of the learning activities. These include:

Lecture courses: These involve expert-led sessions related to a specific field.

Practicum or Laboratory work: These apply previously learned principles/theories in practical projects or lab activities.

Internship: These involve professional activities or work experiences, typically supervised by experts from the relevant external entities.

Field practice/projects: These involve field-based learning or projects supervised by external experts.

Community engagement and service/NCC/NSS/Sports: These involve activities exposing students to societal socio-economic issues, facilitating the application of theoretical and practical knowledge to real-life problems. It also involves skills and physical fitness among students through indoor & outdoor sports, field & track events.

Vision, Mission, PEOs, POs and PSOs

Vision

To become a leading institution in the field of computer applications and contribute in national efforts of computerizing public systems

Mission

To produce competent computer professionals with the ability to face future challenges.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates will:

PEO1: Be able to understand the requirement of computing problem and implement an effective solution.

PEO2: Be able to successfully take up various available career options.

PEO3: Be able to continuously learn in their preferred domains.

PEO4: Be able to acquit themselves in ethical and professional manner while demonstrating effective skills.

PROGRAM OUTCOMES (POs)

The Graduate of Computer Science and Applications will be able to:

PO1: Computational Knowledge: Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge to provide effective solution in the area of computing.

PO2: Problem Analysis: Identify, formulate, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

PO3: Design /Development of Solutions: Design and evaluate solutions for computing problems, and design and evaluate systems, components, or processes that meet specified needs by considering several societal aspects.

PO4: Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools for any computing activities, with an understanding of the limitations.

PO5: Professional Ethics: Understand and commit to professional ethics, responsibilities, and norms of professional computing practice.

PO6: Life-long Learning: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

PO7: Project management: Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO8: Communication Efficacy: Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PO9: Societal and Environmental Concern: Understand and assess societal and environmental issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

P10: Individual and Team Work: Function effectively as an individual and as a member or a leader in diverse teams and in multidisciplinary environments.

P11: Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PROGRAM SPECIFIC OUTCOMES

At the end of the programme, the student should be able to

PSO1: Analyze, evaluate and formulate workable computing solutions to real world problems using computing methods.

PSO2: Apply proficiencies of communication, teamwork and management skills with spirit of entrepreneurship.

SALIENT FEATURES

- Four Years unique programme as per National Education Policy-2020.
- Have a flexible duration of either three or four years, with multiple exit options during this period.
- Provides students with the flexibility to enter, exit, and re-enter the programme at various stages, each with its corresponding certification.
- Award of Degree:
 - **UG Certificate** (Candidate wish to Exit after the First Year with additional requirements of 4 credits summer internship)
 - **UG Diploma** (Candidate wish to Exit after the Second Year additional requirements of 4 credits summer internship)
 - **UG Degree** (Candidate wish to Exit after the Third Year)
 - **UG Honors Degree or UG Honors with Research Degree** (Candidate finishes all Four Years)
- Programme is designed with various categories of courses such as Major, Minor, Multidisciplinary, Ability Enhancement, Skill Enhancement, Value Added, Community engagement and service/NCC/NSS/Sports based on Choice Based Credit System(CBCS).
- Focus on student-centered learning.
- Problem-based learning and industry-relevant curriculum.
- Industry visits, seminars, workshops, and guest lectures by eminent researchers and industry practitioners.
- Active student clubs and bodies.
- The multi-cultural and vibrant teaching environment.

Total Credits of Programme (8 Semesters): 176

**TEACHING SCHEME AND
EXAMINATION SCHEME**

FOR

B.Sc. (IT) PROGRAMME

EFFECTIVE FROM

ACADEMIC YEAR 2024-25

Credit Framework for 3 Years/4 Years UG Programme

NCrF Credit Levels	Qualification Title	Credit Requirement	No. of Semesters	Year
4.5	UG Certificate	48	2	1
5	UG Diploma	92	4	2
5.5	Three Year Bachelor Degree	132	6	3
6	Bachelor's Degree with Honors OR Bachelor's Degree with Honors with Research	176	8	4
<ul style="list-style-type: none">• 1 credit = 1 Hour of Theory• 1 credit = 2 Hour of Practical/Project				

Degree programs offered by Faculty

- Bachelor of Science in Information Technology (Honors) / Bachelor of Science in Information Technology (Honors with Research) (4-Year Programme) and maximum duration of the programme is 7 Years.

CREDIT FRAMEWORK For B.Sc. (IT)
(Bachelor of Computer Science in Information Technology)

Arrangement of Credit Distribution Framework for three/four years Honors/Honors with Research Degree Programme with Multiple Entry and Exit Options

(As per GR No: KCG/admin/2023-24/0607/kh.1, Sachivalaya, Gandhinagar, Date-11/07/2023)

Sr. No.	Categories of Courses	Credit Requirement for each Category				
		1 Year (Certificate)	2 Years (Diploma)	3-Year (UG)	4-Year UG (Honors)	4-Year UG (Honors + Research)
1	Major - Core Courses	16	40	64	88	88
2	Minor-Discipline Specific Electives	8	12	24	32	32
3	Multidisciplinary Courses Open Electives	8	12	12	12	12
4	Ability Enhancement Courses (AEC)	4	8	10	10	10
5	Skill Enhancement Courses (SEC)	4	8	14	14	14
6	Value Added Courses (VAC)	4	8	8	8	8
7	Summer Internship/ Research Project /Dissertation	-	-	-	12	12
8	Exit Courses	4	4	-	-	
	Total	48	92	132	176	176

Structure of B.Sc. (IT) (Bachelor of Computer Science in Information Technology)

NCrF Credit Level	Semester	Major Core	Minor	Multi / Inter Disciplinary	Ability Enhancements Courses (AEC)	Skill Enhancement Courses (SEC)	Value Added Courses (VAC) / IKs	Research Project / Dissertation	Total	Qualification / Certificate
4.5 First Year	I	8	4	4	2	2	2	-	22	UG Certificate
	II	8	4	4	2	2	2	-	22	
1st Year Credit Total		16	8	8	4	4	4	-	44	

Exit 1: Award of UG certificate in Major course with 44 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for the next NCrF credit level

NCrF Credit Level	Semester	Major Core	Minor	Multi / Inter Disciplinary	Ability Enhancements Courses (AEC)	Skill Enhancement Courses (SEC)	Value Added Courses (VAC)/IKS	Research Project / Dissertation	Total	Qualification /Certificate
5.0 Second Year	III	12	-	2	2	4	2	-	22	UG Diploma
	IV	12	4	2	2	-	2	-	22	
2nd Year Credit Total		24	4	4	4	4	4	-	44	
Grand Total 1 st and 2 nd Year Credit		40	12	12	8	8	8	-	88	

Exit 2: Award of UG Diploma in Major course with 88 credits with additional 4 credits of Summer Internship in core specific NSQF defined course OR continue with Major and Minor course for the next NCrF credit level

NCrF Credit Level	Semester	Major Core	Minor	Multi/Inter Disciplinary	Ability Enhancements Courses (AEC)	Skill Enhancement Courses (SEC)	Value Added Courses (VAC)/IKS	Research Project / Dissertation	Total	Qualification /Certificate
5.5 Third Year	V	12	8	-	-	2	-	-	22	UG Degree
	VI	12	4	-	2	4	-	-	22	
3rd Year Credit Total		24	12	-	2	6	-	-	44	
Grand Total 1 st to 3 rd Year Credit		64	24	12	10	14	8	-	132	

Exit 3: Award of UG Degree in Major course with 132 credits.

NCrF Credit Level	Semester	Major Core	Minor	Multi/Inter Disciplinary	Ability Enhancements Courses (AEC)	Skill Enhancement Courses (SEC)	Value Added Courses (VAC)/IKS	Research Project / Dissertation	Total	Qualification / Certificate
6 Fourth Year	VII	12	4	-	-	-	-	6 (OJT)	22	UG Honors Degree
	VIII	12	4	-	-	-	-	6(OJT)	22	
4th Year Credit Total		24	8	-	-	-	-	12	44	
Award of UG Honors Degree in Major course with 176 credits.										
6 Fourth Year	VII	12	4	-	-	-	-	6 (RP)	22	UG Honors With Research Degree
	VIII	12	4	-	-	-	-	6 (RP)	22	
4th Year Credit Total		24	8	-	-	-	-	12	44	
Grand Total 1 st to 4 th Year Credit		88	32	12	10	14	8	12	176	

Award of UG Honors with Research Degree in Major course with 176 credits.

*OJT – On the Job Training

* RP – Research Project With Major Core Courses Only

**TEACHING SCHEME
&
EXAMINATION SCHEME

FOR

B.Sc. (IT) PROGRAMME**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

B.Sc. (IT) Semester-I

Course Code	Course Name	Theory/ Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC101	Introduction to Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC102	Relational Database Administration	Practical	-	-	25	25	02	Major Core
CTUE101	(Select any one) 1. Fundamentals of Business Organization 2. Information Technology in Business 3. Computer Application in Business 4. Basics of Digital Marketing	Theory	50	50	-	-	04	Minor
CTUE102								
CTME101								
CTME102								
CTUD101	Fundamentals of Digital Electronics	Theory	50	50	-	-	04	MDC
CTUS101	Mathematics for Computer Science	Theory	25	25	-	-	02	SEC
CLUV101	Environmental Sciences	Practical	-	-	25	25	02	VAC
HSUA101	Communicative English	Practical	-	-	25	25	02	AEC
CUUV101	(Select any one) Community Engagement and Sustainable Development	Practical	-	-	25	25	02	VAC
CUUV102	Physical Education and Sports							

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
*SEE- Semester -End- Evaluation

B.Sc. (IT) Semester-II

Course Code	Course Name	Theory / Practical / Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC103	Introduction to Object Oriented Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC104	Fundamentals of Web Designing	Practical	-	-	25	25	02	Major Core
CTUE103	(Select any one) 1. Business Models for e-Commerce 2. Managerial Economics	Theory	50	50	-	-	04	Minor
CTUD102	Data Communication and Networks	Theory	50	50	-	-	04	MDC
CTUV101	Fundamentals of Accounting	Theory	25	25	-	-	02	VAC
HSUS101-117	(Select any one) A course on Liberal Arts HSUS101 - Painting HSUS102- Photography HSUS103- Sculpting HSUS104- Pottery and Ceramic Art HSUS105-Media and Graphic Design HSUS106-Art and Craft HSUS109- Dramatics HSUS110-Contemporary Dance HSUS111-Music (Vocal) HSUS112-Music (Instrumental)-Tabla HSUS113-Music (Instrumental)-Guitar HSUS114-Music (Instrumental)-Harmonium HSUS115-Music (Instrumental)- Flute HSUS116- Indian Classical Dance-Kathak HSUS116- Indian Classical Dance-Bharatnatyam	Practical	-	-	25	25	02	SEC
CTUA101	Presentation Skills	Practical	-	-	25	25	02	AEC
CTUI101	Summer Internship and Viva - I	VIVA	-	-	50	50	4	Exit Course

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)

*SEE- Semester -End- Evaluation

B.Sc. (IT) Semester-III

Course Code	Course Name	Theory / Practical / Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC201	Introduction to Data Structures	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC202	System Analysis and Design	Theory	50	50	-	-	04	Major Core
CTUC203	Programming the Internet	Practical	-	-	25	25	02	Major Core
CTUS201	(Select any one) 1. Computer Oriented Numerical Methods 2. Computer Oriented Management System	Theory	50	50	-	-	04	SEC
CTUA201	Life Management	Theory	25	25	-	-	02	AEC
	University Elective-I	Practical	-	-	50	50	02	MDC
HSUV201	Creativity, Problem Solving and Innovation	Practical	-	-	25	25	02	VAC

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
 *SEE- Semester -End- Evaluation

University Elective - I			
Sr. No.	Course Code	Course Name	Department/Faculty
1		Art of Programming	Engineering
2		Environmental Sustainability & Climate Change	Engineering
3		ICT Resources & Multimedia	Engineering
4		Engineering Drawing	Engineering
5		Fundamentals of Packaging	Pharmacy
6		Basic Laboratory Techniques	Applied Science
7		First Aid & Life Support	Nursing
8		Health Promotion & Fitness	Physiotherapy
9		Banking & Insurance	Management
10		Introduction to MATLAB Programming	Engineering
11		Astrophysics, Space and Cosmos-1	Applied Science
12		SDG Handprint Laboratory	Engineering
13		Python Programming	Engineering
14	CAUD201	Introduction to Web Designing	Computer Science

B.Sc. (IT) Semester-IV

Course Code	Course Name	Theory / Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC204	Fundamentals of Operating Systems	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC205	Fundamentals of Visual Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUE201	(Select any one) 1. Introduction to Artificial Intelligence 2. Computer Network Security	Theory	50	50	-	-	04	Minor
CTUA202	Social Media and Blog Writing	Practical	-	-	25	25	02	AEC
	University Elective-II	Practical	-	-	50	50	02	MDC
HSUV203	Indian Knowledge System	Practical	-	-	25	25	02	VAC
CTUI201	Summer Internship and Viva - II	VIVA	-	-	50	50	04	Exit Course

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
 *SEE- Semester –End- Evaluation

University Elective - II			
Sr. No.	Course Code	Course Name	Department/Faculty
1		Prototyping Electronics with Arduino	Engineering
2		Web Designing	Engineering
3		Basics of Environmental Impact Assessment	Engineering
4		Internet Technology & Web Design	Engineering
5		Material Science	Engineering
6		Cosmetics in Daily Life	Pharmacy
7		Life Style Diseases & Management	Nursing
8		Occupational Health & Ergonomics	Physiotherapy
9		Health Care Management	Management
10		Astrophysics, Space and Cosmos-2	Applied Science
11		MATLAB Programming	Engineering
12		Maintenance of Household Apparatus	Engineering
13	CAUD202	Programming the Internet	Computer Science

B.Sc. (IT) Semester-V

Course Code	Course Name	Theory / Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC301	Object Oriented Programming Using JAVA	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC302	Open Source Technology	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUE301 CTUE302	(Select any one) 1. Data Science Essentials 2. Basics of Digital Image Processing	Theory	25	25	-	-	02	Minor
CTUE303	Object Oriented Analysis and Design	Theory	50	50	-	-	04	Minor
CTUE304 CTUE305	1. Advanced Internet of Things 2. Introduction to Game Development	Practical	-	-	25	25	02	Minor
HSUS301	French	Practical	-	-	25	25	02	SEC

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)

*SEE- Semester -End- Evaluation

B.Sc. (IT) Semester-VI

Course Code	Course Name	Theory / Practical / Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC303	Project Work	VIVA	150	150	-	-	12	Major Core
CTUE306	(Select any one) 1. Multi-paradigm Programming Language 2. Frameworks and Applications	Theory and Practical	25	25	25	25	04 (02-Theory) (02-Practical)	Minor
CTUS301	Mobile Application Development	Theory and Practical	25	25	25	25	04 (02-Theory) (02-Practical)	SEC
HSUA302	Professional Communication, Soft Skills and Personality Development	Practical	-	-	25	25	02	AEC

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
 *SEE- Semester -End- Evaluation

B.Sc. (IT) Semester-VII

Course Code	Course Name	Theory / Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC401	Enterprise Computing using Java EE	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC402	Database Technologies	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUE401 CTUE402 CTUE403	(Select any one) 1. Cloud Computing 2. Cryptography & Network Security 3. Blockchain Essentials	Theory	50	50	-	-	04	Minor
CTUP401 CTUR401	(Select anyone) 1. On-Job Training-I 2. Research Project-I	VIVA	-	-	75	75	06	Research Project / Dissertation

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
 *SEE- Semester –End- Evaluation

B.Sc. (IT) Semester-VIII

Course Code	Course Name	Theory / Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC403	Full Stack Web Development	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC404	Advanced Mobile Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUE404	Web Development using Open Source Technologies	Practical	-	-	25	25	2	Minor
CTUE405 CTUE406 CTUE407	(Select any one) 1. Python Web framework 2. HTTP Web Service for Enterprise Applications 3. Game Development using Unity	Practical	-	-	25	25	2	Minor
CTUP402 CTUR402	(Select any one) On Job Training-II Research Project-II	VIVA	-	-	75	75	6	Research Project / Dissertation

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
*SEE- Semester –End- Evaluation

**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**B.Sc. (IT) PROGRAMME
(1st SEMESTER)
AS PER NEP 2020**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

B.Sc. (IT) Semester-I

Course Code	Course Name	Theory/ Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC101	Introduction to Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC102	Relational Database Administration	Practical	-	-	25	25	02	Major Core
CTUE101	(Select any one) 1. Fundamentals of Business Organization 2. Information Technology in Business 3. Computer Application in Business 4. Basics of Digital Marketing	Theory	50	50	-	-	04	Minor
CTUE102								
CTME101								
CTME102								
CTUD101	Fundamentals of Digital Electronics	Theory	50	50	-	-	04	MDC
CTUS101	Mathematics for Computer Science	Theory	25	25	-	-	02	SEC
CLUV101	Environmental Sciences	Practical	-	-	25	25	02	VAC
HSUA101	Communicative English	Practical	-	-	25	25	02	AEC
CUUV101	(Select any one) Community Engagement and Sustainable Development	Practical	-	-	25	25	02	VAC
CUUV102	Physical Education and Sports							

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
*SEE- Semester –End- Evaluation

CTUC101 - Introduction to Programming

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
02	Practical	04	60	40	100
Experiential Learning Components (Theory) : Unit Tests, Assignments, Case Study etc.					
Experiential Learning Components (Practical) : Lab Assignments, Practical Test, VIVA					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During theory lectures, facilitate problem-solving skills by employing algorithms and flowcharts, enabling the understanding of the C programming language's structural aspects, and fostering the capability to create basic programs incorporating data types, variables, and constants. Expand comprehension of diverse conditional and iterative statements and expressions, while also delving into the manipulation of arrays encompassing both numerical and character elements. Develop proficiency in comprehending user-defined functions and explore advanced programming concepts such as utilizing arrays with pointers and structures promoting independent learning and application in real-world scenarios.

Outline of the course (Theory):

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Programming Basics	08
2	Introduction to C	12
3	Expressions and Control Statements	10
4	Arrays and Strings	10
5	Introduction to Functions	10
6	Pointers & Basic of the structures	10

Total Hours (Theory): 60

Total hours (Practical) : 60

Total Contact Hours : 120

Detail Syllabus:

Unit I: Programming Basics	Hours 8
Types of Programming languages and its History, features and application. Introduction to algorithm, Key features of algorithm, Introduction to flow charts, Significance of flow chart, Advantages and limitation of flow chart, Introduction to programming languages, Introduction to editor, compiler, and translator	
Unit II: Introduction to C	Hours 12
Introduction, characteristics of C, Structure of C Program, writing first C program, Files used in C program, Compiling and Executing C program. Basic data types in C, User define data types, Variables in C, Declaring and initializing variables in C, Constants, Input / Output statements in C, Operators - arithmetic, relational, logical, assignment, increment - decrement, conditional, Bitwise, comma operator, size-of operator, operator precedence chart.	
Unit III: Expressions and Control Statements	Hours 10
Arithmetic expressions, evaluation of expressions, type conversions in expressions, operator precedence and associativity, mathematical functions. Type conversion and casting; Introduction to decision control statements, Conditional and branching statements, loop, nested loop, Break, continue and go to statement.	
Unit IV: Arrays and Strings	Hours 10
Arrays: One-dimensional, two-dimensional, Handling of Character Strings: Declaring and initializing string variables, reading string from terminal, writing string to screen, string handling functions, table of strings.	
Unit V: Introduction to Functions	Hours 10
Need for user-defined functions, the form of c function, return values and their types, calling a function, category of functions, handling of non-integer functions, nesting of Functions, recursion, functions with arrays.	
Unit VI Pointers & Basic of the structures	Hours 10
Understanding the Computer's Memory, Introduction to Pointers, Declaring Pointer Variables, Pointer Expressions and Pointer Arithmetic, Null Pointers, Generic Pointers, passing arguments to Function using Pointers, Pointers and Arrays, Passing an Array to a Function, Difference between Array name and Pointer, Pointers and Strings, Array of Pointers. Defining a structure, declaring structure variables, accessing structure members, structure initialization,	

Outline of the Course(Practical) :

Week No	Practical	Description
1	Introduction to Programming and IDE	Overview of programming languages, algorithms, flowchart, Setting up the development environment, Introduction of development environment.
2-3	Basic of C programming	Structure of C Program, writing first C program, Files used in C program, Compiling and Executing C program; Basic data types in C. Variables in C, Declaring and initializing variables in C, Constants, Input / Output statements in C
4-5	Operators, Expressions evaluation & type conversions.	Operators - arithmetic, relational, logical, assignment, increment - decrement, conditional, Bitwise and special, comma operator, size-of operator, operator precedence chart. Arithmetic expressions, evaluation of expressions, type conversions.
6-7	Decision-making statements and looping statements	Decision-making statements (if, else if, else) and nested decision-making statements, Switch statement, Looping statements (for, while, do-while), nested looping statements Break and continue statements.
8-9	Arrays	Understanding arrays, one-dimensional array, two-dimensional arrays, practical exercises of one-dimensional and two-dimensional array.
10-11	String and String functions	Declaring and initializing string variables, reading string from terminal, writing string to screen, string-handling functions.
12-13	User defined functions	Introduction to functions, Function declaration, definition, and calling, Parameters and return values. Scope and lifetime of variables, Recursion.
14-15	Pointers & Structures	Introduction to pointers, Pointers and arrays, Pointer arithmetic, Defining and declaring structures, Accessing structure members

Total hours: 60

Core Books:

1. ReemaThareja: Computer Fundamentals and Programming in C, 2nd Edition, Oxford University press, 2017

2. PradipDey and Manas Ghosh. "Programming in C", Second Edition, Oxford University Press.
3. E. Balagurusamy: Programming In C, 7th Edition.
4. Asok N Kamthane, Pearson,Programming in C
5. Anita Goel, Pearson, Computer Fundamentals
6. Schaum Series, Gottfried B.S.,Tata McGraw Hill,Programming with C

Reference Books:

1. Brian W. Kerighan and Dennis M. Ritchie : The C Programming Language,Prentice Hall.
2. PradipDey, Manas Ghosh: Programming in C, 4th Edition, Oxford University press.
3. Herbert Schildt: The complete reference C, Fourth edition, Tata McGraw Hill
4. YashwantKanetkar: Let us C, 13th Edition, BPB publication.
5. Rajaraman V, PHI, Computer Basics and Programming in C

Web References:

1. <https://cprogrampracticals.blogspot.com/p/basic-concepts.html> [For basic c programing]
2. practical]
3. <https://www.programtopia.net/c-programming/docs/operators-expressions> [For operators and expressions in C]
4. <https://www.javatpoint.com/functions-in-c> [For functions]
5. <https://www.programiz.com/c-programming> [For basic c programing practical]
6. <https://www.javatpoint.com/c-pointers> [pointers in c]
7. <https://www.programiz.com/c-programming/c-structures> [structures in c]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Be able to solve problems using algorithms and flowcharts.
CO2 :	Learn about the structure of C program and able to develop simple programs using the C Programming language with data types, variables and constants.
CO3 :	Gain the knowledge of different conditional and iterative statements and expressions.
CO4 :	Explore the utilization and manipulation of numbers and characters arrays both.
CO5 :	Be able to understand user define function. Also, learn Programming-using Array with Pointer and Structure.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Programming Basics	√				
2	Introduction to C		√			
3	Expressions and Control Statements			√		
4	Arrays and Strings		√	√	√	
5	Introduction to Functions		√	√		√
6	Pointers & Basic of the structures		√			√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	3	2	2	1	2	2	2	1	1	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	2	2	3	3	2	2	2	2	2	1	1	3	2
CO4	3	3	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	2	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC103 - Relational Database Administration

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
02	Practical	02	60	40	100
Experiential Learning Components: Lab Assignments, Practical Test, VIVA , certification courses, development of projects etc.					

Prerequisites: Basic knowledge of working with computer

Methodology, Pedagogy & Andragogy: Learn about computer data. Understand what data is, learn its meaning, examine the types of data sources, and see the difference between data and information. The database applications used in the real world will be discussed with necessary examples. During the laboratory hours' students' will implement the concepts. Apply SQL commands to mine data from databases and data visualization techniques to address organization information needs.

A. Outline of the Course:

Week No	Practical	Description
1	Introduction to Database System	Overview of data, information, file, database, database systems, DBMS, Purpose of DBMS over file system.
2-3	Data modelling and architecture	Various data models: ER model and Relational model, Three level architecture, structure of DBMS and database actors and workers, roles of database administrator
4-5	Database Design Methodology	CODD Rules, Functional Dependency and Normalization for Database Informal Design Guidelines for Relational Schemas, Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF, 4NF, 5NF)
6-7	Schema Definition, Constraints, Queries – I	Basic Data types, Create Table Command, Modifying the structure of tables, renaming table, truncating table, destroying table, Insert, Delete and Update Statements in SQL

8	Schema Definition, Constraints, Queries – II	Data Constraints and Functions: - Pseudo columns, Null values, TAB table, DUAL table Operators, Data constraints, Type of data constraints, modifying constraints, working with data dictionary and use of USER_CONSTRAINTS Functions introduction
9	Inbuilt functions	Merits and demerits of functions, Types of functions: Numeric functions, Character functions, Date functions, Conversion functions, Aggregate functions
10-11	Querying the data	Different operators: LOGICAL, range searching and pattern matching, Viewing Data in the tables, sorting
12-13	Advanced Query Processing-I	Co-related Nested Queries, Group By clause, having clause, Data Control Language Commands: GRANT and REVOKE
14-15	Advanced Query Processing-II	Joins (Inner Join, Outer Join, Self-Join, Equi Join, Cross Join), Creation and manipulation of database objects indexes, views, sequences and synonym.

Total hours: 60

Text Books:

1. Ivan Bayross : SQL, PL/SQL The programming Language Oracle (4th Revised edition).
2. Ramkrishnan, Gehrke : Database Management Systems, 3rd Edition, McGrawHill Publication.
3. RamezElmasri, Shamkant B. Navathe : Fundamentals of Database Systems , 5th Edition, , Pearson Publication.

Reference Books:

1. Silberschatz, Korth, Sudarshan : Database System Concepts, 5th Edition, McGraw Hill.
2. C.J.Date, a Kannan, S Swaminathan : An Introduction to Database Systems, 8th Edition, Pearson Education,(Equivalent Reading).
3. Scoot Urban : Oracle 9i, PL/SQL Programming, Oracle Press.
4. S. K. Singh : Database Systems: Concepts, Design and Applications, Pearson Education
5. Peter Rob, Carlos Coronel: Database Systems: Design, Implementation and Management, 7th Edition, Cengage Learning, 2007.

6. Anjali Jivani and Amisha Shingala, "Practice book on SQL and PL/SQL with solutions", Roopal and Nirav publication.
7. Leon and Leon : Database management Systems, Vikas Publication.

Web References:

1. <https://www.javatpoint.com/er-model-vs-relational-model> [For difference of ER and Relationmodel]
2. http://www.microsoftvirtualacademy.com/trainingcourses/databasefundamentals#?fbid=tbZ92pOp_Tt [For overall subject]
3. http://www.ntu.edu.sg/home/ehchua/programming/sql/Relational_Database_Design.html [for relational database design]
4. http://docs.oracle.com/cd/A97335_02/apps.102/a81358/05_dev1.htm [For ER Diagram]
5. <http://plsql-tutorial.com/> [For PL/SQL]

Course Outcome: Upon successful completion of the course, student will:

C01:	Understand basic concepts regarding data, database systems and various data models.
C02:	Understand various data modeling techniques and entity relationship models.
C03:	Learn about relational data model and related concepts.
C04:	Gain insights into database design, SQL and normalization concepts.
C05:	Advanced query processing

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	1	1	-	3	-	-	-	-	-	2	-
CO2	1	3	3	3	-	3	1	-	-	-	-	1	3
CO3	3	3	3	3	-	3	2	-	-	2	-	2	
CO4	-	3	3	3	-	3	3	-	-	3	3	-	3
CO5	2	3	3	3	2	3	3	-	-	-	3	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE101 - Fundamentals of Business Organization

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During theory lectures the emphasis will be given on the Fundamentals of Business Organization. Students will be introduced to Business Fundamentals, Business Enterprises, Business Services, Emerging Trends of Business, Managing Financial Resources, and Business in Global Environment. Students will give practical exposure in form of case study and by visit to E-commerce / Digital Marketing company and/or supply chain Centre.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Business Fundamentals	09
2	Business Enterprises	11
3	Business Services	09
4	Emerging Trends of Business	11
5	Managing Financial Resources	09
6	Business in Global Environment	11

Total Hours (Theory): 60

Total Contact Hours: 60

Detail Syllabus:**Unit I : Foundation of Information Technology Hours 09**

Introduction to Information Technology, Acquisition of various types of data-
Introduction to Number and Textual Data, Image Data, Audio and Video Data Numbers
and Textual Data, Data Storage and Organization

Unit II : Business Fundamentals Hours 11

Business – Concept, nature and scope, business as a system, business objectives, business
and environment interface, distinction between business, commerce and trade.

Unit III : Business Enterprise Hours 09

Forms of business organization: Sole proprietorship, Joint Hindu Family Firm,
partnership firm, joint stock Company, types of cooperative society: Limited Liability
Partnership, Choice of form of organization, multinational corporations.

Unit IV : Emerging Trends of Business Hours 11

E – business – Meaning, Scope and benefits, Resource required for successful E –Business
implementation, on – line transactions, payment mechanism, Security and safety of
business transactions, Outsourcing – Concept, need and scope

Unit V : Managing Financial Resources Hours 09

Functions of money, financial institutions, role of financial manager, understanding
security markets, career in finance.

Unit VI : Business in Global Environment Hours 11

Globalization of business, threats and opportunities in global business, global business
environment, trade controls, reducing International trade barriers, career in
international business

Core Books:

1. Koontz:Principles Of Management (Ascent Series) Paperback: Tata McGraw Hill Education, 2004.
2. Y.K. Bhushan: Fundamentals of Business Organization, Sultan Chand Publisher, 2018

Reference Books:

1. Dr. Shveta Klara, Dr. Neha Singhal: Business Organization and Management, Scholar Tech Press, 2020.
2. Karen M. Collins, Jacqueline Shemko: Exploring Business, Pearson Education, 2008.

- Stephen J. Skripak : Fundamentals of Business : 3rd Edition, Virginia Tech Libraries, 2018.

Web References:

- <https://vtechworks.lib.vt.edu/bitstream/handle/10919/70961/Chapter%204%20Business%20in%20a%20Global%20Environment.pdf> [Business in Global Environment]
- <https://www.managementstudyguide.com/financial-management.htm> [Managing Financial Resources]
- <https://leverageedu.com/blog/emerging-modes-of-business/> [Emerging Trends of Business]
- <https://open.umn.edu/opentextbooks/textbooks/319> [ebook for reference]
- <http://thuviensobvu.edu.vn/bitstream/TVDHBRVT/15850/1/An-Introduction-to-Business-and-Business-Planning.pdf> [Introduction to Business and Business Planning]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Able to understand business fundamentals
CO2 :	Able to understand different types of business proprietorship.
CO3 :	Able to get the knowledge of functionality of various online business services.
CO4 :	Able to understand the basics to manage finance for business
CO5 :	Learned the concepts and the scope of international business enterprise.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Business Fundamentals	✓				
2	Business Enterprises		✓			
3	Business Services			✓		
4	Emerging Trends of Business			✓		
5	Managing Financial Resources				✓	
6	Business in Global Environment					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	3	-	-	-	-	-	-	1
CO2	-	-	-	-	-	3	-	-	-	-	2	-	2
CO3	-	2	2	2	-	3	2	-	-	2	2	-	2
CO4	-	-	-	-	-	3	-	-	-	-	-	-	2
CO5	-	-	-	-	-	3	-	-	1	1	2	-	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE102 - Information Technology in Business

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During theory lectures the emphasis will be given on the Information Technology in Business. Students will be introduced to Foundation of Information Technology, Internet Applications, Internet Service Trends in Business, E-Business, Data Analytics, Modern Business Management, Emerging Trends, and Societal Impact of IT. Students will give practical exposure in form of case study and by visit to E-commerce / Digital Marketing company and/or supply chain Centre.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Foundation of Information Technology	09
2	Internet Applications	11
3	Internet Service Trends in Business	09
4	E-Business and Data Analytics	11
5	Modern Business Management	09
6	Emerging Trends and Societal Impact of IT	11

Total Hours (Theory): 60

Total Contact Hours:60

Detail Syllabus:**Unit I : Foundation of Information Technology Hours 09**

Introduction to Information Technology, Acquisition of various types of data-
Introduction to Number and Textual Data, Image Data, Audio and Video Data Numbers
and Textual Data, Data Storage and Organization

Unit II : Internet Applications Hours 11

Internet: Introduction, Internet basics, Internet protocols, Internet addressing, Browser
WWW, E-mail, telnet, FTP, application, benefits and limitation of internet, electronic
conferencing, and teleconferencing.

Unit III : Internet Service Trends in Business Hours 09

Fundamentals of Cloud Computing, Types of Cloud based Services, Varieties of Cloud
Computing, Types of Cloud Computing, Advantages and Disadvantage of Cloud
Computing, Cloud Computing Providers, Application of Cloud Computing in Business
Area. E-commerce, E-Marketing, E-Branding, E-Advertising.

Unit IV : E-Business and Data Analytics Hours 11

E-Business: Introduction, Components, Difference between E-Commerce and E-Business
; Types of Data – Qualitative and Quantitative, Data Analytics basics, Types of Analytics,
Common technologies used in data analytics, Tools for Data Analytics

Unit V : Modern Business Management Hours 09

E-SCM: Introduction, Supply Chain Management, E- Supply Chain Management,
Component of Modern E-SCM Major Trends in E-SCM, Example of E-SCM, Architecture of
E-Supply Chain Models

E-CRM: Customer Relationship Management Concept, E-CRM Solution Advantages of E-
CRM Solutions, Advantages of E-CRM, E-CRM Capabilities, Example of E-CRM, E-CRM
Framework

Unit VI : Emerging Trends and Societal Impact of IT Hours 11

Internet of Things, Virtual and Augmented Reality, Industry 4.0, Image Processing;
Introduction to Societal Impact, Social Use of World Wide Web, Privacy, Security and
Integration of Information, Disaster Recovery, Intellectual Property Right, Career in IT

Core Books:

1. V Rajaraman : Introduction to Information Technology, 2nd Edition, PHI Learning Private Limited, 2013.
2. P.T. Joseph, S.J.: E-Commerce An Indian Perspective, 5th Edition, PHI Learning Private Limited, 2015.
3. R. Kalakota & M. Robinson, e-Business 2.0, 2nd Edition, Pearson Publisher, 2012.
4. Thomas Erl, Z. Mahmood and R. Puttini: Cloud Computing Concepts, Technology & Architecture, Pearson Publication, 2014

Reference Books:

1. Syed Muhammad Fahad Akhtar, Big Data Architect's Handbook, Packt Publishing ltd, 2018.
2. Kamlesh K. Bajaj, Debjani Nag: E-Commerce, The Cutting Edge of Business, 2nd Edition, McGraw-Hill Education, 2014.

Web References:

1. <https://blog.k2datascience.com/the-basics-of-data-analytics-77e5cc7ea741> [For Data Analytics]
2. <https://www.investopedia.com/terms/c/cloud-computing.asp> [For Cloud Computing]
3. <https://www.javatpoint.com/cloud-computing-applications> [For Cloud Computing]
4. <https://www.geeksforgeeks.org/difference-between-e-commerce-and-e-business/> [For E-business vs E-Commerce]
5. <https://www.temok.com/blog/what-is-e-business/> [For E- business]
6. <https://files.eric.ed.gov/fulltext/ED536788.pdf> [For Data Analytics]
7. <https://vdocument.in/introduction-to-e-scm.html> [For E-SCM]
8. <http://nek.istanbul.edu.tr:4444/ekos/TEZ/42370.pdf> [For E-CRM]
9. https://wps.prenhall.com/wps/media/objects/10704/10961611/Online_Appendix_B.pdf [For E-CRM]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Understand the basics of Information Technology.
CO2 :	Aware about Internet based Applications for any business context.
CO3 :	Understand trends of Internet services in Business.
CO4 :	Understands basics of Data Analytics and E-business concepts.
CO5 :	Understand modern business management concepts, emerging trends and societal Impact of Information Technology.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Foundation of Information Technology	√				
2	Internet Applications		√	√		
3	Internet Service Trends in Business			√	√	
4	E-Business and Data Analytics				√	
5	Modern Business Management					√
6	Emerging Trends and Societal Impact of IT					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	1	-	-	2	-	-	-	-	-	2	2
CO2	3	1	2	1	-	3	-	-	-	-	2	2	2
CO3	3	1	2	1	-	3	-	-	-	-	2	2	2
CO4	3	1	2	1	-	3	-	-	-	-	2	2	2
CO5	3	1	2	1	2	2	-	-	2	-	-	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTME101: Computer Application in Business

Description:

Credit and Week:

Teaching Scheme	Week	Marks	Credit
	12	100	3

About the course:

The main objective of this course is to familiarize the students with the application of computer in business and how it facilitates in business decision making.

Pre-requisites:

Basic knowledge of computers

Course layout:

Weeks	Video No.	Videos Title	Units
Week-1	Video-1	Introduction to Computers	Unit-1
	Video-2	Application in Computers	Unit-2
	Video-3	Web Application	Unit-3
	Video-4	Basic of Computer Software	Unit-4
Week-2	Video-5	Business Information System-	Unit-5

	Video-6	Database Management System	Unit-5
	Video-7	Business Process & Enterprises Application	Unit-5
	Video-8	GDPR	Unit-5
Week-3	Video-9	IT Securities Measures in Business	Unit-6
	Video-10	Internet Services and Email	Unit-7
	Video-11	Plastic Money, E-Wallet and Online Pay	Unit-8
Week-4	Video-12	Basics of Word Processing	Unit-9 & Unit-10
	Video-13	Tools using Word	Unit-11
	Video-14	Advance Tool using Word Processing	Unit-11
	Video-15	Making Business Documentation using word	Unit-12
Week-5	Video-16	Working with PowerPoint	Unit-13
	Video-17	PPT usages in Business and Corporate	Unit-13

Week-6	Video-18	Meaning of Multimedia	Unit-14
	Video-19	Animation & Presentation	Unit-14
	Video-20	Implementing multimedia tool in business	Unit-14
	Video-21	Meaning and Role of You Tube in Business	Unit-15
	Video-22	Video Impact in Excelling Business	Unit-15
Week-7	Video-23	Curtain raiser to Spreadsheet & its Utility in Business World	Unit-16
	Video-24	Spreadsheet concepts-1	Unit-16
	Video-25	Spreadsheet concepts-II	Unit-16
Week-8	Video-26	Formulas & Functions-I	Unit-17
	Video-27	Formulas & Functions-II	Unit-17
	Video-28	Formulas & Functions-III	Unit-17
	Video-29	Formulas & Functions-IV	Unit-17

	Video-30	Formulas & Functions-V	Unit-17
Week-9	Video-31	Graphical Presentation of Data Meaning and Intro	Unit-18
	Video-32	Graphical Presentation of Data using Spreadsheet	Unit-18
Week-10	Video-33	Advance Option in Spreadsheet-I	Unit-19
	Video-34	Advance Option in Spreadsheet-II	Unit-19
	Video-35	Advance Option in Spreadsheet-III	Unit-19
Week-11	Video-36	Google Workspace and Cloud	All Blocks (Unit 1-20)
	Video-37	Burgeoning & Contemporary Thought In business and Computers	All Blocks (Unit 1-20)
Week-12	Video-38	FAQ-I Computer application	All Blocks (Unit 1-20)
	Video-39	FAQ-II Business Application	All Blocks (Unit 1-20)

	Video-40	Terminology used in Computer Application in Business	All Blocks (Unit 1-20)
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Books and references

Issue Date	Title	Authors and Contributors
2020	<u>Unit-4 Basics of Computer Software</u>	<u>Dhusia, D.K.</u>
2020	<u>Unit-3 Web Applications</u>	<u>Dhusia, D.K.</u>
2020	<u>Unit-2 Application of Computers</u>	<u>Dubey, Arvind Kumar</u>
2020	<u>Unit-1 Introduction to Computer</u>	<u>Kesharwani, Subodh</u>
2020	<u>Block-1 Fundamentals of Computers</u>	<u>Kesharwani, Subodh; Dubey, Arvind Kumar; Dhusia, D.K.; Kesharwani, Subodh</u>

Criteria to get a certificate:

Average assignment score = 25% of average of best 8 assignments out of the total 12 assignments given in the course.

Exam score = 75% of the proctored certification exam score out of 100

Final score = Average assignment score + Exam score

YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE >=10/25 AND EXAM SCORE >= 30/75. If one of the 2 criteria is not met, you will not get the certificate even if the Final score >= 40/100.

CTME102 Basics of Digital Marketing

Description:

Credit and Week:

Teaching Scheme	Week	Marks	Credit
	12	100	3

About the course:

The course familiarize students with an understanding of how the digital media works and develop the critical insights necessary to succeed in e-commerce and digital and social media marketing. Enrich learner with the essential principles and practices of marketing in the digital economy by making this course, an indispensable part of their knowledge base. Companies that were non-existent a few short years ago, including Facebook, Whatsapp, LinkedIn, and Youtube, have dramatically changed how we interact, communicate and get from point A to B. Even Amazon and Google are relatively "young" by any measure. This course is also to serve as basic course for learners who wish to further study in the domain of Digital Media.

Pre-requisites:

Person who wish to study in the domain of Digital Media

Course layout:

Week 1	W1_L1Introduction to Marketing W1_L2Consumer Behavior W1_L3Introduction to Digital Marketing
Week 2	W2_L1Search Engine Optimization 1 W2_L2Search Engine Optimization 2 W2_L3Search Engine Optimization 3
Week 3	W3_L1Search_Engine_Marketing : Part 1 W3_L2Search_Engine_Marketing : Part 2 W3_L3Display Advertising
Week 4	W4_L1Social Media Marketing W4_L2Social Media Marketing (Word of Mouth) W4_L3Social Media Platforms Part 1 W4_L4Social Media Platforms Part 2
Week 5	W5_L1Online Reputation Management W5_L2Mobile Marketing Part 1 W5_L3Mobile Marketing Part 2

	W5_L4 Website Planning & Creation
Week 6	W6_L1 Email Marketing Part 1 W6_L2 Email Marketing Part 2 W6_L3 Introduction to E Commerce Part 1 W6_L4 Introduction to E Commerce Part 2
Week 7	W7_L1 E-COMMERCE Strategy 1 W7_L2 E-COMMERCE Strategy 2 W7_L3 Content Marketing W7_L4 Content Creation Process W7_L5 Influencer Marketing
Week 8	W8_L1 Digital Marketing Strategy Part 1 W8_L2 Digital Marketing Strategy Part 2a W8_L3 Digital Marketing Strategy Part 2b W8_L4 Digital Marketing Strategy Part 3a W8_L5 Digital Marketing Strategy Part 3b
Week 9	W9_L1 Digital Analytics & Measurement Part - 1a W9_L2 Digital Analytics & Measurement Part - 1b W9_L3 Digital Analytics & Measurement Part - 2a W9_L4 Digital Analytics & Measurement Part - 2b
Week 10	W10_L1 Digital Analytics & Measurement Part - 3a W10_L2 Digital Analytics & Measurement Part - 3b W10_L3 Measuring Campaign Effectiveness : ROI – Return on Investment W10_L4 Measuring Campaign Effectiveness : CLV - Customer Lifetime Value W10_L5 Attribution Models
Week 11	W11_L1 Digital Marketing Plan W11_L2 Case Study 1 : Email Marketing W11_L3 Case study 2 : Golf Tripz W11_L4 Case Study 3 : Golkonda Hotels W11_L5 Case Study 4 : Bhalaje Photography
Week 12	W12_L1 New Technologies & Advancement in Digital Marketing Part 1 W12_L2 New Technologies & Advancement in Digital Marketing Part 2 W12_L3 Review of Digital Marketing Course Part 1 W12_L4 Review of Digital Marketing Course Part 2

Books and references

1. Digital Marketing: Cases from India by Rajendra Nargundkar and Romi Sainy, Notion Press, Inc
2. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation by Damian Ryan, Kogan Page Publisher
3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler, Publisher Wiley
4. Digital Marketing by Seema Gupta, McGraw Hill Education
5. Fundamentals of Digital Marketing by Punit Singh Bhatia, Pearson
6. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns by Ian Dodson, Wiley Publisher

Criteria to get a certificate:

If You wish to get certified on this course you must register and write the proctored exam after payment of exam fee.

30 Marks will be allocated for Internal Assessment and 70 Marks will be allocated for end term proctored examination.

Securing 40% in both separately is mandatory to pass the course and get Credit Certificate.

CTUD101 - Fundamentals of Digital Electronics

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: In order to achieve the course objectives, students will be introduced to digital technologies. Various digital modules used to create digital computer devices like gates, flip flops, decoder, encoder etc. are to be studied. Mathematical base is created to understand the organization of digital computer.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Digital Systems and Number Systems	12
2	Boolean Algebra and Logic Gates	12
3	Combinational Circuit Designing	10
4	Sequential Circuit Designing	10
5	Memory Interfaces and Data Representation	08
6	The Arithmetic Logic Unit and Control Unit	08

Total Hours (Theory): 60

Total Contact Hours:60

Detail Syllabus:

Unit I: Digital Systems and Number Systems	Hours 12
Introduction and Evolution of Digital computers, Major components of digital computer, Interfaces and Buses, compiler, interpreter, Assembler, Introduction to various number systems (Decimal, Binary, Octal, Hexadecimal, BCD), Conversion of number system, Binary operations, signed binary numbers, 1's complement and 2's complement.	
Unit II: Boolean Algebra and Logic Gates	Hours 12
Fundamental concepts and rules of Boolean algebra, , Boolean Algebra Laws, Boolean expressions and its simplification with and without Truth Tables, Canonical form and standard form, D-Morgan's Theorem, Basic duality laws, Derivation of Boolean expressions, Introduction to logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR), Implementation of Boolean expressions using logic gates, Sum of product and Product of Sum forms, Universal gates, Implementation of other gates using universal gates, Karnaugh Map method for two, three, four and five variables, K-map with don't care conditions, Tabulation method, determination and selection of prime applicants.	
Unit III: Combinational Circuit Designing	Hours 10
Introduction to combinational circuits, Design procedures, Adders, Subtractors, code conversion circuits, Analysis procedures, Multilevel NAND circuits, Multilevel NOR circuits, EX-OR functions, Binary adder and Subtractors, Decimal adder and Subtractors, Magnitude comparator, Decoder and encoders, Multiplexer and de-multiplexer.	
Unit IV: Sequential Circuit Designing	Hours 10
Introduction to Sequential circuits, Concepts of Flip-flops, triggering flip-flops, Clock signals, Analysis of clock sequential circuits, State Reduction and assignments, Flip flop excitation table, Design procedure of asynchronous and synchronous counters (Ripple counter, Binary counter, BCD counter), Design of registers, Shift registers, Timing sequences.	
Unit V: Memory Interfaces and Data Representation	Hours 08
Memory, Types of ROM, Design of ROM, Types of RAM, Magnetic disc memory, Magnetic tape, Digital recording techniques, Linear-select memory organization, Types of digital codes (Gray code, 8421 code, Alphanumeric codes), Parity checking codes, Floating point representation, Fixed point representation.	

Unit VI: The Arithmetic Logic Unit and Control Unit**Hours 08**

Basic operations of Arithmetic Logic Unit, Construction of the Arithmetic Logic Unit, Representation of Instruction word, Control registers, Instruction and execution cycles of Control registers, Sequence operation of Control Registers.

Core Books:

1. M. Morris Mano: Digital Logic and Computer Design, Third Edition, Pearson Education, 2016.
2. Thomas C. Bartee: Digital Computer Fundamentals, Sixth Edition, Tata McGraw Hill Publishing, 2012.
3. M. Morris Mano: Computer System Architecture, Third Edition, Pearson Education, 2011.

Reference Books:

1. Andrew S. Tanenbaum: Structured Computer Organization, Fourth Edition, Pearson Education, 2005.
2. Albert Paul Malvino and Jerald A. Brown: Digital Computer Electronics, Third Edition, Tata McGraw Hill Publishing, 2008.

Web References:

1. https://www.tutorialspoint.com/digital_circuits/index.htm [Digital Circuits Tutorial]
2. <https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/> [Digital Electronics and Logic Design Tutorials]
3. <https://studymaterialz.in/digital-logic-and-computer-design-by-morris-mano/> [Digital Logic and Computer Design book]
4. <https://cupola.gettysburg.edu/oer/1/> [Digital Circuit Projects]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Able to get the idea about digital system and numbering system.
CO2 :	Able to study logic gates for digital circuit designing.
CO3 :	Able to learn to design various combinational circuits.
CO4 :	Able to learn to design various sequential circuits.
CO5 :	Able to learn memory design concepts and to study computer Arithmetic Logic Unit and Control Unit.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Digital Systems and Number Systems	√				
2	Boolean Algebra and Logic Gates		√			
3	Combinational Circuit Designing			√		
4	Sequential Circuit Designing				√	
5	Memory Interfaces and Data Representation					√
6	The Arithmetic Logic Unit and Control Unit					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	-	3	2	-	-	2	1	3	2
CO2	3	2	2	2	-	3	2	-	-	2	1	3	2
CO3	3	3	3	2	-	2	2	-	-	2	2	3	2
CO4	3	3	3	2	-	2	2	-	-	2	2	3	2
CO5	3	3	3	2	-	3	2	-	-	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUS101 - Mathematics for Computer Science

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
02	Theory	02	30	25	55
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: Basic algebra and geometry, as well as a good understanding of logic and proofs, mathematical statistics.

Methodology, Pedagogy & Andragogy: During theory lectures the emphasis will be given on the fundamentals of mathematics and statistics. Problem solving: Students will demonstrate the ability to solve problems, including applications outside of mathematics. Mathematical communication: Students will demonstrate the ability to communicate mathematical ideas clearly. They will use correct mathematical terminology and proper mathematical notation.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Sets and functions	04
2	Vectors and Matrices	04
3	Fundamentals of Calculus	06
4	Permutation & Combination	05
5	Probability	06
6	Graph Theory	05

Total Hours (Theory): 30

Total Contact Hours:30

Detail Syllabus:

Unit I : Sets and Functions	Hours 04
Introduction to set theory, methods of representation of a set, operations on set, algebra of sets, De 'Morgan's law, function definition, domain, range, one-to-one function, onto function.	
Unit II : Vectors and Matrices	Hours 04
Definition of vector, addition and subtraction of vector, magnitude of a vector, unit vectors, dot product and cross product, definition of matrix, equal matrices, diagonal elements of matrix, row matrix, column matrix, Symmetric matrix, skew symmetric matrix, orthogonal matrix, diagonal matrix, identity matrix, operations on matrix.	
Unit III : Fundamentals of Calculus	Hours 06
Limits, Continuity and Differentiability, Successive Differentiation, Partial Differentiation, Tangents and Normals, Maxima and Minima.	
Unit IV : Permutation and Combination	Hours 05
Meaning of permutation, Formula of permutation, Permutation of n different things, Permutation of similar things, Permutation of repeated things, Circular Permutation, Combination: Meaning of Combination, Formula of Combination.	
Unit V : Probability	Hours 06
Probability: Random Experiment, Sample Space, Event, Mutually exclusive event, Exhaustive event, Equally likely event, Probability Classical definition. (Simple examples of Probability).	
Unit VI : Graph Theory	Hours 05
Introduction to Graph, Graph Definition, Vertices, Edges, Loops, Parallel Edges, Simple Graph, Finite Graph, Adjacent vertices, Incidence between vertex and edge, Degree of a vertex, Isolated Vertex, Pendent Vertex, Null Graph. Isomorphism, Labeled Graph	

Core Books:

1. D. C. Sancheti, V. K. Kapoor: Business Mathematics, Sultan Chand & sons.
2. Lipschutz & Marc Lipson: DISCRETE MATHEMATICS, Tata McGraw Hill
3. Narsingh Deo: Graph Theory with application to engineering and computer science, Prentice Hall of India Pvt. Ltd

Reference Books:

1. Gupta and Gupta: Business Statistics, Sultan Chand and Sons.

Web References:

1. <https://www.statlect.com/matrix-algebra/vectors-and-matrices>
2. <https://www.geeksforgeeks.org/permutations-and-combinations/>
3. <https://www.khanacademy.org/math/statistics-probability/probability-library/basic-theoretical-probability/a/probability-the-basics>

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will learn basics of sets and functions
CO2 :	Students will be familiar with various linear algebra.
CO3 :	Students will be able to compute limits, derivatives, and integrals. Analyze functions using limits, derivatives, and integrals
CO4 :	Students will be able to define a permutation and explain how to calculate probability
CO5 :	Students will be able to understand and apply the fundamental concepts in graph theory

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Sets and Functions	✓				
2	Vectors and Matrices		✓			
3	Fundamentals of Calculus			✓		
4	Permutation and Combination				✓	
5	Probability				✓	
6	Graph Theory					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	2	1	-	-	-	-	2	-
CO2	3	3	3	2	-	2	1	-	-	-	-	2	-
CO3	3	3	3	2	-	2	1	-	-	-	-	2	-
CO4	3	3	3	2	-	2	1	-	-	-	-	2	-
CO5	3	3	3	2	-	2	1	-	-	-	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**B.Sc. (IT) PROGRAMME
(2nd SEMESTER)
AS PER NEP 2020**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

B.Sc. (IT) Semester-II

Course Code	Course Name	Theory / Practical / Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC103	Introduction to Object Oriented Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC104	Fundamentals of Web Designing	Practical	-	-	25	25	02	Major Core
CTUE103	(Select any one) 3. Business Models for e-Commerce 4. Managerial Economics	Theory	50	50	-	-	04	Minor
CTUD102	Data Communication and Networks	Theory	50	50	-	-	04	MDC
CTUV101	Fundamentals of Accounting	Theory	25	25	-	-	02	VAC
HSUS101-117	(Select any one) A course on Liberal Arts HSUS101 – Painting HSUS102- Photography HSUS103- Sculpting HSUS104- Pottery and Ceramic Art HSUS105-Media and Graphic Design HSUS106-Art and Craft HSUS109- Dramatics HSUS110-Contemporary Dance HSUS111-Music (Vocal) HSUS112-Music (Instrumental)-Tabla HSUS113-Music (Instrumental)-Guitar HSUS114-Music (Instrumental)-Harmonium HSUS115-Music (Instrumental)- Flute HSUS116- Indian Classical Dance-Kathak HSUS116- Indian Classical Dance-Bharatnatyam	Practical	-	-	25	25	02	SEC
CTUA101	Presentation Skills	Practical	-	-	25	25	02	AEC
CTUI101	Summer Internship and Viva - I	VIVA	-	-	50	50	4	Exit Course

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)

*SEE- Semester -End- Evaluation

CTUC103 - Introduction to Object Oriented Programming

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
02	Practical	04	60	40	100
Experiential Learning Components (Theory) : Unit Tests, Assignments, Case Study etc.					
Experiential Learning Components (Practical) : Lab Assignments, Practical Test, VIVA					

Pre-requisite: Introduction to Programming

Methodology, Pedagogy & Andragogy: The theory sessions will be enriched with real-world examples to demonstrate how object-oriented programming (OOP) enhances problem-solving. These examples will showcase the practical application of OOP concepts such as classes, objects, inheritance, polymorphism, and exception handling. By applying these concepts to real-world scenarios, students will gain a deeper understanding of how OOP can be used to solve complex problems efficiently and effectively. During the practical sessions of the Practical Programming Subject course, students will apply the concepts through a variety of assignments and case studies to assess their comprehension and progress.

Outline of the course(Theory):

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Object Oriented Programming	08
2	Classes and Objects	11
3	Inheritance	13
4	Polymorphism	10
5	Exception Handling and Type Cast Operators	10
6	Managing I/O formats and operations	08

Total Hours (Theory): 60

Total hours (Practical): 60

Total Contact Hours: 120

Detailed Syllabus:**Unit - I: Introduction to Object Oriented Programming Hours: 08**

Structured programming vs. object oriented programming, Introduction to C++: structure of a C++ program Tokens, inline function, pass by reference, default arguments, OOP characteristics.

Unit - II: Classes and Objects Hours: 11

Define class, objects, visibility modes, static members, friend function, Constructors and Destructors, Default Constructor, Copy constructors, Parameterized Constructor, this keyword.

Unit - III: Inheritance Hours: 13

Objective of Inheritance, types of inheritance, impact of access modes during inheritance, Virtual base classes, Dynamic Binding, Virtual functions, Pure virtual functions, Abstract class, Early vs. Late binding.

Unit - IV: Polymorphism Hours: 10

Introduction of Static Binding, Function Overloading and ambiguity raised in function overloading, Operator overloading through member function and friend functions.

Unit - V: Exception Handling and Type Cast Operators Hours: 10

Introduction to Exception handling, catching class types, using multiple catch statements, exception handling options, creating custom exceptions, introduction to cast operators, const cast, static cast, reinterpret cast, dynamic cast.

Unit - VI: Managing I/O Formats and Operations Hours: 08

Understand and apply concepts from various header files like iostream, iomanip, fstream, etc. opening and closing file, reading and writing text files and binary files, performing random access on files, handle command line arguments.

Outline of the course(Practical):

Week No	Practical	Description
1	Introduction to Object Oriented Programming and Setting up IDE	Introduction to C++, Setting up a development environment and its introduction, structure of a C++ program Tokens, inline function, pass by reference, default arguments
2	Classes and Objects	Define class, objects, visibility modes, static members
3	Friend Functions	Introduction and hands on friend functions
4	Constructors and Destructors	Constructors and Destructors, Default Constructor, Types of constructs
5	Inheritance	Exposure on Inheritance programs and their types
6	Virtual Function	Programs on Virtual Function, Pure Virtual functions, Abstract Class, Early Binding and Late Binding
7	Function Overloading	Introduction of Static Binding, Function Overloading and ambiguity raised in function overloading
8	Operator Overloading	Operator overloading through member function and friend functions
9	Exception Handling	Introduction to Exception handling, catching class types,
10	Multiple Statements Catch	Using multiple catch statements, exception handling options, creating custom exceptions
11	Type Cast Operators	Introduction to cast operators, const cast, static cast, reinterpret cast, dynamic cast
12	Managing I/O Formats	Understand and apply concepts from various header files like iostream, Iomanip ,fstream, etc
13	File Handling	Opening and closing file, reading and writing text files and binary files
14	File Handling Operations	opening and closing file, reading and writing text files and binary files, performing random access on files
15	Command Line Arguments	handle command line arguments.

Total hours: 60

Core Books:

1. Herbert Schildt: C++: A Beginner's Guide, 2nd Edition Paperback, McGraw-Hill,2003.
2. E Balagurusamy: Object Oriented Programming with C++ Paperback, McGraw Hill India,2017.

Reference Books:

1. Yashavant Kanetkar: Let Us C++, Paperback, BPB Publications,2020.
2. Robert Lafore: Object Oriented Programming in C++, 4th Edition, Sams Publications,2002.
3. Bruce Eckel:Thinking in C++, Volume 1, 2nd Edition, Pearson Education,2006.

Web References:

1. <https://www.geeksforgeeks.org/c-plus-plus/> [For Entire Syllabus]
2. <https://google.github.io/styleguide/cppguide.html> [For coding standards and concepts]
3. http://www.tutorialspoint.com/cplusplus/cpp_basic_input_output.htm [For Practical's]

Course Outcomes: Upon successful completion of the course, the students will:

C01 :	Understand the basic structure of C++ program and understand the concept of object oriented programming characteristics.
C02 :	Understand the concept of Constructor and Destructor and able to create class and objects.
C03 :	Understand the need of Polymorphism and implement static polymorphism.
C04 :	Understand the purpose of Inheritance, identify relations between classes, implement inheritance and perform dynamic binding.
C05 :	Able to handle the runtime errors or exceptions in C++ and use type cast operators. Able to read input from device, file, command line arguments and apply formats to input and output.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		C01	C02	C03	C04	C05
1	Introduction to Object Oriented Programming	√				
2	Classes and Objects		√			
3	Inheritance			√		
4	Polymorphism				√	
5	Exception Handling and Type cast operators					√
6	Managing I/O formats and operations					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	2	2	2	2	2	2	2	2	3	2
CO2	3	3	3	2	2	2	3	2	2	2	2	3	2
CO3	3	2	3	2	2	2	3	2	2	2	2	3	2
CO4	3	3	3	2	2	2	3	2	2	2	2	3	2
CO5	3	2	3	2	2	2	2	2	2	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC104 - Fundamentals of Web Designing

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
02	Practical	04	60	40	100
Experiential Learning Components : Lab Assignments, Practical Test, VIVA					

Prerequisites: Basic concepts of web.

Methodology, Pedagogy & Andragogy: This course focuses on providing hands-on experience to students for design and develop entire web sites using several web designing tools and HTML scripting language.

Outline of the Course:

Week No	Practical	Description
1	Basic Construction of an HTML & HTML5 Page, HTML Text Editors, HTML Building blocks.	Learn basic concepts of web page design.
2	Basic HTML tags – Text formatting tags, Heading tags, paragraph tags, division tag, Span tags, Break line tag, Binding space in HTML .	Get familiar with different tags and attributes which is used to add the text in a web page.
3	Controlling Font size and color, Adding Table – Table tag.	Learn user interface designing using Table Layout, change font style, color etc.
4	Grouping and merging table rows and columns. Adding List – ordered, unordered and definition list.	Able to display the data in various formats and design different types of list in the table.

5	Adding Image, Adding links - Changing link colors, Email link.	Learn to add images and link in the web page.
6	Embedding audio and video, Adding Field sets.	Able to add multimedia in web page using internal and external methods.
7	Adding Form: Form tag, Action, Method. Basic form controls.	Learn basic form elements and when and where to apply it.
8	Textbox, Password field, Radio Button, Checkbox, Multiple line text area, file upload.	Use various types basic form controls with types of form input elements.
9	Various types of buttons – submit, reset, image, simple button.	Learn various types of buttons to make it more interactive.
10	HTML5 input elements - Color, Number, Date, Month.	Learn new input types in HTML5.
11	Week, Time, date time-local, Email, url, range, search.	Learn to add defining inputs and minimum and maximum range to make the form attractive.
12	Data list, output, progress, meter.	Learn to add list and provide progress horizontal view and range with output.
13	Regular expression, HTML5 new attributes – Placeholder, Required.	Learn HTML 5 form element to provide user side web form validation.
14	Pattern, Autocomplete, Autofocus, novalidate, formnovalidate.	Learn HTML 5 new form properties.
15	formaction, formmethod, spellcheck, contenteditable.	Learn HTML 5 to user submit the form and redirect the form data to selective method.

Total hours: 60

Text Books:

1. Powel Thomas: HTML - The Complete Reference, 3rd Edition, McGraw-Hill Education – Europe,2018.
2. DT Editorial Services: HTML 5 Black Book,2nd Edition, Dreamtech Press, 2016
3. Matt West: HTML 5 Foundations, Wiley publication, 2013
4. Farrar: HTML Example book, BPB,2007.

Reference Books:

1. David DuRocher : HTML and CSS QuickStart Guide, Paperback,2021
2. Laura Lemay, Rafe Colburn, Jennifer Kyrnin : Mastering Html, CSS & JavaScript Web Publishing, Paperback, 2016.
3. Whyte: Basic HTML, 2nd Edition, Payne-Gallway, Oxford, 2003.
4. Shelly Woods: HTML introductory concepts and techniques, 5th Edition, Course Technology,2009.
5. Jon Dukett: Beginning Web Programming with HTML, XHTML and CSS, Wrox Publication.

Web References:

1. www.w3schools.com/html [For HTML tutorials]
2. html.net/tutorials/html/ [For HTML tutorials]
3. www.htmlgoodies.com/ [For HTML resources]
4. <https://developer.mozilla.org/en-US/learn/html> [For HTML best practices]

Course Outcome: Upon successful completion of the course, student will:

C01 :	Able to understand basic construction of HTML & HTML5 document and started using basic tags.
C02 :	Able to Add content using various tags and format the content in table & list.
C03 :	Able to design links and multimedia elements such as image, audio, video.
C04 :	Able to design a web page form using HTML & HTML5.
C05 :	Able to apply validation using HTML5 attributes.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PSO1	PSO2
CO1	1	2	1	3	2	2	1	1	-	1	1	1	1
CO2	-	1	2	3	1	3	1	-	-	2	2	2	2
CO3	1	1	2	3	1	3	1	-	-	2	2	2	2
CO4	1	1	2	3	1	1	1	1	-	1	-	1	1
CO5	2	2	3	3	2	3	3	2	1	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE103 - Business Models for e-Commerce

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During theory lectures the emphasis will be given on the fundamentals of E-commerce. Students will be introduced to E-Commerce, E-Marketing, E-Security and E-Payment, Mobile Commerce, CRM and ERP, and E-Commerce Applications. Students will give practical exposure in form of case study and by visit to E-commerce / Digital Marketing company and/or supply chain Centre.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to E-Commerce	09
2	E-Marketing	11
3	E-Security and E-Payment	09
4	Mobile Commerce	11
5	E-CRM and ERP	09
6	E-Commerce Applications	11

Total Hours (Theory): 60

Total Contact Hours:60

Detail Syllabus:

Unit I : Introduction to E-Commerce	Hours 09
Emergence and use of Internet, origin of web and world wide web, advantages and disadvantages of E-commerce, Features of E-Commerce, Electronic Commerce over the Internet, Types of Ecommerce.	
Unit II : E-Marketing	Hours 11
Traditional Marketing, Online Marketing, E-advertising, Internet Marketing Trends and strategies, E-branding.	
Unit III : E-Security and E-Payment	Hours 09
Security on the Internet, E-Business risk management issues, Digital token based E-Payment System, Properties of Electronic Cash, Digital Signature.	
Unit IV : Mobile Commerce	Hours 11
Definition of M-Commerce, Features of M-Commerce, Advantages and Disadvantages of M-Commerce, Areas of M-Commerce Applications, Payment Systems and Models in M-Commerce.	
Unit V : E-CRM and ERP	Hours 09
Customer Relationship Management, CRM capabilities and Customer life cycle, Introduction to ERP, Reasons for the growth of the ERP Market, Advantages and Disadvantages of ERP.	
Unit VI : E-Commerce Applications	Hours 11
Retail and Wholesale, Finance, Manufacturing, Online Booking, Online Publishing, Digital Advertising, Digital Shopping, Digital Media, Auctions, A case study need to be discussed for these application. Hands-on experience in setting up and managing an e-commerce store. Developing a business plan for an ecommerce startup.	

Core Books:

1. P.T.Joseph, S.J.: E-Commerce- An Indian Perspective, 3rd Edition, PHI learning Private Limited.
2. Kamlesh K. Bajaj, Debjani Nag: E-Commerce, The Cutting Edge of Business, 2nd Edition, McGraw-Hill Education.

Reference Books:

1. Anita Rosen: The e-commerce Question and Answer Book: A Survival Guide for Business Managers, 2nd Edition, Amacom.
2. Janice Reynolds: The Complete E-Commerce Book: Design, Build & Maintain a Successful Web-based Business, 2nd Edition, CRC Press.
3. By Philippe Humeau&Matthieu Jung : The White Book of Ecommerce Solutions, NBS System.
4. IshitaLahiri and Sujit Kumar Ghose : Principles of Marketing and E-Commerce

Web References:

1. <http://www.ecommercetutorial.net/> [For Tutorial]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	To introduce the concept of Electronic Commerce
CO2 :	To understand the concept of E-marketing
CO3 :	To understand the role of E-Security & E-Payment
CO4 :	To understand M-Commerce Payment System
CO5 :	To learn CRM, ERP and E-commerce Applications.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to E-Commerce	✓				
2	E-Marketing	✓	✓			
3	E-Security and E-Payment		✓	✓		
4	Mobile Commerce		✓	✓		
5	E-CRM and ERP				✓	
6	E-Commerce Applications					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	3	2	2	1	2	2	2	1	1	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	2	2	3	3	2	2	2	2	2	1	1	3	2
CO4	3	3	3	3	3	3	3	3	3	2	3	3	2
CO5	3	3	3	3	3	3	3	3	3	2	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE104 - Managerial Economics

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components : Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During theoretical lessons, real-world examples will be used to discuss economic topics such as demand, supply, production, cost function, market structure, factor pricing, and macroeconomics. Students will be offered appropriate case studies in order to provide actual exposure to theoretical economic ideas.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Basic Economic Concepts	08
2	Demand and Supply	11
3	Production, Cost and Revenue	11
4	Inflation	11
5	Market Structures & Pricing	10
6	Market Failures and Price Regulations	09

Total Hours (Theory): 60

Total Contact Hours:60

Detail Syllabus:**Unit I: Basic Economic Concepts** **Hours 08**

Basic of Economics, Nature of Economics, Scope of Economics, Business Economics, Difference Between Micro and Macro Economics, Laws of Economics, Business Cycle, Inflation, Needs, wants.

Unit II: Demand and Supply **Hours 11**

Demand and supply, Types of Demand, Determinants of Demand and supply, Law of Demand and supply, Demand and supply Schedule, Demand Function. Own-price elasticity of demand, cross-price elasticity of demand, and income elasticity of demand.

Unit III: Production, Cost and Revenue **Hours 11**

Production function, law of variable proportion and laws of returns to scale, different types of costs – variable cost, fixed cost, total cost, average cost, average fixed cost, average variable cost and marginal cost, Total revenue, average revenue and marginal revenue, profit function.

Unit IV: Inflation **Hours 11**

Meaning, Depreciation of money, Monetary inflation concepts, types of inflation, Causes and effect of inflation different sectors of the economy, Causes of Inflation, Advantages, Formula and Disadvantages of inflation.

Unit V: Market Structures & Pricing **Hours 10**

Concept of market and equilibrium- characteristics of perfect competition, Features of Market Structure, monopoly, monopolistic competition and oligopoly–price determinations, Measure of market structure with example.

Unit VI: Market Failures and Price Regulations **Hours 09**

Market failures and need for regulation, Regulations and market structure, Firm behavior, Price regulation. More on Externalities, and role of government, importance of competition in market failure and price regulations.

Core Books:

1. P.L Mehta: Managerial Economics, Sultan Chand and Sons, (2014)
2. Keat Paul , K Young Philip , Erfle Steve , College Dickinson, Banerjee Sreejatha , Managerial Economics, Pearson Education; 6th ed..

Reference Books:

1. Yogesh Maheswari, Managerial Economics, Phi Learning, New Delhi, 2005 Gupta G.S.
2. Moyer & Harris. Managerial Economics, Tata McGraw-Hill, New Delhi
3. Geetika, Ghosh & Choudhury. Managerial Economics, Cengage Learning, New Delhi, 2005
4. Dominick Salvatore, Managerial Economics, adapted by Ravikesh Srivastava, Oxford University press
5. Mote V.L., Samuel Paul and G.S. Gupta, Managerial Economics Concepts and Cases, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2001

Web References:

1. <https://www.geektonight.com/managerial-economics-notes/>
2. <https://www.learningclassesonline.com/2020/10/pedagogy-of-economics.html>
3. <https://mrcet.com/downloads/MBA/Managerial%20Economics.pdf>

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Able to understand basic economic concepts.
CO2 :	Able to understand market.
CO3 :	Able to learn basics of inflation.
CO4 :	Able to deal with situation between cost and revenue.
CO5 :	Able to understand basics of Demand and Supply.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Basic Economic Concepts	✓				
2	Demand and Supply					✓
3	Production, Cost and Revenue					✓
4	Inflation			✓		
5	Market Structures & Pricing		✓			
6	Market Failures and Price Regulations		✓			

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	1	2	1	-	-	-	1	1	2
CO2	-	1	1	-	1	2	2	-	-	1	3	1	2
CO3	-	1	1	-	1	2	2	-	-	-	2	1	2
CO4	1	1	1	-	1	2	2	-	-	1	2	1	2
CO5	1	1	1	-	1	2	2	-	-	1	2	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUD102 - Data Communications and Networks

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study, Certification courses, etc.					

Pre-requisite: Basic knowledge of computers and their working.

Methodology, Pedagogy & Andragogy: During the lecture sessions, the students will learn about role of computer network in modern communication systems, underlying principles of network communication, need for standardization through network reference model. The teacher will also discuss communication issues at different layers and concepts related to network security. The students will adopt the latest certification courses from reputed and recognized platforms. Furthermore, the students will be engaged in problem-solving, emphasizing real-world applications and relevance.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Computer Networks	10
2	Physical Layer Communication	08
3	Network reference model	11
4	Data Link Layer Functions and Protocol	12
5	Network Layer Functions and Protocol	10
6	Network security	09

Total Hours (Theory):60

Total Contact Hours:60

Detail Syllabus:

Unit I: Introduction to computer network	Hours 10
Definition of computer network, aim and objective of computer network: applications of computer network, merits & demerits of computer network, examples of computer network, components of computer network, types of networks, network topologies, network devices: hub, switch, repeater, router, gateway, bridge.	
Unit II: Physical Layer Communication	Hours 08
Analog and digital signal, Definition of bandwidth, Maximum data rate of a channel, Line encoding schemes, Transmission modes, Modulation techniques, Multiplexing techniques- FDM and TDM, Transmission media-Guided and Unguided, Switching techniques- Circuit switching, Packet switching, Connectionless datagram switching, Connection-oriented virtual circuit	
Unit III: Network reference model	Hours 11
Need for network reference model, history of TCP/IP and OSI model, layers of OSI and TCP/IP model, comparison between TCP/IP and OSI model, Protocol Hierarchy, Network Protocols: Simple Mail Transfer Protocol (SMTP), File Transfer Protocol (FTP), Multiple Internet Mail Extension (MIME), Post Office Protocol (POP), Telnet, Domain Name Service (DNS), Dynamic Host Configuration Protocol (DHCP), Address Resolution Protocol (ARP), Reverse Address Resolution Protocol (RARP).	
Unit IV: Data Link Layer Functions and Protocol	Hours 12
Definition of Framing, Framing methods, Error detection techniques, Error correction techniques, Flow control mechanisms- Simplex protocol, Stop and Wait ARQ, Go-Back-N ARQ, Point to Point protocol.	
Unit V: Network Layer Functions and Protocol	Hours 10
Connection oriented vs Connectionless services, Definition of Routing, Routing algorithms, IP protocol, IP addresses, ARP, RARP	
Unit VI: Network security	Hours 09
Introduction to cryptography, symmetric key and public key encryption systems, digital signature and key management concepts, communication security.	

Core Books:

1. Andrew S. Tanenbaum: Computer Networks, 6th edition, Pearson Publication: 2021.
2. Behrouz Forouzan: Data communications and networking, 4th Edition, McGraw Hill, 2018.
3. William Stallings: Data and computer communication: 5th Edition, Pearson Publication, 2019.

Reference Books:

1. James F. Kurose, Keith W. Ross: Computer networking – A top-down approach: 3rd Edition: Pearson Publication: 2017
2. Narsimha Karumanchi: Elements of computer networking: An Integrated Approach: 1st Edition: Careermonk Publication: 2014
3. Ed Tittel: Computer networking: 1st Edition, Schum's Publication: 2020

Web References:

1. <https://computer.howstuffworks.com/computer-networking-channel.htm> [How Stuff Works]
2. [https://learn.microsoft.com/en-us/previous-versions/windows/it-pro/windows-server-2012-R2-and-2012/dn313100\(v=ws.11\)?redirectedfrom=MSDN](https://learn.microsoft.com/en-us/previous-versions/windows/it-pro/windows-server-2012-R2-and-2012/dn313100(v=ws.11)?redirectedfrom=MSDN) [Microsoft Networking]
3. https://help.sap.com/docs/SAP_COMMERCE/d0224eca81e249cb821f2cdf45a82ace/8c74877b866910148cc9ba5f39a2fd28.html?version=6.7.0.0 [For multicast and unicast]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Student will be able to understand role of computer network in digital communication
CO2 :	Student will grasp underlying concepts related with network communication
CO3 :	Student will understand role of reference models in standardizing communication
CO4 :	Students will learn about intra and inter network communication and technology behind it.
CO5 :	Students will learn about different aspects of network security.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Computer Networks	√				
2	Physical Layer Communication		√			
3	Network reference model			√		
4	Data Link Layer Functions and Protocol				√	
5	Network Layer Functions and Protocol				√	
6	Network security					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	2	1	-	1	1	1	-	-	1	2	-
CO2	2	3	3	2	-	1	1	1	-	-	1	3	1
CO3	3	3	3	2	-	1	1	1	1	-	1	3	3
CO4	1	3	3	2	-	1	1	1	1	-	1	3	2
CO5	3	3	3	2	-	1	1	1	1	-	1	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUV101 - Fundamentals of Accounting

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
02	Theory	02	30	20	50
Experiential Learning Components: Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During the classroom sessions, the emphasis will be given on the fundamentals of accounting. Students will be introduced to book keeping systems in modern accounting, financial accounting, and cost accounting. Students will prepare financial statements such as journal, ledger, trial balance, trading and profit and loss account, and balance sheet. Students will also get hands on exposure in make or buy decisions in cost accounting. Same concepts will be made concrete through assignments, case studies, and unit tests.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Accounting	05
2	Book Keeping System	05
3	Financial Accounting - I	05
4	Financial Accounting - II	07
5	Cost Accounting - I	04
6	Cost Accounting - II	04

Total Hours (Theory): 30

Total Contact Hours:30

Detail Syllabus:

Unit I : Introduction to Accounting	Hours 05
Introduction and users of Accounting, Branches of Accounting, Objectives, Accounting Concepts and Conventions, Accounting Terms	
Unit II : Book Keeping System	Hours 05
Single and Double Entry Book Keeping Systems, Advantages of Double Entry Book Keeping System, Limitations of Double Entry Book Keeping System, Types of Accounts: Personal, Real, and Nominal, Terms of Book Keeping Systems	
Unit III : Financial Accounting – I	Hours 05
Stages of Accounting Cycle, Types of Transactions, Forms of Economic Transactions, Cash and Credit Transactions, Introduction to Journal, Journal Entries	
Unit IV : Financial Accounting – II	Hours 07
Introduction to Ledger, Relationship Between Journal and Ledger, Rules of Ledger Posting, Balancing of the Accounts in Ledger, Trial Balance, Objectives of Preparing Trial Balance, Trading and Profit and Loss Account, Balance Sheet, Different between Trial Balance and Balance Sheet	
Unit V : Cost Accounting – I	Hours 04
Introduction to Cost Accounting: Cost, Costing, and Cost Accounting, Limitations of Financial Accounting, Difference Between Cost Accounting and Financial Accounting, Objectives of Cost Accounting,	
Unit VI : Cost Accounting – II	Hours 04
Elements of Cost: Material Cost, Labor Cost, and Expenses, Techniques of Costing, Marginal Costing, Make or Buy Decision, Breakeven Analysis	

Core Books:

1. Dr. S. N. Maheshwari: Principles of Management Accounting, Sultan Chand Publication. Eighteenth Edition, 2021
2. M. Pande: Financial Management, Vikas Publishing House, 2015
3. M.N. Arora: Cost Accounting, Vikas Publishing House, 2013

Reference Books:

1. Dr. S.N. Maheshwari: Advanced Accountancy, Volume 1, Eleventh & Revised Edition, Vikas Publishing House, 2017

Web References:

- <https://www.accountingtools.com/articles/basics-of-accounting.html> [For Basics of Accounting]
- <https://www.youtube.com/watch?v=vuetn PQOvM> [For Journal Entries – 1]
- <https://www.youtube.com/watch?v=3xCzh3-bm4o&list=RDCMUCNh1egMomGI3hjJ0DHExdUg&index=3> [For Journal Entries – 2]
- <https://www.youtube.com/watch?v=z KO49Pk3DM> [For Ledger Posting & Trial Balance]
- <https://www.youtube.com/watch?v=Y4azRCTTw0U> [For Trading A/c & Profit & Loss A/c]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will get basic understanding of the field of Accounting
CO2 :	Students will be familiar with Accounting Book Keeping Systems
CO3 :	Students will learn concepts of financial accounting and different types of accounts with rules of debit and credit
CO4 :	Students will be able to generate Journal, Ledger, Trial Balance, and Final Accounts
CO5 :	Students will get basic understanding of the field of Cost Accounting

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Accounting	√				
2	Book Keeping System		√			
3	Financial Accounting – I			√		
4	Financial Accounting – II				√	
5	Cost Accounting – I					√
6	Cost Accounting – II					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1	-	-	2	2	3	1	2	1	1	1	1
CO2	1	2	-	-	2	2	3	1	2	1	1	-	-
CO3	3	3	2	1	1	2	3	-	2	2	1	2	-
CO4	3	3	3	1	1	2	3	-	2	2	1	2	-
CO5	2	3	2	1	3	2	3	1	2	3	1	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUA101 - Presentation Skills

Credit	Component	Instruction / Contact Hours (Per Week)	Instruction / Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
02	Practical	02	30	20	50
Experiential Learning Components: Lab Assignments, Practical Test, VIVA					

Prerequisites: Basic computer skills and knowledge of English.

Methodology, Pedagogy & Andragogy: The aim of this course is to develop effective presentation skills in students. Students will be taken systematically through the key stages of giving presentations, from planning and introducing to concluding and handling questions. The topics for the presentation will range from academic presentations to research presentations.

B. Outline of the Course:

Week No	Practical	Description
1	Introduction	Knowing the Purpose, Knowing the Audience, Internal and External Presentation, Presentation to Heterogenic Group, Greetings, Introducing self and peers, Asking and sharing information
2	ICT tools for presentation – Brief introduction	Microsoft PowerPoint, Canva, Prezi, AI-powered presentation tools
3	Presentation using Canva	Introduction to Canva, Creating, presenting, sharing and downloading presentation
4	Presentation design in Canva	Templates, layouts, Presenter Notes, Duration, Timer
5	Basic design elements in Canva	Shapes, Graphics, Charts, Tables
6	Advanced design elements in Canva	Photos, Videos, Audio, Frames, Grids, Stickers
7	Intermediate features of PowerPoint	Using Screenshot, Inserting objects, video and audio in presentation, Screen recording

8	Advanced features of PowerPoint	Using Hyperlink and Action, Slide Show Set-up, Presenter View, Master views
9	Cloud-based presentation using Google Slides	Creating a new presentation, importing slides, Sharing, Printing, Downloading in different formats, Version History
10	Basic features of Google Slides	Slideshow, Motion, Theme Builder, Inserting image, audio, video, shape
11	Advanced features of Google Slides	Spell-check, Linked objects, Q-A History, Notification Settings, Accessibility, Activity Dashboard
12	Engaging audience using feedback-gathering tools	Use of menitimeter for Word Clouds, Live Polls, Scales, Ranking and Pin It
13	Ethical practices	Using Citations/References for texts, images and other type of information, Plagiarism check
14	AI and Presentation	Use of Generative AI tools such as ChatGPT, CoPilot etc. in presentations
15	Select case-study	Examples of best presentations.

Total hours: 30

Text Books:

1. The Presentation Book : How to Create It, Shape It and Deliver It! Improve Your Presentation Skills Now, 2nd Edition, Pearson Education.
2. Beginners Guide for Canva 2024, by Karla J Kane. ISBN: 979-8875801853

Reference Books:

1. Microsoft PowerPoint Guide for Success by Kevin Pitch, Top Notch International. ISBN:978-1915331489
2. Getting Started with Google Slides: A Practical Guide to Cloud-Based Presentations by Scott La Counte, SL Editions ISBN:978-1629179513

Web References:

1. <https://www.canva.com/education/students/>
2. <https://support.microsoft.com/en-us/powerpoint>
3. <https://support.google.com/a/users/answer/9282488>
4. <https://www.mentimeter.com/features>

Course Outcome: Upon successful completion of the course, student will be able to:

C01	Understand key elements of an effective presentation and ICT tools for presentation.										
C02	Acquire in-depth knowledge of one of the popular presentation tools.										
C03	Develop intermediate and advanced skills in alternative presentation tool.										
C04	Familiarize with cloud-based presentation tool.										
C05	Create effective presentation with ethical practices and enhance it with AI tools.										

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	3	-	2	1	-	-	2	-	-
CO2	2	-	3	-	2	1	-	-	2	2	3	1	1
CO3	-	3	-	2	-	1	3	2	-	-	-	3	2
CO4	2	1	2	2	2	1	2	-	2	-	2	3	2
CO5	-	2	2	3	1	-	2	2	2	2	-	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUI101 : Summer Internship and Viva – I

Objective and Scope:

Students who choose to exit the programme after the completion of the first two semesters must undertake internships, community engagement programmes and field based learning/minor projects during the summer term. This internship, worth 4 credits, is a requirement for the award of the Undergraduate Certificate. Students have to undergo internship in reputed Tech Companies, Software Development Firm, IT services companies, Research Institutions and Lab etc. This provision ensures that students gain valuable practical experience and industry exposure, complementing their academic learning and enhancing their career prospects. Following are the intended objectives of internship training:

- **Practical Experience:** Provide hands-on experience with real-world projects to apply theoretical knowledge gained during the course.
- **Skill Development:** Enhance technical skills, such as programming, software development, database management, and other relevant IT skills.
- **Industry Exposure:** Familiarize students with the working environment of the IT industry, including understanding company culture, workflows, and professional practices.
- **Professionalism:** Instil a sense of professionalism and work ethic, including adhering to deadlines, following instructions, and working collaboratively.
- **Transition to Employment:** Facilitate a smoother transition from academic life to professional careers by bridging the gap between theory and practice.

Guidelines of Internship:

The Summer Internship shall be of 15 (Minimum 60 hours) duration and will be undertaken during the Summer Vacation. Students have to undergo internship in reputed Tech Companies, Software Development Firm, IT services companies, Research Institutions and Lab etc. It is mandatory for the students to seek written approval from the coordinator about the topic and the organization before commencing the Summer Internship. During Summer Internship students are expected to take necessary guidance from the faculty guide allotted by the Institute. To do it effectively they should be in touch with their guide through e-mail or phone. Students must maintain regular reports detailing the work completed, challenges faced, and learning experiences. Students must submit a final report and presentation summarizing the internship experience, project outcomes, and key learnings to guide. The technical specifications for report preparation is as under:

Technical details:

1. The report shall be printed on A-4 size white paper.
2. 12 pt. Times New Roman font shall be used with 1.5-line spacing for typing the report.
3. 1" margin shall be left from all the sides.
4. Considering the environmental issues, students are encouraged to print on both sides of the paper.
5. The report shall be spiral bound as per the standard format of the cover page given by the Institute.
6. The report should include a Certificate (on company's letter head) from the company duly signed by the competent authority with the stamp.
7. The report shall be signed by the respective guide(s) & the Principal of the Institute 10 (Ten) days before the viva-voce examinations.
8. Student should prepare two hard bound copies of the Summer Internship Project Report and submit one copy in the institute. The other copy of the report is to be kept by the student for their record and future references.

Evaluation:

The evaluation of Internship will be done as per the following criteria:

Sr. No.	Evaluation Criteria	Marks
1	Summer Internship Report	50
2	Presentation and Viva-voce examination	50
TOTAL MARKS		100

Students must secure 36% passing marks in both components to qualify for the Certificate.

Internship and Exit:

Any student intending to exit the course must complete the summer internship (Including scoring at least 36% marks in the evaluation) before exit. A student intending to exit shall have to submit an application to Principal through Counsellor before even semester university theory examination. However, any such student desiring to withdraw the exit option may do that before the last paper of theoretical examinations of even semester.

**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**BSc-IT PROGRAMME
(3rd SEMESTER)
AS PER NEP 2020**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

BSc-IT Semester-III

Course Code	Course Name	Theory / Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC201	Introduction to Data Structures	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC202	System Analysis and Design	Theory	50	50	-	-	04	Major Core
CTUC203	Programming the Internet	Practical	-	-	25	25	02	Major Core
CTUS201	(Select any one) 3. Computer Oriented Numerical Methods 4. Computer Oriented Management System	Theory	50	50	-	-	04	SEC
CTUA201	Life Management	Theory	25	25	-	-	02	AEC
	University Elective-I	Practical	-	-	50	50	02	MDC
HSUV201	Creativity, Problem Solving and Innovation	Practical	-	-	25	25	02	VAC

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
 *SEE- Semester -End- Evaluation

University Elective - I

Sr. No.	Course Code	Course Name	Department/Faculty
1		Art of Programming	Engineering
2		Environmental Sustainability & Climate Change	Engineering
3		ICT Resources & Multimedia	Engineering
4		Engineering Drawing	Engineering
5		Fundamentals of Packaging	Pharmacy
6		Basic Laboratory Techniques	Applied Science
7		First Aid & Life Support	Nursing
8		Health Promotion & Fitness	Physiotherapy
9		Banking & Insurance	Management
10		Introduction to MATLAB Programming	Engineering
11		Astrophysics, Space and Cosmos-1	Applied Science
12		SDG Handprint Laboratory	Engineering
13		Python Programming	Engineering
14	CAUD201	Introduction to Web Designing	Computer Science

CTUC201: Fundamentals of Data Structures and Algorithms

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
02	Practical	04	60	40	100
Experiential Learning Components (Theory) : Unit Tests, Assignments, Case Study etc.					
Experiential Learning Components (Practical) : Lab Assignments, Practical Test, VIVA					

Pre-requisite: Foundation of C Programming, Fundamentals of Object Oriented Programming

Methodology, Pedagogy & Andragogy: Theory lectures focus on fundamental concepts of data structures and algorithms, emphasizing the selection of the most efficient structures for various applications. Andragogical principles are integrated to promote self-directed and practical learning for learners. For practical teaching of Data Structures and Algorithms, the approach combines hands-on programming exercises with real-world case studies to reinforce the selection of efficient structures for various applications. This blended method enhances both theoretical understanding and practical skills, ensuring learners can effectively apply concepts in real-world scenarios.

Outline of the course (Theory):

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1.	Principles of Data Structures and Algorithms	06
2.	Arrays and Sequential Data Structures	10
3.	Advanced Dynamic Data Structures	12
4.	Tree Structures and Their Applications	11
5.	Graph Theory and Utilizations	11
6.	Sorting and Searching	10

Total Hours (Theory): 60

Total hours (Practical) : 60

Total Contact Hours : 120

Detail Syllabus:**Unit I: Principles of Data Structures and Algorithms** **Hours 06**

Atomic and composite data, Data type, Data object, Data Structure, Abstract Data type, Types of Data Structures, Introduction to Algorithms, Relationship among Data, Data Structures and Algorithms, Analysis of Algorithms, space and time complexity algorithm

Unit II: Arrays and Sequential Data Structures **Hours 10**

Linear Data Structures using sequential organization, Representation of Stacks using sequential organization, Applications of Stack, Application of Recursion, Concepts of Queues, Realization of Queues using sequential organization, circular queue, Multiqueue, Deque, Priority Queue, Applications of Queue.

Unit III: Advanced Dynamic Data Structures **Hours 12**

Linked list, Comparison of sequential and linked organizations, Dynamic Memory Management, types of link list , Applications of linked list, operation on link list.

Unit IV: Tree Structures and Their Applications **Hours 11**

Basic Terminologies, Definition and concepts, Representation of Binary Tree, Operations on Binary Tree and algorithms, Types of Binary Trees , BTree, B+Tree, ,Red and Black Tree, AVL trees,

Unit V: Graph Theory and Utilizations **Hours 11**

Graph Terminology, Representation of Graph, Operations on Graph, Applications of Graph Structure, minimum spanning tree.

Unit VI: Sorting and Searching **Hours 10**

Sorting Notations and Concepts, Sorting Techniques, Sequential Searching, Binary Searching, Search Trees.

Outline of the Course (Practical):

Week No	Practical	Description
1	Basic of C and C++	foundational concepts in C and C++.
2	Two dimension array	Understand and utilize arrays effectively.
3	Stack	Implement stack operations including push, pop, and peek.
4	Stack and its application	Cover infix, prefix, and postfix notations.
5	Queue and Circular queue	Implement queue operations such as insert, delete, and display.
6	Linear and Binary Search	Apply various searching techniques on arrays.
7	Merge sort, Bubble Sort	Implement and compare different sorting techniques to sort data.
8	Selection sort , Insertion Sort,	
9	Quick sort	
10	Single Link List	Perform insert and delete operations at the beginning, end, and middle of link list data structures.
11		
12	Double Link List	
13		
14	Circular Single Link List	
15	Circular Double Link List	

Total hours: 60

Core Books:

1. Jean-Paul Tremblay, Paul G. Sorenson: An introduction to data structures with applications, 2nd Edition, Tata McGraw Hill Publications, 1991.
2. D. Samanta: Classic Data Structures, 2 Edition, PHI Publications, 2002.

Reference Books:

1. Varsha h. Patil : Data Structures Using C++, 1st Edition, Oxford University Press, 2012.
2. Yashvant Kanethkar : Data structures through C++, 2nd Edition, BPB Publications,2003.
3. Mark Allen Weiss: Data Structures and Algorithm Analysis in C++, 3rd Edition, Pearson Education, 2009.
4. Reema Thareja: Data Structures using C, 1st Edition, Oxford University Press, 2012.

Web References:

1. https://www.cs.auckland.ac.nz/~jmor159/PLDS210/ds_ToC.html [For materials of Data Structures and Algorithms]
2. <http://www.cs.usfca.edu/~galles/visualization/> [For Data Structures Visualization]
3. <https://www.cs.auckland.ac.nz/~jmor159/PLDS210/mst.html> [For Graph Data Structures]
4. <http://interactivepython.org/runestone/static/pythonds/Trees/trees.html> [For Tree Data Structures]
5. https://www.cs.auckland.ac.nz/~jmor159/PLDS210/niemann/s_man.pdf [For Sorting and
 - i. Searching Cookbook]
6. <http://www.cs.princeton.edu/~rs/AlgsDS07/10Hashing.pdf> [For Hashing Materials]
7. <http://nptel.ac.in/video.php?subjectId=106102064> [For Data Structures videos]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Comprehend and convey the essential concepts and importance of data structures and algorithms.
CO2 :	Effectively implement and use array-based and linear data structures.
CO3 :	Analyze and apply advanced dynamic data structures, such as linked lists.
CO4 :	Construct and manipulate various tree data structures, including binary trees and AVL trees.
CO5 :	Use graph theory concepts to solve complex problems and understand real-world applications.
CO6:	Implement and compare various sorting and searching algorithms for optimal performance.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes					
		CO1	CO2	CO3	CO4	CO5	CO6
1	Principles of Data Structures and Algorithms	√					
2	Arrays and Sequential Data Structures		√				
3	Advanced Dynamic Data Structures			√			
4	Tree Structures and Their Applications				√		
5	Graph Theory and Utilizations					√	
6	Sorting and Searching						√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	-	1	3	1	-	-	1	1	2	1
CO2	3	2	3	1	1	3	1	-	-	1	2	2	1
CO3	3	2	3	1	1	3	1	-	-	1	2	2	1
CO4	3	2	3	1	1	3	1	-	-	1	2	2	1
CO5	3	2	3	1	1	3	1	-	-	1	2	2	1
CO6	3	2	3	1	1	3	1			1	3	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC202 : System Analysis and Design

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/ Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components : Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None.

Methodology & Pedagogy: During theory lectures emphasis will be given on understanding of analysing business needs, perform planning and analysis of business system, give examples of how Information Systems are designed and constructed and how major modifications are made to the existing systems.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Basics of Information Systems	08
2	Information Systems Analysis Overview	11
3	Information Gathering and System Requirement specification	11
4	Data flow diagrams and Process Specification	11
5	Overview to Data input and designing output methods	10
6	Implementation and maintenance of information systems	09

Total Hours (Theory): 60

Total Contact Hours:60

Detailed Syllabus:**Unit - I: Basics of Information Systems** **Hours:08**

Types of Information, Understand the concept of System, Need for a Computer-Based Information
System, Management Structure, Management and Information Requirements, Qualities of Information, Examples of Information Systems, Various Functions in Organizations, Varieties of Information Systems.

Unit - II: Information Systems Analysis Overview **Hours: 11**

Overview of Design of an Information System, System Development Life Cycle (SDLC), The Role and Tasks of Systems Analyst, Attributes of a Systems Analyst, Tools Used by Systems Analyst, Approaches to Systems Development.

Unit III: Information Gathering and System Requirement specification **Hours: 11**

Strategy to Gather Information, Information Sources, Methods of Searching for Information,
Interviewing Technique, Questionnaires, Other Methods of Information Search, System Requirements Specification, Data Requirements, steps in Systems Analysis, Modularizing Requirements Specifications, deciding on Project Goals, Examining Alternative Solutions, Evaluating Proposed Solution, Cost-benefit Analysis, Payback Period, Feasibility Report, System Proposal.

Unit IV: Data flow diagrams and Process Specification **Hours: 11**

Symbols Used in DFDs, describing a System with a DFD, Levelling of DFDs, Levelling Rules,
Logical and Physical DFDs, Case Tools to Draw DFD, Process Specification Methods, Structured English, Decision Table Terminology and Development, Extended Entry Decision Tables, Eliminating Redundant Specifications

Unit V: Overview to Data input and designing output methods **Hours: 10**

Data Input, Coding techniques, validating input data, interactive data input, objective of output designing, design of screens and output reports.

Unit VI: Implementation and maintenance of information systems **Hours: 09**

Control in Information Systems, The Objectives of Control, Control Techniques, Audit of Information Systems, Security of Information Systems, designing reliable and

maintainable systems, design of software, software design and documentation tools, managing quality assurance, user training, training methods and conversion.

Core Books:

1. James A Senn: Analysis and Design of Information System, McGraw Hill International, 2003.
2. V. Rajaraman : Analysis and Design of Information Systems, Prentice-Hall of India Private Limited, 2003.
3. Kendall and Kendall: Systems analysis and Design, 5th Edition, Prentice-Hall of India Private Limited, 2003.

Reference Books:

1. Jeffrey L. Whitten, Lonnie D. Bentely and Kevin C. Dittman : Systems Analysis and Design Methods, Tata McGraw Hill Publishing Co. Ltd., 2001.
2. Tuthill and Leavy : Knowledge Based Systems : Managers Perspectives : Tab professional and Reference Books, 1991.

Web references:

1. <http://lecture-notes-forstudents.blogspot.in/2010/04/system-analysis-anddesignsad.html>
2. <http://www.slideshare.net/aroravinay/1-introduction-to-ado-infosys>
3. <http://bcastuff.blogspot.in/p/sad-notes.html#.U6uW-ZzWle>
4. <http://www.eis.mdx.ac.uk/staffpages/geetha/bis2030/DFD.html>
5. <http://faculty.washington.edu/ytan/is460/notes/LN11.pdf>

Course Outcomes: Upon successful completion of the course, students will:

C01	Understand basic concepts of system, types of information, qualities of information and its flow with respect to management structure
C02	Gain knowledge about how the system will develop and guide by well-experienced person in the organization with its documentation.
C03	Learn about various tools used to design flows of data, processes and data stores, performed by users of the system in graphical way.
C04	Understand various designing methods used to solve a problem while taking input and producing output as per given specification.
C05	Gain knowledge about various concepts of system maintenance and conversions

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		C01	C02	C03	C04	C05
1	Basics of Information systems	✓				
2	Information system analysis Overview		✓			
3	Information gathering and System Requirement Specification		✓			
4	Data Flow Diagram and Process specifications			✓		
5	Overview to data input and design output methods				✓	
6	Implementation and maintenance of information systems					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	3	3	2	1	3	2	3	2
CO2	2	2	3	2	3	3	2	2	3	2	3	3	2
CO3	2	2	3	3	1	2	2	1	2	1	1	3	1
CO4	2	2	3	1	2	2	1	1	1	1	1	3	2
CO5	2	2	2	2	1	2	2	1	1	1	1	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC203: Programming the Internet

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/Contact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
02	Practical	04	60	40	100
Experiential Learning Components : Lab Assignments, Practical Test					

Prerequisites: Basic concepts of web.

Methodology, Pedagogy & Andragogy: This course focuses on providing hands-on experience to students for design and develop dynamic and interactive web sites using HTML5, CSS3 and JavaScript.

C. Outline of the Course:

Week No	Practical	Description
1	Basic Construction of an HTML & HTML5 Page, HTML Text Editors, HTML Building blocks. Adding Content: Basic HTML tags - Text formatting tags, heading tags, paragraph tags, division tag, Span tags, Break line tag, Binding space in HTML.	Student can learn basic concepts of web page design. Students get familiar with different tags and attributes which is used to add the text in a web page.
2	Controlling Font size and color, Adding Table – Table tag, grouping and merging table rows and columns. Adding List – ordered, unordered and definition list.	Student can able to change the font styles and color in more attractive way. Also, they can able to display the information in tabular & List format.
3	Adding Image, Adding links - Changing link colors, Email link, Embedding audio and video, Adding Field sets.	Student can add multimedia like image, audio, video in a web page. Student can explore various internal and external linking methods.
4	Adding Form: Form tag, Action, Method. Basic form controls – Textbox, Password field, Radio Button, Checkbox, Multiple line text area, file upload, Various types of buttons – submit, reset, image, simple button.	Student can design the various form elements for interaction with the web page users.
5	HTML5 input elements - Color, Number, Date, Month, week, Time, datetime-local,	Student can apply HTML5 input element to make form more attractive.

	Email, url, range, search,<datalist>, <output>, <progress>, <meter>	
6	Regular expression, HTML5 new attributes - Placeholder, Required, Pattern, Autocomplete, Autofocus, novalidate, formnovalidate, formaction, formmethod, spellcheck, contenteditable.	Student can explore the basic HTML5 new attributes and also apply validation on form submission.
7	CSS Styling the web - Applying CSS Building blocks -CSS Selectors, Cascade & inheritance, CSS Properties, CSS Box model.	Student can apply various types of CSS with its basic properties.
8	Creating Layout - Header, footer, navigation menu, and sub-navigation. Floats, Flexbox, Grids, Positioning, Multiple column layout.	Student can create different layout using semantic elements of HTML5 & CSS classification properties.
9	Creating Image Gallery and Animation - 2D/3D Transformation, Transitions and Animation, CSS Media query	Student can create layout image gallery & animation.
10	JavaScript - Adding Internal & External JavaScript, Working with variables, datatype - Number, String, Boolean.	Student can write script for basic programs using condition, Loop.
11	datatype -Array, Object, Operators, Conditional statements, Looping statements	Student can write script for basic programs using array and object.
12	Adding Dialog boxes in HTML page – Alert, Confirm and Prompt. Creating user defined function.	Student can able to use in-build and user defined functions of JavaScript
13	Adding Mouse and Keyboard Event in HTML page, Manipulating String and Date.	Students can make user interaction using various Events
14	JavaScript Document Object Model hierarchy - Create find and manipulate HTML Element using Objects and methods	Student can explore the DOM Hierarchy.
15	Form validation, Applying Style using JavaScript. Creating New window, Accessing & manipulating History of HTML Pages.	Student can apply various objects to make web page dynamic with user interactions.

Total hours: 60

❖ **Text Books:**

1. Matthew MacDonald: HTML5 The Missing Manual, O'Reilly Media, August 2011.
2. Peter Gasston: The Book of CSS3, A Developer's Guide to the Future of Web Design, No Starch Press, April 2011.

3. Richard York: Beginning CSS Cascading Style sheets for Web Design, Wrox Press (Wiley Publishing), 2005.

Reference Books:

1. Ivan Bayros : Web Enabled Commercial Application Development using HTML, JavaScript, DHTML and PHP, fourth revised edition , BPB Publication.
2. David Mc Farland : CSS The Missing Manual, O'Reilly, 2006.
3. Julie C. Meloni : HTML, CSS and JavaScript All in One, Pearson.

Web References:

1. <http://www.tutorialspoint.com/html5> [For notes on HTML5 tags]
2. <http://www.w3schools.com/html/> [For HTML5, CSS and JavaScript notes and examples]
3. <https://in.godaddy.com/help/dreamweaver-cs6-publish-your-website-7811>[Publish your website using Dreamweaver]
4. <http://fullbooksfreedownload.blogspot.in/2016/02/html-css-javascript-web-publishing-in.html> [Book :- HTML, CSS & JavaScript Web Publishing in One Hour a Day, Sams Teach Yourself, 7th Edition PDF]

Course Outcome: Upon successful completion of the course, student will:

C01:	Able to understand basic construction of HTML & HTML5 document and started using basic tags.
C02:	Able to understand the implementation of HTML tags and able to create HTML static Web pages.
C03:	Able to use basic properties of CSS and CSS3 in html file and Able to create HTML, CSS layout.
C04:	Able to write client side script – JavaScript to perform basic program.
C05:	Able to use DOM objects for dynamic web pages.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	-	2	-	-	-	2	-	1	1
CO2	3	2	2	1	-	2	-	-	-	2	-	1	1
CO3	3	3	3	1	-	2	-	-	-	2	-	2	1
CO4	3	3	2	1	-	2	-	-	-	2	-	2	1
CO5	3	3	2	1	-	2	-	-	-	2	-	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUS201: Computer Oriented Numerical Methods

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components : Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: The course covers key topics like finding roots of equations, solving linear equations, interpolation, and solving differential equations. Teaching includes lectures, interactive problem-solving, and project-based assessments with continuous feedback. The focus is on practical applications and real-world problems, using flexible and engaging teaching methods. The aim is to make the content relevant and useful for students' careers and interests.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Numerical Methods	08
2	Interpolation	09
3	Numerical Integration and Differentiation	10
4	Solution of Linear Equation	12
5	Solution of Differential Equations	11
6	Solution of Partial Differential Equations	10

Total Hours (Theory): 60
Total Contact Hours: 60

Detailed Syllabus:**Unit - I: Numerical Methods** **Hours: 08**

Introduction to Numerical Methods, Various methods such as Bisection, False-Position and Newton Raphson methods, Graffes Root Squaring Method, Convergence of Solution

Unit - II: Interpolation **Hours:09**

What is an interpolation, Difference tables, Newton forward and backward Interpolation formula, Lagrange's formula, Newton's Divided Difference Formula

Unit - III: Numerical Integration and Differentiation **Hours:10**

Numerical Integration, Trapezoidal rule, Differentiating Continuous function (Two point and Three-point formula), Tabulated function and its maxima and minima, Newton-Cote's Formula.

Unit - IV: Solution of Linear Equation **Hours:12**

Solution of Linear Equation, Gauss-Jordan Elimination methods, Gauss - Seidal and Gauss Jacobi Interactive methods

Unit - V: D Solution of Ordinary Differential Equations **Hours:11**

Solution of Ordinary Differential Equations, Taylor Series and Euler Methods, Runge-Kutta Methods.

Unit - VI: Solution of Partial Differential Equations: **Hours:10**

Review and examples of partial differential equations, classification of partial differential equations, Difference equation, Laplace's equation and Poisson's equation.

Core Books:

1. D. N. Datta: Computer Oriented Numerical Methods, Vikas Pub. House, 2012.
2. S.S. Sastry : Introductory methods of Numerical Analysis, Prentice Hall of India,4th edition 2006

Reference Books:

1. V. Rajaraman Computer Oriented Numerical Methods, 3rd Edition, Prentice-Hall of India Pvt.Ltd, 3 rd edition, 2016
2. M. Ray, Har Swarup Sharma, Sanjay Chaudhary: Mathematical Statistics, Ram Prasad and sons, 11th edition
3. B S Grewal: Numerical Methods In Engineering & Science (With Programs In C, C++ And MATLAB), Khanna Publishers, 10th edition, 2014

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Able to use Numerical methods in computer technology
CO2 :	To learn Interpolation
CO3 :	To Learn the concepts of Numerical Integration and Numerical Differentiation
CO4 :	To understand linear equations
CO5 :	To learn techniques to solve ordinary differential and partial differential equations

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Numerical Methods	✓				
2	Interpolation		✓			
3	Numerical Integration and Differentiation			✓		
4	Solution of Linear Equation				✓	
5	Solution of Differential Equations					✓
6	Solution of Partial Differential Equations					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	-	2	-	-	-	2	-	2	1
CO2	3	3	2	1	-	2	-	-	-	2	-	2	1
CO3	3	3	2	1	-	2	-	-	-	2	-	2	1
CO4	3	3	2	1	-	2	-	-	-	2	-	2	1
CO5	3	3	2	1	-	2	-	-	-	2	-	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUS202: Computer Oriented Management System

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components : Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: The theory sessions will emphasize real-time systems. To enhance comprehension, we will provide illustrations using actual data across various systems. The sessions will meticulously explain the system's functionality through detailed flow descriptions. To bridge the gap between theoretical knowledge and practical application, we have to schedule industrial visits. These visits are designed to offer students a tangible correlation between their studies and real-world practices. Students should be assigned case studies to facilitate the practical application of their acquired knowledge. These case studies aim to deepen understanding and foster the ability to apply theoretical concepts to real-world scenario.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Basics of Information System	09
2	Architecture and Design of Information System	08
3	Transaction Processing System	09
4	Management Information System	06
5	Decision Support System & Executive Support System	18
6	Introduction to ERP and trending technologies	10

Total Hours (Theory): 60

Total Contact Hours:60

Detail Syllabus:**Unit I : Basics of Information System** **Hours 09**

Role of data and information, Types of Systems, Types of information, Quality of Information, what is an Information System, Functions of Information System, classification of an Information System, Major Types of Information Systems, Interrelationship of Information Systems.

Unit II : Architecture and Design of Information System **Hours 08**

Meaning of Architecture, development and maintenance of information system, centralized and decentralized systems, factors of success and failure in information system and risk involved with information system.

Unit III : Transaction Processing System **Hours 09**

Introduction of Transaction Processing System (TPS), Transaction Processing System (TPS) Architecture, Transaction Processing System (TPS) Life cycle, Methods of Transaction Processing System (TPS), Information System Availability Control, Illustrations and live demonstration of TPS such as Banking System, Railway reservation system etc.

Unit IV : Management Information System **Hours 06**

Introduction to Management: Approaches of Management, Function of Management, System from Functional Perspective, Reports of Management Information System, A business perspective of MIS, Dimensions of MIS, contemporary Approaches to Information System.

Unit V : Decision Support System and Executive Support System **Hours 18**

Business value of Improved Decision making, Types of Decision, Decision making Process, The difference between MIS and DSS, Components of DSS, System for Decision Support Group Decision Support System, Business value of GDSS. Important Dimensions of knowledge, Organizational learning and Knowledge Management, The Knowledge Management value chain, Overview of different types of Knowledge Management Systems, Characteristics of ESS, The Role of ESS in the Firm, Business value of ESS, Monitoring Corporate Performance, Working Examples of ESS.

Unit VI : Introduction to ERP and trending technologies **Hours 10**

An overview of ERP, Basic ERP Concepts, Risk and Benefits of ERP, ERP and related technologies, Business Intelligence, Some case studies on ERP or Information system.

Core Books:

1. K. C. Laudon and J. P. Laudon: Management Information Systems, 12th Edition, Pearson Education.
2. Alexis Leon: ERP Demystified, Second Edition, Tata McGraw-Hill.

Reference Books:

1. W.S. Jawadekar: Management Information Systems, 2nd Edition, Tata McGraw-Hill.

Web References:

1. <http://www.slideshare.net/NorazilaMat1/laudon-mis12-ppt01-16595885> [Function of Information system, A business perspective of MIS, Dimensions of MIS, Contemporary Approaches to Information System]
2. <http://www.uh.edu/~mrana/try.htm> [Types and Functions of Information system]
3. <http://bisom.uncc.edu/courses/info2130/Topics/istypes.htm> [Types of Information system]
4. <http://kalyan-city.blogspot.com/2011/05/levels-of-management-top-middle-and.html> [classification of information system]
5. <http://my.safaribooksonline.com/book/management/9780470916803/operational-planning-and-control-systems/management levels comma functions comm> [classification of information system]
6. <http://ambarwati.dosen.narotama.ac.id/files/2011/05/FIS-2011-w2.pdf> [Transaction processing system]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	To understand basic of data & information, types of information system, function of information system and its quality.
CO2 :	To understand designing and architecture of information system
CO3 :	To understand transaction processing concepts and its working.
CO4 :	Learning Management Information system, its types and its implementation. To gain understanding of Decision Support Systems.
CO5 :	To learn Knowledge Management, Executive Support Systems, ERP and its technology.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Basics of Information System	√				
2	Architecture and Design of Information System		√			
3	Transaction Processing System			√		
4	Management Information System				√	
5	Decision Support System & Executive Support System				√	
6	Introduction to ERP and trending technologies					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	1	3	1	-	3	-	1	2	3	3	-	1	1
CO2	1	3	1	-	2	1	-	2	3	3	2	-	1
CO3	1	3	1	1	3	3	-	2	3	3	-	-	1
CO4	1	2	1	-	2	3	1	2	2	2	1	1	1
CO5	1	3	1	-	3	3	-	1	3	3	1	-	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUA201: Life Management

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	02	30	25	55
Experiential Learning Components : Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: During theory lectures the emphasis will be given on the fundamentals of life management. Students will be introduced life styles and its basic, time management, work efficiency, yoga, physical health management, stress and mental health management, and personality skills. Students will give experimental learning exposure in form of assignment and case study.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Life Style and its Basics	06
2	Work Efficiency	04
3	Personality Skills	06
4	Time Management for students	05
5	Physical health management	04
6	Stress and mental health management	05

Total Hours (Theory):30
Total Contact Hours:30

Detail Syllabus:**Unit I : Life Style and its Basics** **Hours 06**

Purpose of life and its dimensions, Importance of Self-Evaluation; (Daily routine, Food habits, Dressing Sense, Habit formation, Company, Etiquettes), Duties and Commitment of Self, Family and Society, Adjustment with Self and Environment

Unit II : Work Efficiency **Hours 04**

Positive way of thinking, Tools & techniques for Positive thinking, Karma and Karma Phal Sidhanta, Behavioural Skill

Unit III : Personality Skills **Hours 06**

Self-Assessment Techniques, Adjustment Skills, Art of Positive Thinking, Developing Self Confidence,

Unit IV : Time Management for students **Hours 05**

Importance, Steps, Barriers and solutions of Time Management, Reading and Writing Skill, Making Notes and Conceptual Clarity of Subject topic.

Unit V : Physical health management **Hours 04**

Importance of physical health and exercise, importance of yoga, physical problems, exercise for health improvements

Unit VI : Stress and mental health management **Hours 05**

Importance of mental health, spirituality, improving concentration, importance of Dhyan, Memory problem and Memory Boosting techniques, causes and effects of stress, importance of Prathana, Upasna, Sadhna, and Aradhna

Core Books:

1. Time Management, McGraw-Hill, 2003
2. How To Manage Your Life, Vishal Tatwaved, 2012.

Reference Books:

1. Living Stress Free - The Secret of How to Manage Stress and Live Life Fully, Sonali Perera, SP MEDIA MARKETING.
2. TIME MANAGEMENT, BRIAN TRACY, American Management Association, 2013.

Web References:

1. Life management: a holistic approach to make the most of your life, Dr. Hannah Rose <https://nesslabs.com/life-management>
2. Life Management, <https://www.sciencedirect.com/topics/computer-science/life-management>
3. <https://edynamicilearning.com/course/health-1-life-management-skills/>

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Students will learn basics of life managements
CO2 :	The students will be familiar with various styles
CO3 :	Students will get the knowledge of time management and stress management
CO4 :	Students will get various aspects of physical and mental health
CO5 :	They will be able to develop personality and good habits

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Life Style and its Basics	√				
2	Work Efficiency		√			
3	Personality Skills					√
4	Time Management for students			√		
5	Physical health management				√	
6	Stress and mental health management				√	

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	3	1	-	3	-	1	2	3	3	-	1	1
CO2	1	3	1	-	3	1	-	1	3	3	1	-	1
CO3	1	3	1	1	3	3	-	2	3	3	-	-	1
CO4	1	2	1	-	2	3	1	2	2	2	1	1	1
CO5	1	3	1	-	3	3	-	1	3	3	1	-	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

**TEACHING SCHEME &
DETAILED SYLLABUS**

FOR

**BSc-IT PROGRAMME
(4th SEMESTER)
AS PER NEP 2020**

**EFFECTIVE FROM
ACADEMIC YEAR 2024-25**

B.Sc. (IT) Semester-IV

Course Code	Course Name	Theory / Practical/ Others	Marks (Theory)		Marks (Practical)		Credit	NEP -2020 Classification
			CCE	SEE	CCE	SEE		
CTUC204	Fundamentals of Operating Systems	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUC205	Fundamentals of Visual Programming	Theory and Practical	50	50	25	25	06 (04-Theory) (02-Practical)	Major Core
CTUE201	(Select any one) 3. Introduction to Artificial Intelligence 4. Computer Network Security	Theory	50	50	-	-	04	Minor
CTUA202	Social Media and Blog Writing	Practical	-	-	25	25	02	AEC
	University Elective-II	Practical	-	-	50	50	02	MDC
HSUV203	Indian Knowledge System	Practical	-	-	25	25	02	VAC
CAUT201	Summer Internship and Viva - II	VIVA	-	-	50	50	04	Exit Course

*CCE- Continuous and Comprehensive Evaluation (Assignments, Unit Tests, Sessional Test, Case Study, Attendance, Practical Test, Viva etc.)
 *SEE- Semester -End- Evaluation

University Elective - II			
Sr. No.	Course Code	Course Name	Department/Faculty
1		Prototyping Electronics with Arduino	Engineering
2		Web Designing	Engineering
3		Basics of Environmental Impact Assessment	Engineering
4		Internet Technology & Web Design	Engineering
5		Material Science	Engineering
6		Cosmetics in Daily Life	Pharmacy
7		Life Style Diseases & Management	Nursing
8		Occupational Health & Ergonomics	Physiotherapy
9		Health Care Management	Management
10		Astrophysics, Space and Cosmos-2	Applied Science
11		MATLAB Programming	Engineering
12		Maintenance of Household Apparatus	Engineering
13	CAUD202	Programming the Internet	Computer Science

CTUC204 : Fundamentals of Operating Systems

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
02	Practical	04	60	40	100
Experiential Learning Components (Theory) : Unit Tests, Assignments, Case Study etc.					
Experiential Learning Components (Practical) : Lab Assignments, Practical Test, VIVA					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: In order to achieve the course objectives, students will be introduced to the basic operating system concepts and basic functions. Students will be offered appropriate case studies in order to provide actual exposure to theoretical operating system ideas. During the practical session, student will commence the learning from MS-DOS commands in windows environment. The student will also get hands on working with basic Linux commands. Finally using base of Linux commands, shell scripts would be written to demonstrate operating system programming.

Outline of the course (Theory):

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Operating System Fundamentals	09
2	Memory Management	11
3	Processor Management	11
4	Device Management	11
5	File Management	10
6	Introduction to Shell Script	09

Total Hours (Theory): 60
Total hours (Practical): 60
Total Contact Hours: 120

Detail Syllabus:**Unit I: Operating System Fundamentals Hours 09**

What is an operating system, Brief history of an operating system, Pyramid structure of an operating system, Operating system hardware and software, Evolution of an operating system, types of operating system, Batch system, Interactive system, Real time system, Hybrid system, Shell, compiler, assembler, interpreter.

Unit II: Memory Management Hours 11

Memory management of early system, Fixed partition, Dynamic partition, Re-locatable dynamic partition, Best fit and first fit allocation method, De-allocation, Paged memory allocation, Demand paging allocation, segmented memory allocation, Virtual memory, cache memory, Associative memory, Page replacement policies.

Unit III: Processor Management Hours 11

What is job and Process, Multiprogramming concept, Process scheduler, Job scheduler, various process states, Thread control, Process Control Block (PCB), Processor scheduling policies, FCFS, SJN, SRT, RR, EDF, Multiple level queues.

Unit IV: Device Management Hours 11

Meaning, Depreciation of money, Monetary inflation concepts, types of inflation, Causes and effect of inflation different sectors of the economy, Causes of Inflation, Advantages, Formula and Disadvantages of inflation.

Unit V: File Management Hours 10

Fundamentals of File management, File naming conventions, Fixed length and variable length records, Physical file organization, Physical storage allocation, File access methods, File control matrix, File compression.

Unit VI: Introduction to Shell Script Hours 09

Shell Script, Shell environment, Making Script interactive, Command Line Argument, Evaluating Expression, Operator, Control Statement, Looping statement.

Outline of the Course (Practical):

Week No	Practical	Description
1	Disk operating system -Commands	Introduction to MS DOS environment with basic commands
2	Introduction to Linux Editor	Introduction to Cygwin as Linux Editor along with its usage
3	Linux Operating System-Commands	Using basic commands of Linux
4	Linux Operating System-Advanced Commands	Implementation of advanced Linux commands used in industry
5	Vi editor-Create Text file	Practice of writing and modifying various files in Vi editor
6	Introduction of Shell Programming-Create .sh file and Execute file	Creating simple shell script to get introduced with operating system programming
7	Variable and Rules for variable	Creating and using variables, and constants in shell scripts
8	Interactive Shell Script, Working with Command Line Arguments	Practicing shell scripts which are responsive to the user input
9	Working with expression	Arithmetic expressions in shell script
10	Conditional statement-IF, Working with Operator	Learning conditional statements such as if, elif, case. Using arithmetic, relational, and logical operators.
11	Looping Statement-While	Writing shell scripts with while loops with real life examples
12	Looping Statement-Until, For	Writing shell scripts with until and for loops with real life examples
Total hours: 60		

Core Books:

1. Ann McIver McHoes, Ida M Flynn: Understanding Operating System, 7 Edition, Cengage Learning, 2014.
2. William Stallings: Operating Systems Internals and Design Principles, 5th Edition, PHI, 2005.
3. Sumitabha Das: Unix concepts & application, 4th Edition, Tata McGraw Hill, 2010.
4. Kenneth Rosen, Douglas Host, James Farber and Richard Rosinski: The Complete Reference, Tata McGraw Hill, 1999.
5. Christopher Negus: Linux Bible, 10th Edition, Wiley, 2020.

Reference Books:

1. Silberschatz: Operating System Concepts, 5th Edition, John Wiley & Sons (ASIA) Ltd., 2008.
2. Mark G. Sobell: A Practical Guide to Linux, Pearson Education, 1997.
3. KJ. George, Operating System Concepts and Principles, Sroff Publishers, 2003.

Web References:

1. <https://study.com/learn/operating-system.html> [Operating System Video Lessons]
2. <https://www.studytonight.com/operating-system/> [Operating System Tutorial]
3. <http://www.ics.uci.edu/~ics/43/lectures.html> [Lecture notes of OS]
4. <http://www.tutorialspoint.com/unix/index.htm> [Unix Tutorials]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	To understand the fundamental concepts of an operating System
CO2 :	To understand memory allocation and de-allocation methods
CO3 :	To study fundamentals of processor and its scheduling policies
CO4 :	To study various supported device and file access technologies
CO5 :	To understand the commands of disk operating system, Linux operating system and Learning basic shell programming.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Operating System Fundamentals	✓				
2	Memory Management		✓			
3	Processor Management			✓		
4	Device Management				✓	
5	File Management				✓	
6	Introduction to Shell Script					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	1	1	2	2	-	2	2	-	1	1	-	3	2
C02	3	2	2	2	-	2	2	-	1	1	-	3	2
C03	3	2	2	2	-	2	2	-	1	1	-	3	2
C04	3	2	2	2	-	2	2	-	1	1	-	3	2
C05	2	2	3	3	-	2	3	-	1	1	-	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUC205 : Fundamentals of Visual Programming

Credit	Component	Instruction/Contact Hours (Per Week)	Instruction/Contact Hours (Per Course)	Experiential Learning Hours (Per Course)	Total Notional Hours
04	Theory	04	60	50	110
02	Practical	04	60	40	100
Experiential Learning Components (Theory) : Unit Tests, Assignments, Case Study etc.					
Experiential Learning Components (Practical) : Lab Assignments, Practical Test, VIVA					

Pre-requisite: Basic knowledge of C & C++ programming language.

Methodology, Pedagogy & Andragogy: During theory lectures illustrations emphasizing the need for advanced features of .Net framework and to develop windows and web-based application using C# language will be given. During practical sessions, students will actively engage in developing both desktop and web applications, applying the concepts discussed in lectures as well as will explore various features of Visual Studio and .NET.

Outline of the course (Theory):

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1.	Introduction to .NET framework	09
2.	Basics of Object Oriented programming using C#	11
3.	Building desktop application	11
4.	Web programming fundamentals	10
5.	Database connectivity through ADO.NET	11
6.	Building WPF application	08

Total Hours (Theory): 60

Total hours (Practical): 60

Total Contact Hours:120

Detail Syllabus:**Unit I: Introduction to .NET framework** **Hours 09**

Introducing .NET Framework, .NET Framework Component, .NET Framework Version Compatibility, Core of .NET Framework: Application Services, Base Class Library and CLR, Types of Applications which can be developed using MS.NET, MS.NET Base Class Library, MS.NET Namespaces, The Common Language Runtime (CLR), Managed Code, MS.NET Memory Management / Garbage Collection, Common Type System (CTS), Common Language Specification (CLS), Types of JIT Compilers

Unit II: Basics of Object-Oriented programming using C# **Hours 11**

Overview of Object-Oriented Programming, Principles of Object Orientation programming: Encapsulation, inheritance, polymorphism, Object, Defining Properties, Using Auto- Implemented Properties, Defining Methods, Understanding Constructors, Extending .NET Classes via Inheritance, Defining and Implementing Interfaces, Understanding the Role of Interfaces in .NET. C# Datatypes & Variables Declaration, Implicit and Explicit Casting, Checked and Unchecked Blocks –Overflow Checks, Casting between other datatypes, Boxing and Unboxing, Enum and Constant, Operators, Control Statements, Working with Arrays, C# Application Basics: Command line and VS.NET compilation.

Unit III: Building desktop application **Hours 11**

Building Windows Forms Applications, Setting Form Properties, Understanding the Life-cycle of a Form, Using the Windows Forms Designer, MessageBox Class and .config File, Working with Windows Forms Controls: TextBox, Button, Selection, List, Container, Image, ErrorProvider, TooltipProvider, etc. Handling Events: Understanding the Event-Driven Programming Model, Writing Event Handlers, Sharing Event Handlers.

Unit IV: Web programming fundamentals **Hours 10**

Basic of Http Request and Http Response. o Understand form Tag and Comparison between Get and Post. ASP.NET Page Life Cycle. Structure of an ASP.NET Page: ASPX Page, Code behind File, WebConfig and machine config, Rich Web Control, Validation Controls, Concept of custom control.

Unit V: Database connectivity through ADO.NET **Hours 11**

Evolution of ADO.NET, Understanding the ADO.NET Object Model, Connected vs. Disconnected Access, Use of Connection, Command, DataReader, DataAdapter and Dataset class.

Unit VI: Building WPF application **Hours 08**

Overview of WPF, Features of WPF, Windows Forms vs WPF, Introduction to XAML, WPF Layout: Grid Panel, Stack Panel, Dock Panel, Wrap Panel and Canvas Panel, WPF Controls: TextBlock, PasswordBox, ListBox, Slider, Popup, Menus and Expander

Outline of the Course (Practical):

Week No	Practical	Description
1	Basics of Visual Studio IDE and .NET Introduction	Getting familiar with Visual Studio IDE and basic programming structure of C#.
2	Simple C# Programs	Writing basic C# programs, understanding syntax, and compiling with Visual Studio.
3	Console Applications	Developing console-based applications, using input and output statements, and understanding the main method.
4	Object-Oriented Programming Concepts	Implementing encapsulation, inheritance, and polymorphism in C#.
5	Control Statements and Arrays	Using operators, control statements, and working with arrays in C#.
6	Building Windows Forms Applications	Working with TextBox, Button, and other common controls in Windows Forms.
7		
8		
9	Event Handling in Windows Forms	Understanding event-driven programming and writing event handlers.
10	Basics of ASP.NET	Understanding HTTP requests and responses, and creating a simple ASP.NET page.
11		
12	Database Connectivity with ADO.NET	Connecting to a database, executing commands, and retrieving data using ADO.NET.
13		
14	A Fully Windows Form Application	Designing and implementing a complete Windows Forms application, integrating various controls, handling events, and database connectivity.
15	Building a WPF Application	Creating a basic WPF application.

Total hours: 60

Core Books:

1. Christian Nagel : Professionals C# and .NET 2021 Edition , Wiley – India, WROX
2. Albahani Josheph: C# 4.0 Pocket Reference, Shroff publication,2010.

Reference Books:

1. Jon Skeet, C# in Depth, Managing Publication,2010
2. Drayton David: C# Language Pocket Reference, Shroff publication,2005

Web References:

1. <http://csharp.net-informations.com/> [to learn C# and .NET fundamentals]
2. <http://www.wptutorial.net/> [to learn WPF]
3. https://dotnet.microsoft.com/en-us/learn/csharp_tutorial_and_videos_to_learn_C%23
4. <https://dotnettutorials.net/course/csharp-dot-net-tutorials/>
5. <https://www.javatpoint.com/c-sharp-tutorial>

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Understanding .NET Framework core features and Components.
CO2 :	To develop object oriented programming skills using C#.
CO3 :	To develop windows and web based application using core feature of .NET framework and C# language
CO4 :	Access and manipulate data in a Microsoft SQL Server database by using MicrosoftADO.NET.
CO5 :	Use modern approach to build windows based application using WPF

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to .NET framework	✓				
2	Basics of Object Oriented programming using C#		✓			
3	Building desktop application			✓		
4	Web programming fundamentals			✓		
5	Database connectivity through ADO.NET				✓	
6	Building WPF application					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	3	-	2	1	-	-	1	1	2	-
CO2	2	3	2	2	-	3	2	-	-	2	-	1	-
CO3	2	3	3	2	-	2	2	-	-	2	1	2	1
CO4	2	3	3	2	-	3	3	-	-	2	2	2	1
CO5	-	3	3	-	-	-	-	-	-	-	1	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE201 : Artificial Intelligence (AI) Fundamentals

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components : Unit Tests, Assignments, Case Study etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: The theory sessions will be focused on basics of Artificial Intelligence, problem solving paradigms, and search strategies. Areas of application such as Expert Systems, Software Agents, knowledge representation, natural language processing, expert systems, robotics will be explored.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Artificial Intelligence	08
2	Problem-solving by Search and constraint satisfaction	11
3	Knowledge representation and reasoning	11
4	Expert Systems	11
5	Agents	10
6	Introduction to AI Techniques and Application Areas	09

Total Hours (Theory): 60

Total Contact Hours:60

Detail Syllabus:**Unit I: Introduction to Artificial Intelligence Hours 08**

Concepts and definitions of Artificial Intelligence (AI) – Brief history of AI – AI and related fields – The AI problems and underlying assumptions, AI approaches: Cognitive Science, Turing Test.

Unit II: Problem solving by Search and constraint satisfaction Hours 11

Problem spaces; brute-force search; best-first search; two-player games; constraint satisfaction

Unit III: Knowledge representation and reasoning Hours 11

Review of propositional and predicate logic; resolution and theorem proving; non-monotonic inference; probabilistic reasoning; Bayes theorem, reasoning under uncertainty.

Unit IV: Expert Systems Hours 11

Introduction – Representing and using domain knowledge – Knowledge acquisition and representation – General structure of Expert Systems – Expert System Shell – Advantages and disadvantages of Expert Systems, Applications of Expert Systems

Unit V: Agents Hours 10

Definition of agents; successful applications and state-of-the-art agent-based systems; software agents, personal assistants, and information access; multi-agent systems.

Unit VI: Introduction to AI Techniques and Application Areas Hours 09

Introduction to fuzzy logic – Introduction to various application areas of AI like Natural Language Processing (NLP), Learning, Speech Recognition, Computer Vision, Game Playing, Robotics.

Core Books:

1. Norvig, Peter, *Paradigms of AI Programming*, Morgan Kauffman, 1992.
2. S. Russell and P. Norvig, *Modern Approach to Artificial Intelligence*, Prentice Hall of India Ltd., 2006.
3. Rich & Knight, *Artificial Intelligence*, 2nd edition, TMH, 1991.

Reference Books:

1. R.Akerkar and P. S. Sajja, Knowledge-Based Systems, Jones and Bartlettes, MIT, 2010.
2. George Luger, Artificial Intelligence, 5th Edition, Addison Wesley, 2004.

Web References:

1. http://www.tutorialspoint.com/artificial_intelligence/ [Basics of AI]
2. <http://intelligence.worldofcomputing.net/ai-branches/expert-systems.html> [Expert Systems]
3. <http://pages.cs.wisc.edu/~bolo/shipyard/neural/local.html> [Neural Network]

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	To understand basic problems of AI and history of AI.
CO2 :	Getting deep knowledge of searching algorithms and its applications in AI.
CO3 :	Learning Knowledge Representation and reasoning techniques.
CO4 :	To gain understanding Expert System and Agent Based Systems.
CO5 :	To explore various application areas of AI.

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Artificial Intelligence	✓				
2	Problem solving Search and constraint satisfaction		✓			
3	Knowledge representation and reasoning			✓		
4	Expert Systems				✓	
5	Agents				✓	
6	Introduction to AI Techniques and Application Areas					✓

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	PSO1	PSO2
C01	-	2	2	2	1	-	-	-	-	-	-	1	2
C02	3	2	2	3	2	2	-	3	-	-	-	2	2
C03	-	-	3	3	2	-	-	-	-	-	-	1	-
C04	3	2	2	-	2	2	-	3	-	-	-	1	2
C05	2	-	-	-	2	-	3	3	-	-	-	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUE202: Computer Network Security

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/C ontact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
04	Theory	04	60	50	110
Experiential Learning Components: Unit Tests, Assignments, Case Study, Certification courses, etc.					

Pre-requisite: None

Methodology, Pedagogy & Andragogy: The methodology for teaching Computer Network and Security involves a hybrid approach that blends theoretical knowledge with practical application, catering to both novice and experienced learners through pedagogy and andragogy. This includes the use of multimedia resources, simulations, and hands-on exercises to facilitate understanding. Andragogically, the course engages adult learners by emphasizing problem-based learning, real-world case studies, and collaborative projects that draw on learners' prior knowledge and professional experiences. This approach ensures learners can critically analyze and apply security measures in complex networking environments, adapt to emerging threats, and design secure network infrastructures.

Outline of the course:

Unit Number	Title of the Unit	Minimum Number of Theory Hours
1	Introduction to Computer Network Security	07
2	Symmetric Ciphers	11
3	Public Key Cryptography	12
4	Authentication and Authorization	11
5	Network Security	10
6	Web Security	09

**Total Hours(Theory):60
Total Contact Hours:60**

Detail Syllabus:**Unit I: Introduction to Computer Network Security** **Hours 07**

Need for Security, Security Attacks, Services and Mechanisms, Network Security, Models

Unit II: Symmetric Ciphers **Hours 11**

Substitution & Transposition Techniques, Block Cipher, DES, Triple DES, Stream Ciphers, RC4

Unit III: Public Key Cryptography **Hours 12**

Need and Principles of Public Key Cryptosystems, RSA Algorithm, Key Distribution and Management

Diffie-Hellman Key Exchange, Digital Signatures

Unit IV: Authentication and Authorization **Hours 11**

Authentication Requirements, Message Authentication Codes, Hashes, MD5 & SHA, User Authentication: Password, Certificate based & Biometric Authentication 6. Kerberos

Unit V: Network Security **Hours 10**

Firewalls, IP Security , VPN, Intrusion Detection , SSL, TLS

Unit VI: Web Security **Hours 09**

Web Security, Security Principles (CIA Triad: Confidentiality, Integrity, Availability), Vulnerability Scanning (e.g., OWASP ZAP, Burp Suite), Content Security Policy (CSP)

Core Books:

1. Kizza JM. Computer network security. Springer Science & Business Media; 2005 Apr 7.
2. Wang J. Computer network security. Berlin/Heidelberg, Germany: Springer; 2009.

Reference Books:

1. Buchmann J. Introduction to cryptography. New York: Springer; 2004 May.
2. Delfs, H., Knebl, H., & Knebl, H. (2002). *Introduction to cryptography* (Vol. 2). Heidelberg: Springer.

3. Garfinkel S, Spafford G. Web security, privacy & commerce. " O'Reilly Media, Inc."; 2002.
4. Garfinkel, Simson, and Gene Spafford. *Web security & commerce*. Cambridge, MA: O'reilly, 1997.

Web References:

1. https://www.cisco.com/c/en_in/products/security/what-is-network-security.html
2. <https://www.javatpoint.com/computer-network-security>
3. <https://tndalu.ac.in/econtent/9 Computer Network And Network Security.pdf>

Course Outcomes: Upon successful completion of the course, students will be,

CO1 :	Develop Concept of Security needed in Communication of data through computers and networks along with Various Possible Attacks
CO2 :	Understand Various Encryption mechanisms for secure transmission of data and management of key required for encryption
CO3 :	Understand authentication requirements and study various authentication mechanisms
CO4 :	Understand network security concepts and study different Web security mechanisms.
CO5 :	Understand web security concepts

Course Outcomes Mapping:

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Introduction to Computer Network Security	√				
2	Symmetric Ciphers		√			
3	Public Key Cryptography			√		
4	Authentication and Authorization				√	
5	Network Security					√
6	Web Security					√

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	1	-	2	1	-	-	1	-	2	2	2
CO2	1	2	2	2	3	1	-	-	1	1	2	2	2
CO3	1	2	2	2	2	2	1	-	1	-	2	2	2
CO4	2	2	2	2	3	3	2	-	2	1	3	3	3
CO5	1	2	2	1	2	2	1	-	1	1	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUA202: Social Media and BLOG Writing

Credit	Component	Instruction/Contact Hours(Per Week)	Instruction/Contact Hours(Per Course)	Experiential Learning Hours(Per Course)	Total Notional Hours
02	Practical	04	60	40	100
Experiential Learning Components : Lab Assignments, Practical Test, VIVA					

Prerequisites: None.

Methodology, Pedagogy & Andragogy: This course focuses on providing hands-on experience to students for understanding social media marketing strategies and BLOG writing skills.

Outline of the Course:

Week No	Practical	Description
1	Introduction to Social Media <ul style="list-style-type: none"> • Platforms for social media marketing • Roles of social media in digital marketing 	Learn basics of Social Media
2	Optimizing for Social Media Platforms <ul style="list-style-type: none"> • Facebook • Instagram • X (formerly Twitter) 	Learn about various social media platforms and optimizing for them.
3	Content Calendar for Social Media <ul style="list-style-type: none"> • Creating content calendar with different focus 	
4	Content creation and Management in Meta Business Suite <ul style="list-style-type: none"> • Understanding and Managing Meta Business Suite 	Understanding Search Engine Result Page, and learn about On-the-Page and Off-the-Page Optimization
5	Paid Marketing in Meta Platforms – I <ul style="list-style-type: none"> • Understanding Ads Manager • Understanding Billing 	Understanding paid marketing in Meta platforms
6	Paid Marketing in Meta Platforms – II <ul style="list-style-type: none"> • Brand awareness campaign • Traffic campaign • Engagement campaign 	Understanding paid marketing in Meta platforms with different objectives
7	Paid Marketing in Meta Platforms – III <ul style="list-style-type: none"> • Lead generation campaign • Conversion campaign 	Understand to embed Social Media with website

8	Getting data from Social Media Paid Advertisement using Meta Pixel	For custom audiences and lookalike audiences
9	Introduction to BLOG <ul style="list-style-type: none"> • What is BLOG? • Importance of BLOG 	-
10	Popular Blogging Platforms <ul style="list-style-type: none"> • WordPress • Blogger 	-
11	Using SEO in Blogging <ul style="list-style-type: none"> • Using AI in Blogging • Understanding SEO in Blogging 	-
12	Using Blogger for Blogging	-
13	Using WordPress for Blogging	-
14	Case Study – I (Social Media)	-
15	Case Study – II (Blogging)	-
Total hours: 60		

Text Books:

1. Damian Ryan and Calvin Jones: Understanding Digital Marketing, Kogan Page, 2014
2. Stephanie Diamond: Digital Marketing All-in-One for Dummies, Wiley Publication, 2019
3. Amy Lupold Bair, Blogging for Dummies, 7th Edition, Wiley Publication, 2020

Reference Books:

1. Philip Kotler, Hermawan Kartajaya, and Iwan Setiawan: Marketing 4.0: Moving from Traditional to Digital, Wiley Publication, 2016
2. Jan Zimmerman and Deborah Ng: Social Media Marketing All-in-One for Dummies, Wiley Publication, 2017

Web References:

1. <https://www.simplilearn.com/tutorials/digital-marketing-tutorial>
2. https://www.tutorialspoint.com/digital_marketing/index.htm
3. <https://intellipaat.com/blog/digital-marketing-tutorial/>
4. <https://www.javatpoint.com/digital-marketing>
5. <https://www.javatpoint.com/blog>

Course Outcome: Upon successful completion of the course, student will:

CO1:	Able to understand digital marketing and its importance.
CO2:	Able to create and manage content using social media platforms
CO3:	Able to understand paid advertisements on social media platforms
CO4:	Able to blogging and its importance in digital marketing.
CO5:	Able to use generative AI in Digital Marketing.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	2	1	3	2	2	1	1	-	1	1	1	1
CO2	-	1	2	3	1	3	1	-	-	2	2	2	2
CO3	1	1	2	3	1	3	1	-	-	2	2	2	2
CO4	1	1	2	3	1	1	1	1	-	1	-	1	1
CO5	2	2	3	3	2	3	3	2	1	2	2	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation “-”

CTUI201 : Summer Internship and Viva - II

Objective and Scope:

Students who choose to exit the programme after the completion of the first two semesters must undertake internships, community engagement programmes and field based learning/minor projects during the summer term. This internship, worth 4 credits, is a requirement for the award of the Diploma. Students have to undergo internship in reputed Tech Companies, Software Development Firm, IT services companies, Research Institutions and Lab etc. This provision ensures that students gain valuable practical experience and industry exposure, complementing their academic learning and enhancing their career prospects. Following are the intended objectives of internship training:

- **Practical Experience:** Provide hands-on experience with real-world projects to apply theoretical knowledge gained during the course.
- **Skill Development:** Enhance technical skills, such as programming, software development, database management, and other relevant IT skills.
- **Industry Exposure:** Familiarize students with the working environment of the IT industry, including understanding company culture, workflows, and professional practices.
- **Professionalism:** Instil a sense of professionalism and work ethic, including adhering to deadlines, following instructions, and working collaboratively.
- **Transition to Employment:** Facilitate a smoother transition from academic life to professional careers by bridging the gap between theory and practice.

Guidelines of Internship:

The Summer Internship shall be of 15 (Minimum 60 hours) duration and will be undertaken during the Summer Vacation. Students have to undergo internship in reputed Tech Companies, Software Development Firm, IT services companies, Research Institutions and Lab etc. It is mandatory for the students to seek written approval from the coordinator about the topic and the organization before commencing the Summer Internship. During Summer Internship students are expected to take necessary guidance from the faculty guide allotted by the Institute. To do it effectively they should be in touch with their guide through e-mail or phone. Students must maintain regular reports detailing the work completed, challenges faced, and learning experiences. Students must submit a final report and presentation summarizing the internship experience, project outcomes, and key learnings to guide. The technical specifications for report preparation is as under:

Technical details:

1. The report shall be printed on A-4 size white paper.
2. 12 pt. Times New Roman font shall be used with 1.5-line spacing for typing the report.
3. 1" margin shall be left from all the sides.

4. Considering the environmental issues, students are encouraged to print on both sides of the paper.
5. The report shall be spiral bound as per the standard format of the cover page given by the Institute.
6. The report should include a Certificate (on company's letter head) from the company duly signed by the competent authority with the stamp.
7. The report shall be signed by the respective guide(s) & the Principal of the Institute 10 (Ten) days before the viva-voce examinations.
8. Student should prepare two hard bound copies of the Summer Internship Project Report and submit one copy in the institute. The other copy of the report is to be kept by the student for their record and future references.

Evaluation:

The evaluation of Internship will be done as per the following criteria:

Sr. No.	Evaluation Criteria	Marks
1	Summer Internship Report	50
2	Presentation and Viva-voce examination	50
TOTAL MARKS		100

Students must secure 36% passing marks in both components to qualify for the Diploma.

Internship and Exit:

Any student intending to exit the course must complete the summer internship (Including scoring at least 36% marks in the evaluation) before exit. A student intending to exit shall have to submit an application to Principal through Counsellor before even semester university theory examination. However, any such student desiring to withdraw the exit option may do that before the last paper of theoretical examinations of even semester.

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY, CHANGA															
Smt. Chandaben Mohanbai Patel Institute of Computer Applications															
FACULTY OF COMPUTER SCIENCE AND APPLICATIONS															
BCA, B Sc(IT), MCA, M Sc (IT) Programmes (ODD Semester)															
Academic Calendar (2024-2025)															
Week No	Month	M	T	W	T	F	S	S	Activity						
1	June	<u>24</u>	25	26	27	28	29	<u>30</u>	Commencement of New Academic Sessions of BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT-III Bridge Course for BCA-I, B.Sc.IT-I (Online Mode)						
2	July-August	<u>1</u>	2	3	4	5	6	<u>7</u>	Teaching Bridge Course for MCA-I, M.Sc.IT-I (Online Mode) Commencement Celebration for BCA-I, B.Sc.IT-I (Offline Mode)						
3		<u>8</u>	9	10	11	12	<u>13</u>	<u>14</u>	Teaching Bridge Course for MCA-I, M.Sc.IT-I(Online Mode) Commencement of Acedemic sessions for BCA-I, B.Sc.IT-I						
4		<u>15</u>	16	<u>17</u>	18	19	20	<u>21</u>	Teaching Commencement Celebration for MCA-I, M.Sc.IT-I(Offline Mode) Muharram						
5		22	23	24	25	26	<u>27</u>	<u>28</u>	Teaching Commencement of Acedemic sessions for MCA-I, M.Sc.IT-I	Expert Session					
6		29	30	<u>31</u>	1	2	3	<u>4</u>	Teaching	Expert Session					
7		5	<u>6</u>	<u>7</u>	8	<u>9</u>	10	<u>11</u>	Teaching	Workshop on Current Trends	Aarohan Club Activity				
8	August-September	<u>12</u>	13	14	<u>15</u>	16	17	<u>18</u>	Teaching	Independence Day	Vastuvit Club Activity				
9		<u>19</u>	20	21	22	<u>23</u>	<u>24</u>	<u>25</u>	Teaching	(Online Mode)	Rakshabandhan	Samarpan Club Activity			
10		<u>26</u>	27	<u>28</u>	29	30	31	<u>1</u>	Teaching	Janmashtami	Samvardhan Club Activity				
11		<u>2</u>	3	4	5	6	<u>7</u>	<u>8</u>	Teaching	Industrial Visit Samvatsari(Ganesh Chaturthi)					
12	September-October	9	<u>10</u>	11	12	<u>13</u>	<u>14</u>	<u>15</u>	Teaching	Expert Session	Tarkmanthan Club Activity				
13		16	17	<u>18</u>	19	<u>20</u>	21	<u>22</u>	Teaching	Expert Session	Vignatma Club Activity				
14		23	24	25	26	27	<u>28</u>	<u>29</u>	Teaching	Aavishkar Club Activity					
15		30	1	<u>2</u>	3	4	5	<u>6</u>	Teaching	Gandhi Jyanti					
16		7	<u>8</u>	<u>9</u>	10	11	<u>12</u>	<u>13</u>	Teaching	Workshop on Current Trends					
17	October-November	<u>14</u>	15	16	17	18	19	<u>20</u>	Teaching	Sessional Examination (BCA-III,V, B.Sc.IT-III,V,MCA-III,M.Sc.IT-III)					
18		<u>21</u>	<u>22</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	DIWALI VACATION						
19		<u>28</u>	<u>29</u>	<u>30</u>	<u>31</u>	<u>1</u>	<u>2</u>	<u>3</u>							
20		<u>4</u>	<u>5</u>	<u>6</u>	7	8	<u>9</u>	<u>10</u>	Teaching (Online Mode)	University Practical Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT- III)					
21	November - December	<u>11</u>	12	13	14	<u>15</u>	16	<u>17</u>	Teaching MCA-I, M.Sc.IT-I	University Practical Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT- III) (Continue) Sessional Examination(BCA-I, B.Sc.IT-I) Guru Nanak Jayanti					
22		18	19	20	21	22	<u>23</u>	<u>24</u>	Teaching MCA-I, M.Sc.IT-I	University Theory Examination (BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT- III) Sessional Examination(BCA-I, B.Sc.IT-I)					
23		<u>25</u>	26	27	28	29	30	<u>1</u>	University Theory Examination (BCA-III,V,B.Sc.IT-III,V, M.Sc.IT-III, MCA-III) (Continue) University Practical Examination(BCA-I,B.Sc.IT-I)						
24		<u>2</u>	3	4	5	6	7	<u>8</u>	Sessional Examination(MCA-I, M.Sc.IT-I)						

25	December	9	10	11	12	13	14	15	University Practical Examination(MCA-I,M.Sc.IT-I) University Theory Examination (BCA-I, B.Sc.IT-I) (Continue) icSoftComp2024 International Conference Remedial Examination of BCA-III,V, B.Sc.IT-III,V, MCA-III,M.Sc.IT-III
26		16	17	18	19	20	21	22	University Theory Examination(MCA-I,M.Sc.IT-I) Teaching Commencement of New Academic Sessions of BCA-IV,VI, B.Sc.IT-IV,VI, MCA-IV,M.Sc.IT-IV Remedial Examination for BCA-III,V, B.Sc.IT-III,B.Sc.IT-V, MCA-III and M.Sc.IT-III (Continue) AGNITIO
27		23	24	25	26	27	28	29	University Theory Examination(MCA-I,M.Sc.IT-I) Christsmas Teaching Commencement of New Academic Sessions of BCA-II, B.Sc.IT-II Remedial Examination for BCA-I, B.Sc.IT-I
28	December-January	30	31	1	2	3	4	5	Commencement of New Academic Sessions of MCA-II,M.Sc.IT-II Teaching Remedial Examination for BCA-I, B.Sc.IT-I (Continue)

SECTION - 2

VARIOUS ADMINISTRATIVE PROCESS

Payment of tuition fees or other charges

Step : 1

- Visit University web-portal click on Pay Fees :
<https://www.charusat.ac.in/student-corner> or visit
<https://charusat.edu.in:912/FeesPaymentApp/>

Step : 2

- Enter your Student ID and Pay your Fees

Step : 3

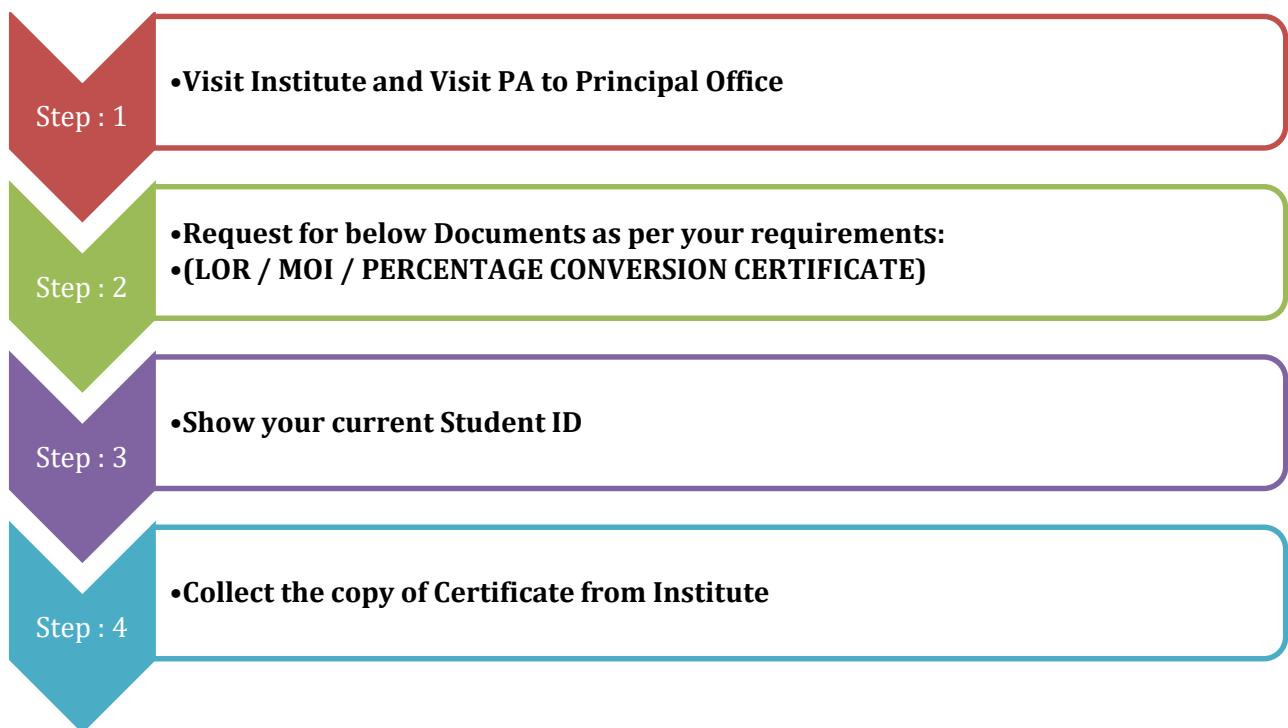
- After Successfull payment download your fees receipt

Process of Acquiring WIFI Access

To access the Wi-Fi on the Charotar University of Science and Technology (CHARUSAT) campus, students can use the following:

- **Wi-Fi enabled campus:** The entire CHARUSAT campus is Wi-Fi enabled.
- **Computers with internet:** All computers on campus have internet access.
- **Dedicated bandwidth:** Students are given a large bandwidth for internet surfing.
- **Ring connectivity:** The campus has ring connectivity to provide uninterrupted network access.

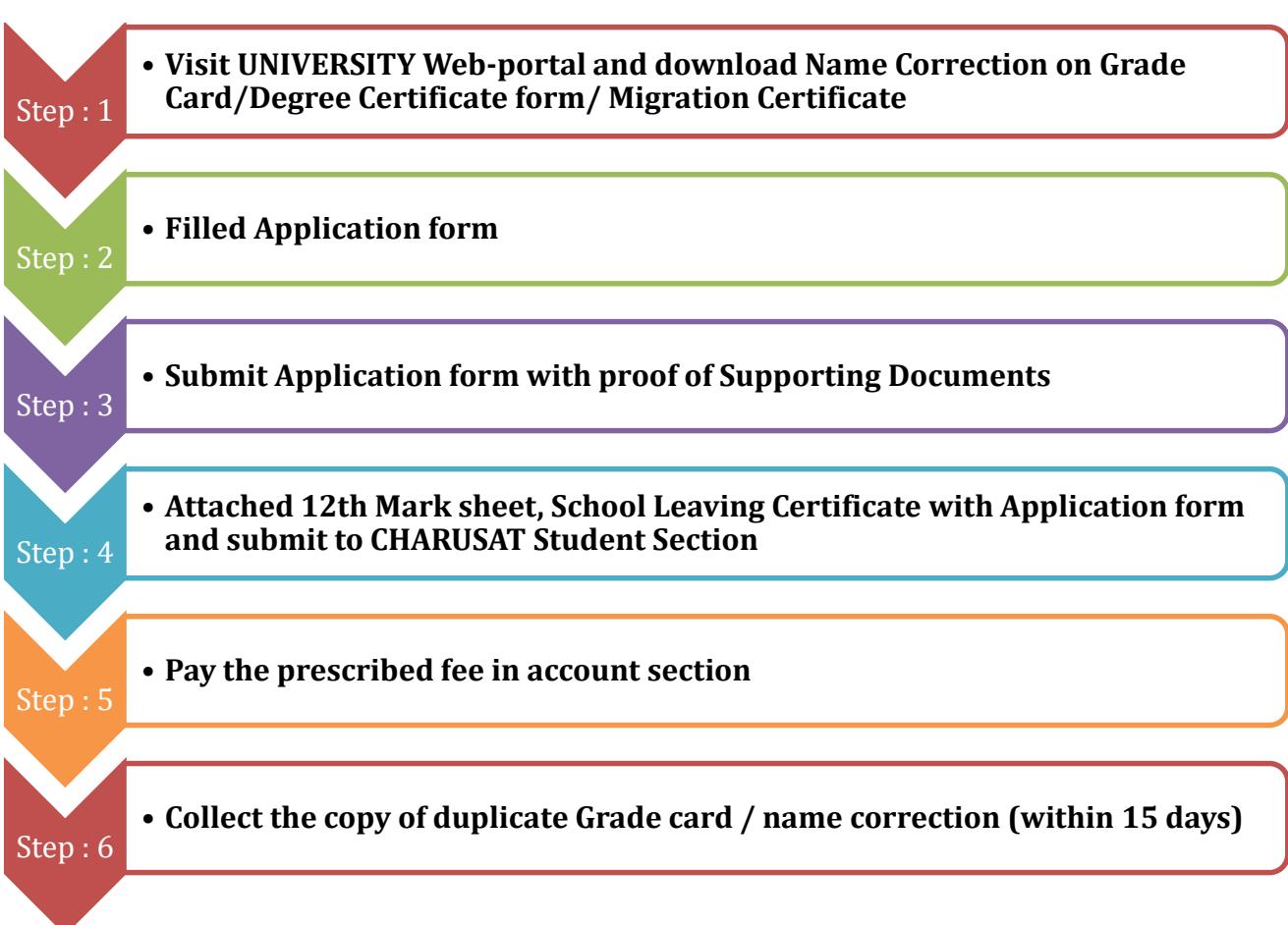
Process to obtain required Certificate from the institute



Process to obtain required Certificate from the University

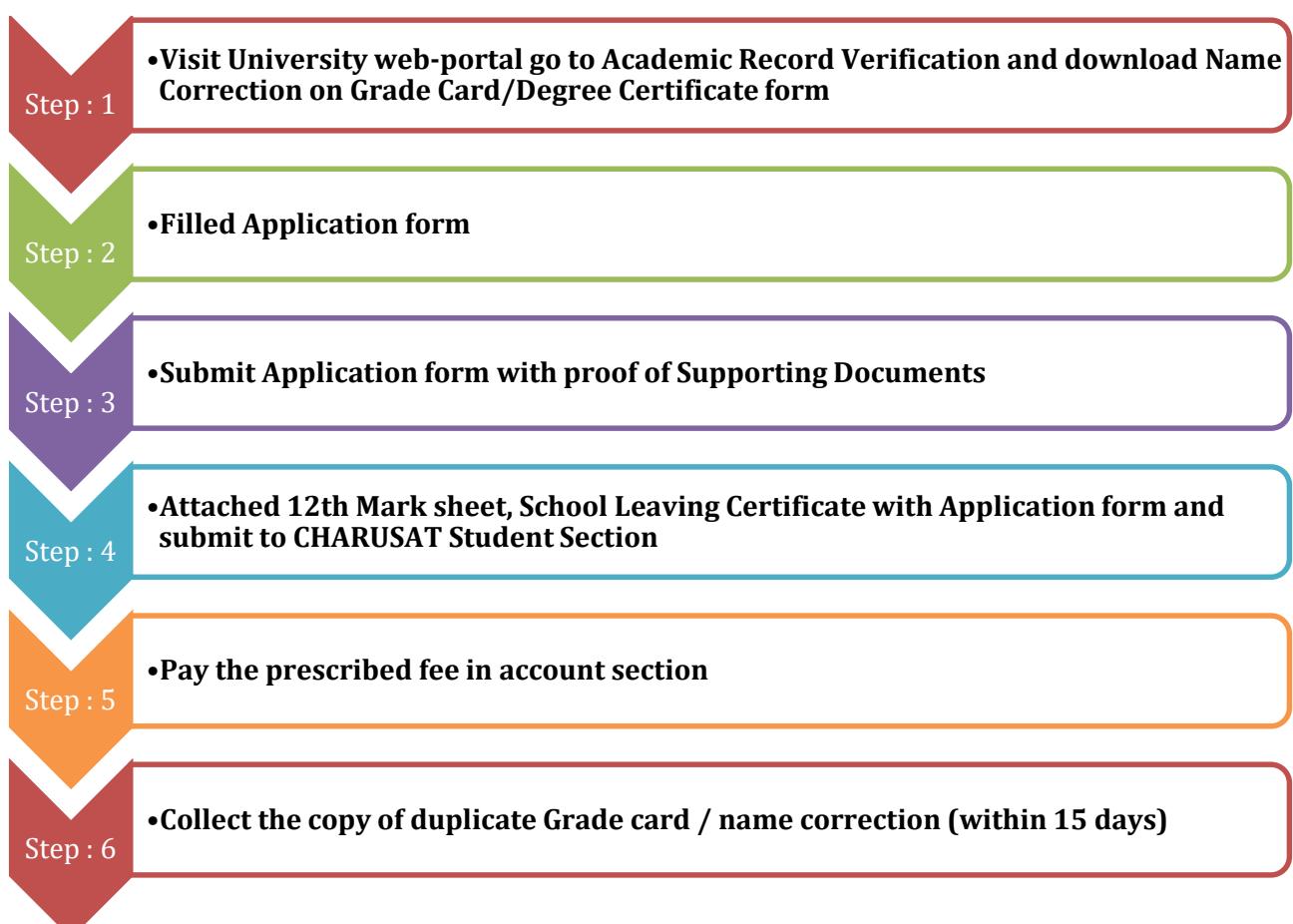
In order to obtain the required certificate at the University Level, students need to visit the Student Corner of the CHARUSAT University website. They can choose to apply online or offline and should ensure to include all necessary enclosures with their application. The application must be submitted to the Student Section of the University and should be duly attested by the relevant institute's HoD/ Principal/ Dean. Once all the necessary procedures are completed, the certificate will be issued at the University office.

Process to obtain Duplicate Grade Card/ Name correction in Grade Card/ Migration certificate

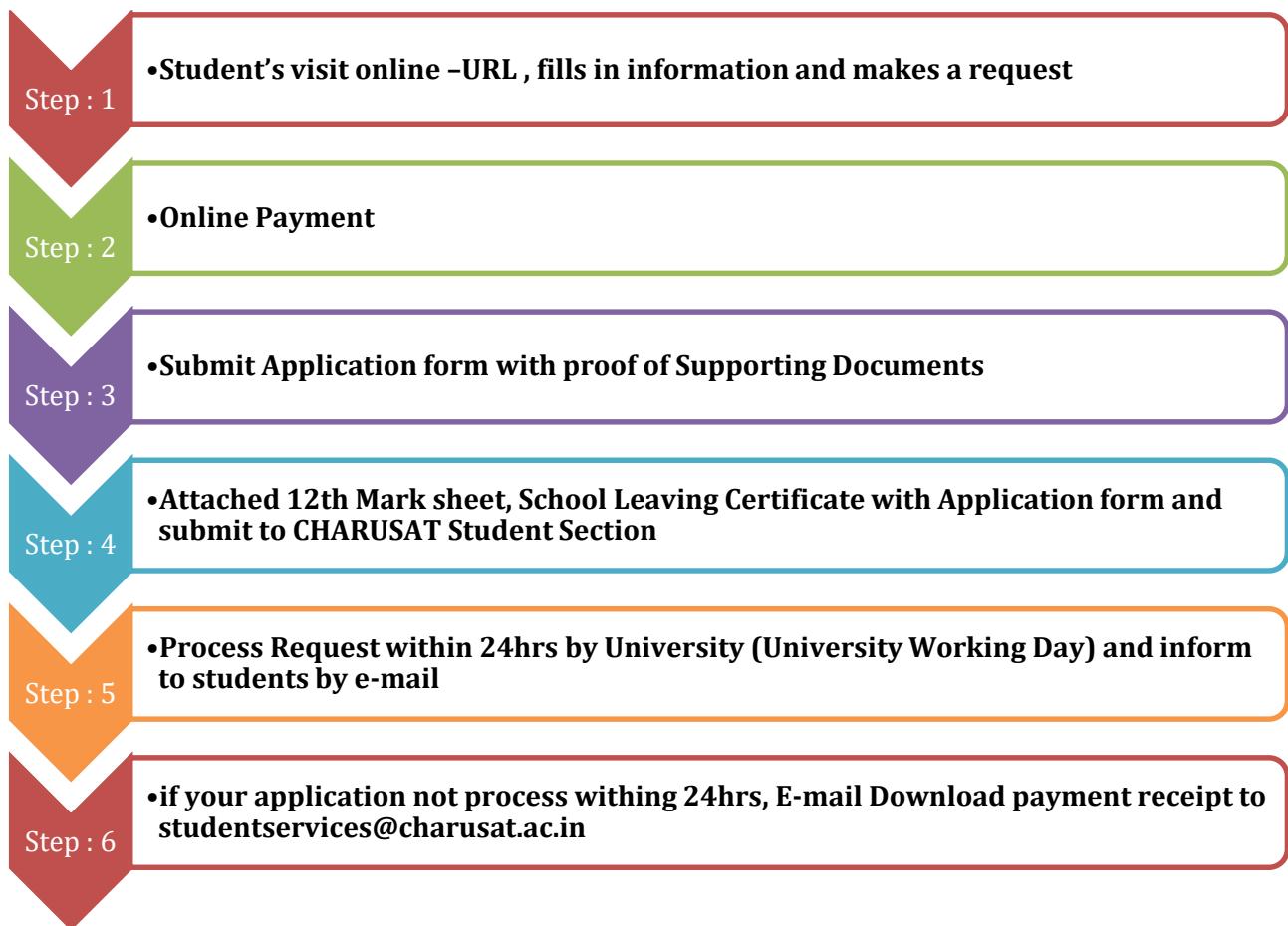


Initiator	Task
Student	Online Application Request through CHARUSAT Web Portal https://www.charusat.ac.in/student-corner Select Transcript / Duplicate Grade Card / Migration Certificate Select Document Type Migration Certificate Transcript/E-Transcript / WES Duplicate Grade Card Enter CHARUSAT Student ID Make Online Payment
Student	Pay fees at online Download Payment Receipt (for further Communication)
University Admin Office	University will get request after successful Payment (Time is depend on clearing of payment)
Entire process time duration: 24hrs after payment done	

Process for Academic Document Verification by External Agency



Work flow



SECTION – 3

UNDERTAKINGS AND DECLARATIONS

UNDERTAKING
(Observing Rules and Regulations of the University)

Roll No. _____

I, _____ Mr. /Ms. son/daughter of _____ have secured admission at the Smt. Chandaben Mohanbai Patel Institute of Computer Applications of CHARUSAT University in the academic year for the _____ Programme. We hereby confirm that we have gone through the academic rules and regulations of the Institute very carefully and we assure you that we will abide by the same.

Student Signature : _____

Name of the Parent/Guardian : 1. _____
2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

DECLARATION
(Code of Conducts and Disciplinary Rules)

I bearing roll no. admitted in (programme) of the Institute of....., CHARUSAT University, Changa do hereby declare and undertake that I will abide by the Code of Conduct, including rules for misconduct/indiscipline by the students, provisions like dress code on the campus, rules for maintaining vehicles on the campus, public display of affection (PDA), etiquette on the campus etc.

I will abide by all the rules and regulations as and when intimated by the university and if I am found violating any rules then, I shall be subjected to the major/minor penalties as may deemed fit by the university.

Signature : _____

Name of the Parent/Guardian : 1. _____
2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

UNDERTAKING
(Observing Rules & Regulations of the Examination)

I, Roll No..... studying in the First year of programme at Institute of, CHARUSAT University, Changad hereby undertake that I have read and understood all the Rules & Regulations related to Academic Dishonesty at examinations/tests/assignments and punishment in case of using unfair means, I have also gone through the Academic Regulations related to Granting of Term and Cancellation of admission, and I shall observe, follow and abide by all these rules and regulations.

I shall abide by all the rules and regulations and if I am found violating any rules then, I shall be subjected to the necessary action/penalties as per provision of rules/regulations of the university.

Signature : _____

Name : _____

Address : _____

Signature of the Parent/Guardian : 1. _____ 2. _____

UNDERTAKING
(To Refrain from Consumption of Drugs and Alcohol)

I, _____ bearing Roll No._____ admitted in _____ (programme) at Institute of _____ do hereby declare and undertake that I will refrain myself from possession / consumption of Drugs and Alcohol.

I know that the use/possession of narcotics drugs and alcohol is a punishable offence under the law of the Government of Gujarat and if I am found guilty of using such thing/s, then it will amount to a criminal offence and I am liable for the appropriate penalty as per laws and also liable to cancel my admission from the university.

I hereby give an undertaking to the Institute that I will refrain myself from possession or consumption of Drugs and Alcohol in and around the campus.

Date :

Place :

Signature of Student

I undertake that I will take utmost care to see that my ward does not get involved in any such incident.

Name of the Parent/Guardian : 1. _____

2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____
Address of Parent/ Guardian : _____

Contact no of Parent/ Guardian : 1. _____ 2. _____

4. IMPORTANT CONTACTS

+91-02697-265011 (Last 4 digits: Extension number)

Name and Designation	Extension number & Email-id
Dr. Sanskruti Patel Dean - Faculty of Computer Application	5243 Dean.fca@charusat.ac.in
Dr. Dharmendra Patel Principal	5241 Principal.cmpica@charusat.ac.in
Mr. Harikrushna Patel P.A to Principal	5242 Haripatel.mba@charusat.ac.in
Mr. Suresh Patel Librarian	5255 sureshsolanki.mca@charusat.ac.in
Mr. Harikrushna Patel Student Section	5242 Haripatel.mba@charusat.ac.in
Shri Mukesh Yadav Dy. Registrar, Academic Section	5008 dipenpatel.rnd@charusat.ac.in
Shri Bhavdip Patel Dy. Accounts Officer, Accounts Section	5024 bhavdippatel.acc@charusat.ac.in
Dr. Abhilash Shukla Examination Section	8222 abhilashshukla.mca@charusat.ac.in
Dr. Ritesh Patel Coordinator, E-governance	5251 coordinator.egov@charusat.ac.in
Shri Ritesh Bhatt WIN Cell Coordinator	5106 riteshbhatt.win@charusat.ac.in
Mr. Sujal Dadhaniya Corporate Development & Placement Cell	5213 tpo@charusat.ac.in,tnp@charusat.ac.in
Dr. Dilip Gosai Head, Charusat Rural Education Development Programme	5160 head.credp@charusat.ac.in
Dr. Gayatri Dave Chairperson, Women Development Cell	5192 gayatridave.bt@charusat.ac.in
Dr. Mrunali Patel Chairperson, Internal Complaint Committee	5163 chairperson.icc@charusat.ac.in
Dr. Vijay Panchal Head, Equal Opportunity Cell	5081 vijaypanchal.cv@charusat.ac.in
Mr. Kautilya Pandya, Member-Secretary Student Grievance Redressal Cell	5112 kautilpandya.adm@charusat.ac.in
Dr. Vijaykumar Chaudhary Convenor, Anti-ragging Cell	5221 / vijaychaudhary.me@charusat.ac.in