NOORUL ISLAM CENTRE FOR HIGHER EDUCATION

(Deemed to be University Under Section 3 of the UGC Act, 1956)
Kumaracoil, Thuckalay

DEPARTMENT OF COMPUTER APPLICATIONS

BACHELOR OF COMPUTER APPLICATIONS

CURRICULUM AND SYLLABI

REGULATION 2023

NOORUL ISLAM CENTRE FOR HIGHER EDUCATION, Kumaracoil

Regulation : 2022

Curriculum and Syllabi

BCA Programme

DEPARTMENT OF COMPUTER APPLICATIONS

BCA - BACHELOR OF COMPUTER APPLICATIONS

Vision of the University

To be recognized by the Government and society at large as an institution able to deliver excellence with relevance in the field of higher education and research focusing on the needs of the nation in tune with the technological revolution to cope with the knowledge explosion and global competence.

Mission of the University

To develop the institution as a Centre of Excellence, keeping pace with the advances in the field, so as to provide quality higher education to the students and instill in them high standards of discipline and ethics so that they become enlightened individuals in the service of humanity and to carry out focused research in the frontier areas of science and technology.

Faculty of Information and Computer Engineering

Department of Computer Applications

Vision of the Department

The department of Computer Applications aims to prepare the students technically competent, **be industry-ready and achieve academic excellence by continuous learning** to meet the current challenges of computing industry.

Mission of the Department

- To provide quality education to meet the global needs and challenges of profession and society.
- To provide necessitate based quality training in the field of computer applications.
- To provide technical solution to the real time application requirement for the local society.
- To provide theoretical and practical knowledge across recent developments in computer science in software development.

Description of the programme

BCA full form is Bachelor of Computer Applications, it is a three-year undergraduate degree focused on computer applications and software development. The BCA curriculum includes programming languages like C, C++, Java, .Net, Python, database management, web development, networking, and software engineering, providing a strong foundation in computer applications and preparing students for careers in the IT industry

PROGRAMME EDUCATIONAL OBJECTIVES - PEO	
PEO-01	Graduates will possess a strong foundation in computer science and information technology, enabling them to excel in various roles such as software developers, system analysts, and IT consultants across diverse industries.
PEO-02	Graduates will be skilled in applying analytical and problem-solving techniques to address complex computing challenges and will be able to innovate and create effective solutions using modern technologies.
PEO-03	Graduates will demonstrate strong communication skills and the ability to work collaboratively in teams, contributing effectively to group projects and interacting proficiently with clients, stakeholders, and colleagues.
PEO-04	Graduates will uphold high standards of ethical and professional conduct in their work, understanding and applying ethical principles and best practices in computing and information technology.
PEO-05	Graduates will recognize the importance of continuous learning and professional development, staying updated with emerging technologies and industry trends to adapt to the evolving demands of the IT field.
PEO-06	Graduates will be prepared to take on leadership roles and entrepreneurial ventures, leveraging their technical knowledge and skills to drive innovation and contribute to organizational and societal growth.

Graduate Attributes-GA	
GA-01	**Fundamental Computing Knowledge** Acquire a strong foundation in key areas of computer applications, including programming languages, algorithms, data structures, and database management, enabling problem-solving in various computing environments.
GA-02	**Software Development and Testing** Develop the skills to design, develop, and test software applications across diverse platforms, ensuring efficiency, reliability, and user-centric design in all computing projects.
GA-03	**Web and Mobile Application Development** Gain proficiency in web and mobile application development using modern tools, frameworks, and languages to create dynamic, responsive, and secure applications for the digital economy.
GA-04	**Data Analytics and Database Management** Demonstrate expertise in data analytics, data management, and database design, using statistical and analytical tools to extract insights, manage large datasets, and optimize business processes.

GA-05	**Cybersecurity Fundamentals** Understand the principles of cybersecurity and implement best practices to safeguard systems and applications from security breaches, ensuring the integrity and confidentiality of data.
GA-06	**Emerging Technologies** Stay updated with emerging technologies like cloud computing, IoT, and artificial intelligence, applying these innovations to solve real-world problems and enhance the efficiency of IT systems.
GA-07	**Problem-Solving and Analytical Thinking** Develop critical thinking and analytical skills, enabling effective problem-solving and decision-making in complex and dynamic computing environments.
GA-08	**Ethics and Professionalism in IT** Uphold ethical standards and professionalism in all computing practices, ensuring responsible use of technology, data privacy, and compliance with industry regulations.
GA-09	**Communication and Teamwork** Exhibit strong communication and collaboration skills, working effectively within teams to execute projects, deliver solutions, and contribute to the achievement of common goals.
GA-10	**Lifelong Learning and Adaptability** Embrace a commitment to continuous learning, staying updated with evolving technologies, industry trends, and best practices to remain adaptable in the fast-changing IT landscape.

Programme **Outcome – POs**

Programme Outcome – PO	
PO-A	Apply the knowledge of mathematics and computing fundamentals to various real life applications for any given requirement.
PO-B	Analyze and review literatures to invoke the research skills to design, interpret and make inferences from the resulting data.
PO-C	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects
P0-D	Design and develop applications to analyze and solve all computer science related problems
PO-E	Involve in perennial learning for a continued career development and progress as a computer professional

PO-F	Integrate and apply efficiently the contemporary IT tools to all computer applications
PO-G	Function effectively both as a team leader and team member on multi-disciplinary projects to demonstrate computing and management skills
PO-H	Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations
PO-I	Utilize the computing knowledge efficiently in projects with concern for societal, environmental, and cultural aspects
PO-J	Create and design innovative methodologies to solve complex problems for the betterment of the society
PO-K	Function competently as an individual and as a leader in multidisciplinary projects
PO-L	Communicate effectively and present technical information in oral and written reports
PO-M	Apply the inherent skills with absolute focus to function as an successful entrepreneur

Mapping of Graduate Attributes (GAs) and Programme Educational Objectives(PEOs)

GAs / PEOs	GA-01	GA-02	GA-03	GA-04	GA-05	GA-06	GA-07	GA-08	GA-09	GA-10
PEO-01	H	A	H	A	H	H	H	A	H	H
PEO-02	H	H	A	H	A	H	H	A	H	A
PEO-03	H	A	H	H	A	H	H	A	H	H
PE0-04	H	H	A	H	A	A	H	H	A	A

PEO-05	A	H	H	A	A	H	A	H	A	A
PEO-06	H	A	H	H	A	H	H	A	H	H

H- Highly Associated A- Associated Not – Not Associated

Mapping of Graduate Attributes (GAs) and Programme Outcomes (POs)

GAs / POs	GA-01	GA-02	GA-03	GA-04	GA-05	GA-06	GA-07	GA-08	GA-09	GA-10
PO-A	H	A	H	A	H	A	H	H	A	A
PO-B	H	H	A	H	A	H	A	H	H	A
PO-C	A	H	A	H	A	H	A	A	H	A
PO-D	H	H	A	H	A	A	A	H	H	A
PO-E	A	H	H	A	A	H	A	H	A	A
PO-F	A	H	A	A	H	A	A	H	H	A
PO-G	A	H	A	A	A	H	A	A	A	A
PO-H	A	H	A	A	A	H	A	H	H	H
PO-I	A	H	A	H	H	H	A	A	H	A
PO-J	A	H	A	H	A	H	A	A	H	A
PO-K	A	H	A	A	A	H	A	H	H	H

PO-L	A	H	A	H	H	H	A	A	H	A
PO-M	A	H	A	H	A	H	A	A	H	A

H- Highly Associated A- Associated Not – Not Associated

Mapping of Programme Educational Objective (PEOs) and Programme Outcomes (POs)

PEO / PO	PEO-01	PEO-02	PEO-03	PEO-04	PEO-05	PEO-06
PO-A	H	A	H	A	H	A
PO-B	A	H	A	H	H	H
PO-C	H	H	H	A	H	A
PO-D	H	A	A	A	H	A
PO-E	A	A	A	H	A	H
PO-F	H	A	H	A	H	H
PO-G	H	H	H	H	H	A
PO-H	H	A	A	H	H	A
PO-I	A	H	H	A	A	H
PO-J	H	A	A	H	A	H
PO-K	H	H	H	H	H	A
PO-L	H	A	A	H	H	A
PO-M	A	H	H	A	A	H

H- Highly Associated A- Associated Not – Not Associated

Duration of the programme: 3 Years/ 6 Semesters
Total credit : 137

CURRICULUM & SYLLABI

SEMESTER I

Sl.	Course	Course Title	L	T	P	C
THEORY						
1.	MS36T1/ MS36M1/ MS36H1	Tamil-I / Malayalam-I / Hindi - I	3	0	0	3
2.	EG3601	English - I	3	0	0	3
3.	MA3605	Discrete Mathematics	3	1	0	4
4.	CA3601	Programming in C	3	1	0	4
5.	CA3602	Digital Electronics	3	1	0	4
6.	GE3603	Value Based Education	2	0	0	2
PRACTICAL						
7.	CA3671	C Programming Laboratory	0	0	2	2
8.	CA3672	Office Automation Laboratory - I	0	0	2	2
TOTAL			17	3	4	24

SEMESTER II

Sl.	Course	Course Title	L	T	P	C
THEORY						
1.	MS36T2/ MS36M2/ MS36H2	Tamil-II / Malayalam-II / Hindi - II	3	0	0	3
2.	EG3602	English – II	3	0	0	3
3.	MA3606	Mathematical Foundations of Computer Science	3	1	0	4
4.	CA3603	Object Oriented Programming Using C++	3	1	0	4
5.	CA3604	Computer Architecture	3	1	0	4
6.	GE3602	Environmental Studies	2	0	0	2
PRACTICAL						
7.	CA3673	Object Oriented Programming Laboratory	0	0	2	2
8.	CA3674	Office Automation Laboratory - II	0	0	2	2
TOTAL			17	3	4	24

SEMESTER III

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	CA3605	Programming with Java	3	1	0	4
2.	CA3606	Web Designing	3	1	0	4
3.	MA3607	Fundamentals of Statistics	3	1	0	4
4.	CA3607	Software Engineering	3	0	0	3
5.	CA3608	Computer Graphics	3	0	0	3
PRACTICAL						
6.	CA3675	JAVA Programming Lab	0	0	2	2
7.	CA3676	Web Designing Lab	0	0	2	2
TOTAL			15	3	4	22

SEMESTER IV

Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
1.	CA3609	Data structures	3	1	0	4
2.	CA3610	Computer Networks	4	0	0	4
3.	CA36**	Elective I	3	0	0	3
4.	CA3611	Python Programming	3	1	0	4
5.	CA3612	Operating System	3	0	0	3
PRACTICAL						
6.	CA3677	Data structures Lab	0	0	2	2
7.	CA3678	Python Programming Lab	0	0	2	2
TOTAL			16	2	4	22

Elective I

S. No.	Course Code	Course Title	L	T	P	C
1.	CA36A1	Financial Accounting	3	0	0	3
2.	CA36A2	Management Information Systems	3	0	0	3
3.	CA36A3	E-Commerce	3	0	0	3
4.	CA36A4	Human Resource Management	3	0	0	3

Elective II

S. No.	Course Code	Course Title	L	T	P	C
1.	CA36A5	Introduction to Data Mining	3	0	0	3
2.	CA36A6	Cloud Computing	3	0	0	3
3.	CA36A7	Wireless Networks	3	0	0	3
4.	CA36A8	Software Testing	3	0	0	3
5.	CA36B4	Cloud Computing Fundamentals	3	0	0	3

Elective III

S. No.	**Course Code**	**Course Title**	L	T	P	C
1.	CA36A9	Robotic Process Automation	3	0	0	3
2.	CA36B1	Client Server Computing	3	0	0	3
3.	CA36B2	Enterprise Resource Planning	3	0	0	3
4.	CA36B3	Distributed Computing	3	0	0	3

Duration of the Programme : 3 years (6 semesters)

Total : 137

SEMESTER V

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	CA3613	VB.Net Programming	3	1	0	4
2.	CA3614	Data Base Management Systems	3	1	0	4
3.	CA****	Elective II	3	0	0	3
4.	CA3615	Artificial Intelligence	3	0	0	3
5.	CA3616	Cyber Security	3	0	0	3
PRACTICAL						
6.	CA3679	VB.Net Programming Lab	0	0	2	2
7.	CA3680	DBMS Lab	0	0	2	2
8.	CA36P1	Internship	0	0	0	2
TOTAL			15	3	4	23

SEMESTER VI

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	CA3617	PHP Programming	3	1	0	4
2.	CA3618	Introduction to Big data	3	0	0	3
3.	CA****	Elective III	3	0	0	3
4	CA3619	Professional Ethics	3	0	0	3
PRACTICAL						
5.	CA3681	PHP Programming Lab	0	0	2	2
6.	CA36P2	Project Work	0	0	14	7
TOTAL			9	2	16	22

SEMESTER I

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	MS36T1/ MS36M1/ MS36H1	Tamil-I / Malayalam-I / Hindi - I	3	0	0	3
2.	EG3601	English - I	3	0	0	3
3.	MA3605	Discrete Mathematics	3	1	0	4
4.	CA3601	Programming in C	3	1	0	4
5.	CA3602	Digital Electronics	3	1	0	4
6.	GE3603	Value Based Education	2	0	0	2
PRACTICAL						
7.	CA3671	C Programming Lab	0	0	2	2
8.	CA3672	Office Automation Laboratory - I	0	0	2	2
TOTAL			17	3	4	24

MS36T1	TAMIL- I	L	T	P	C
		3	0	0	3

Course Outcome		Cognitive Skill
CO-01	செய்யுள் பகுதி மூலம் மாணவர்கள் பாரதியார், பாரதிதாசன் போன்றோர்களின் படைப்புகளை கற்று அறிவு பெற்றனர்	U
CO-02	இலக்கணப் பகுதி மூலம் மாணவர்கள் எழுத்துக்களை பேசும் போதும் எழுதும் போதும் பிழையின்றி பயன்படுத்த கற்றுக் கொண்டனர்	A
CO-03	உரைநடை பகுதி மூலம் மாணவர்கள் தமிழ் மொழியின் இன்பம் இலக்கியங்களைப் பற்றி கற்று வாழ்க்கையை முறைப்படுத்தினர்.	R
CO-04	சிறுகதை பகுதி மூலம் மாணவர்கள் மூடநம்பிக்கை பேராசை, தற்கொலை எண்ணம் போன்றவற்றிலிருந்து தற்காத்துக் கொண்டனர்	U
CO-05	இலக்கிய வரலாறு பகுதி மூலம் மாணவர்கள் தமிழ் இலக்கிய வரலாற்று நிகழ்வுகளை கற்று மேம்பாடு அடைந்தனர்.	R

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	L	M	S	S	L	S	S	S	M	S	L	L	L
CO-02	L	L	L	S	L	S	L	M	S	S	S	S	S
CO-03	L	S	S	L	L	L	S	S	M	S	S	S	M
CO-04	L	S	L	M	L	L	L	S	M	S	M	S	S
CO-05	S	M	S	M	S	S	S	M	S	S	S	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

அலகு I: செய்யுள் **9**

அன்னையை வேண்டுதல் - பாரதியார்- தொழிலாளர் விண்ணப்பம் - பாரதிதாசன் - ஒற்றுமையே உயர்நிலை– தேசிகவிநாயகனார்- மாணவனுக்கு -இராமலிங்கம்- புதுமை–சுரதா- இருபதுகட்டளைகள்- வைரமுத்து- தம்பி உனக்காக–சிற்பிபாலசுப்பிரமணியன்- மரங்கள் - மு. மேத்தா- மனிதத் தத்துவங்கள்-கண்ணதாசன்- ஊமைராகங்கள் மதியழகன்- ஏரி–சல்மா- டவுண் பஸ் - சிவசோமன்- கவனஈர்ப்புத் தீர்மானம் உமாஹரிஹரன்- ஹைக்கூக் கவிதைகள்- கழனியூரான், முருகேஷ், ராஜமுருகுபாண்டியன்- நாட்டுப்புறப் பாடல்கள் - பஞ்சமும் மழையும்

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அலகு II: இலக்கணம் **9**

எழுத்துபற்றியவிளக்கம்- முதலெழுத்துசார்பெழுத்துக்கள்- சுட்டெழுத்துக்கள், வினாவெழுத்துக்கள்- கிரந்தஎழுத்துக்கள்.- வல்லினம் மிகும், மிகா இடங்கள்.

அலகு III: உரைநடை **9**

சங்ககால வாழ்வியல் நெறிகள்- தமிழர்களின் விஞ்ஞானப் பார்வை- பத்துப்பாட்டில் சமூக அறம்- அகநானூற்றில் தமிழர் வழக்காறுகள்- புறநானூற்றில் மனிதநேயம்- ஆற்றுப்படை இலக்கியங்கள்- கலித்தொகைகாட்டும் பழந்தமிழர் பண்பாடு- செவ்வியல் மொழிதமிழ்- தமிழ் இலக்கியங்களில் மூலிகைமருத்துவம்- தமிழ் மாந்தர் கடமை.

அலகு IV: சிறுகதை **9**

இதுவும் ஒரு சரஸ்வதி பூஜை- கிணறு- தொண்டன்- ஊர்க்குருவியும் பருந்தும்- அனாதைகள்

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அலகு V: இலக்கியவரலாறு **9**

புதுக்கவிதை–தோற்றமும் வளர்ச்சியும்- சிறுகதை–தோற்றமும் வளர்ச்சியும்- புதினம் - தோற்றமும் வளர்ச்சியும்- நாட்டார் பாடல்கள்- தகவல் தொடர்புச் சாதனங்களும் தமிழ் வளர்ச்சியும்

TOTAL: 45 HOURS

பார்வை நூல்கள்

1. உரைநடை - சங்கத் தமிழர் வாழ்வியல் - தா. நீலகண்டபிள்ளை
2. சிறுகதை–நோன்பு - டி. செல்வராஜ்
3. இலக்கியவரலாறு– மு. வரதராசனார்

MS36H1	HINDI- I	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To acquire knowledge regarding fundamental concepts in Hindi grammar.
- To acquire the ability to master translation skills
- To develop writing skills for official documentation - Letter, Banking terminologies

Course Outcome		Cognitive Skill
CO-01	Improve the Hindi communication skills	U
CO-02	Identify Eminent Hindi Writers.	R,U
CO-03	Framing Sentences.	An
CO-04	Official Documentation Skills	An, S
CO-05	In Depth Application of Hindi Language	A,An,S

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	L	M	S	S	L	S	S	S	M	S	L	L	L
CO-02	L	L	L	S	L	S	L	M	S	S	S	S	S
CO-03	L	S	S	L	L	L	S	S	M	S	S	S	M
CO-04	L	S	L	M	L	L	L	S	M	S	M	S	S
CO-05	S	M	S	M	S	S	S	M	S	S	S	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

UNIT I : PROSE

- Jeevan Aur Shikshan
- Torch Bechne Wala
- Nayi Sanskrithi ki Aur

UNIT II : SHORT STORIES

- Thakur ka Kuwa
- Heli Bone Ki Bathakein
- Umas
- Nail Cutter

UNIT III : GRAMMAR

- Saghya
- Sarvanam
- Visheshan
- Kriya

UNIT IV : LETTER WRITING

UNIT V : TRANSLATION

TEXT BOOKS :

1. Gandhya Prathibha -Dr. Basavaraj K Barkaer, Published by Jawahar Pusthakalay Sardar Bazar, Madurai
2. Kahani Sankalan Thatha Vyavaharik Hindi Sunil Kumar Published by Orient Black Swan. Himalayanth Nagr, Hyderabad
3. Vyakaran Pradeep Ram Dev Published by Hindi Bhavan. Allahabad

REFERENCES :

1. Kahanı Sankalan Thatha Vyavaharik Hindi Sunil Kumar Published by Orient Black Swan, Himalayanth Nagr, Hyderabad

EG3601	ENGLISH - I	L	T	P	C
		3	0	0	3

OBJECTIVES

- To make the students acquire basic knowledge in English with communicative competence.
- To enable them to develop their communication skills effectively
- To make them get exposure to English prose, poetry, short story and grammar

Course Outcome		Cognitive Skill
CO-01	The students will be able to learn the various themes, styles and the nuances of modern English prose written by great masters of prose writing in the 20th century.	R
CO-02	The students will be able to grasp the poetical language, the rhythm and cadence of poetry, the themes and styles of different masters of English poetry.	U
CO-03	The students will be able to understand the elements of a short story, narrative techniques employed and its brevity and wisdom from the great masters of storytelling.	U
CO-04	The students will learn basic grammar and vocabulary that will enrich their communicative competence.	A
CO-05	The students will learn the format, the basics and the requirements of letter writing, understand the different types of letters, their characteristics and the formalities involved in writing them, and learn how to skim and scan passages for comprehension.	A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	M	L	M	M	M	L	L	M	M	M	M
CO-02	M	S	M	L	M	L	L	M	M	M	M	M	M
CO-03	M	S	M	L	M	M	M	L	L	M	M	M	M
CO-04	M	M	M	L	M	M	M	M	M	M	M	S	S
CO-05	M	M	M	L	M	M	M	M	M	M	M	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Prose - A Galaxy Of Precious Prose (Detailed) **12**

1. Spoken English and Broken English - George Bernard Shaw
2. Reading for Pleasure - L. A. G. Strong
3. University Days - James Thurber
4. The Model Millionnaire - Oscar Wilde
5. On Forgetting - Robert Lynd

Unit II: Poetry - Harmony (Detailed) **12**

1. The Solitary Reaper - William Wordsworth
2. Stopping by Woods on a Snowy Evening - Robert Frost
3. Enterprise - Nissim Ezekiel
4. Lead, Kindly Light - Cardinal Newman
5. Where the mind is without fear - Rabindranath Tagore

Unit III: Short Story - Popular Short Stories (Non-Detailed) **6**

1. The Gift of the Magi - O. Henry
2. The Ant and the Grasshopper - W. Somerset Maugham
3. The Mark of Vishnu - Kushwant Singh

Unit IV: Grammar **6**

1. Functional English - Parts of Speech, Articles, Prepositions, Auxiliaries and Modals, Agreement of subject with verb
2. Vocabulary - Antonyms, Synonyms, Suffixes, Prefixes, One-word Substitutes, Odd words Out

.

Unit V: Letter Writing **9**

Basics of Letter Writing - Reading Comprehension

TOTAL: 45 HOURS

REFERENCES:

1. Galaxy of English Prose, Ed. Dr. B. Symala Rao, Blackie Books, Madras.
2. An Anthology of Poems, Harmony, Ed. Biyot K. Tripathy.

MA3605	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

OBJECTIVES

- To extend student's Logical and Mathematical maturity
- Ability to deal with abstraction
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

Course Outcome		Cognitive Skill
CO-01	Recognize graph models and its application in technical sectors	R, U, A, An, E, S
CO-02	Know about the shortest path algorithm for solving real life situation	R, U, A, An, E, S
CO-03	Gain knowledge about various Cryptosystem for securing data	R, U, A, An, E, S
CO-04	Know about Product of two Posets and its applications	R, U, A, An, E, S
CO-05	Understand the Minimal spanning tree and algorithms	R, U, A, An, E, S

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	S	M	M	S	L	M	M	M	L	M
CO-02	S	S	M	S	M	M	S	L	M	M	M	L	M
CO-03	S	S	M	S	M	M	S	L	M	M	M	L	M
CO-04	S	S	M	S	M	M	S	L	M	M	M	L	M
CO-05	S	S	M	S	M	M	S	L	M	M	M	L	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Graph Theory **9**

An introduction to graph - Definition of a Graph - Graphs as models - More definitions - Vertex Degrees - Sub graphs - Paths and cycles. The matrix representation of graphs (definition and example only) Trees - Binary trees - Binary search trees and traversals.

Unit II: Euler Tours And Hamiltonian Cycles **9**

Euler's paths and cycles - Hamiltonian paths and cycles - Minima's Path Application (Flow charts and state transition Graphs - Algorithm for determining cycle and minimal paths.

Unit III: Introduction To Cryptography **9**

From Caesar Cipher to Public key Cryptography - the Knapsack Cryptosystem.

Unit IV: Poset And Lattices **9**

Diagrammatical Representation of a Poset - Isomorphism, Duality, Product of two Posets – Lattices - Semi lattices - Complete Lattices - Sub lattices.

.

Unit V: Network Models **9**

Shortest Route Algorithm - Minimal Spanning tree - Prim's Algorithm and Kruskal's algorithm - Maximal Flow Models - Ford Fulkurson's Algorithm

TOTAL: 45 + 15 = 60 HOURS

TEXT BOOKS

1. John Clark Derek Allen Holton " A first look at graph theory", Allied Publishers.
2. David M Burton "Elementary Number Theory", 6th Edition TMH
3. VijayK.Khanna, "Lattices and Boolean Algebras-FirstConcepts", VikasPublishingHouse Pvt. Ltd.
4. Kenneth H.Rosan, "Discrete Matematics and its apllicatuions",Fifth Edition,TataMcgraw Hill, 2003(UNIT V)

REFERENCES:

1. Douglas B West Peter Grossman, "Introduction to Graph Theory".
2. W.D.Wallis - A Biginner's, "Guide to Discrete Mathematics", Springer.
3. R. Balakrishnan, K. Ranganathan "A textbook of Graph Theory", Springer International Edition.
4. S.Arumugham, S. Ramachandran "Invitation to Graph Theory", Scitech. Peter Grossman,
5. J.K Sharma, "Discrete Mathematics", (2nd edition),(Macmillion).
6. S. A. Choudam "A First Course in Graph Theory", (Macmillian)Theory (Macmillian).

CA3601	PROGRAMMING IN C	L	T	P	C
		3	1	0	4

OBJECTIVES

- To study the basic programming concept using C Language.
- To study the Statement format and the application of statements in the programs.
- To study the functions, structures, unions, file and pointer concepts in C Language.

Course Outcome		Cognitive Skill
CO-01	Understand the operators and decision making statements.	R,U,A,E
CO-02	Interpret looping statements, arrays and strings.	R,U,A,E
CO-03	Examine the various categories of functions and recursion.	R,U,A,E
CO-04	Study the concept of pointers and array of pointers.	R,U,A,E
CO-05	Study the concept of structures, unions and design files.	R,U,A,E

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	S	S	S	S	S	S	S	S	S
CO-02	S	L	M	S	M	M	M	M	M	M	M	S	M
CO-03	S	L	M	S	S	M	S	S	S	S	S	S	M
CO-04	L	M	M	M	S	M	M	S	S	S	S	S	S
CO-05	L	S	S	S	S	S	M	M	S	S	S	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction **9**

History and Importance of C – Keywords and Identifiers – Constants – Variables – Data types – Types of Operators and Expressions – Managing Input and Output Operations. Decision Making and Branching – Types of if statements – switch statement and go to statement.

Unit II: Loop, Control Structures And Arrays **9**

Loop Control Statements: while Loop – do while Loop – for Loop – Jumps in Loops. Array: Declaration and Initialization of One Dimensional Arrays – Two Dimensional and Multidimensional Arrays – Reading and Writing Strings – String Handling Functions.

Unit III: Functions **9**

User-Defined Functions: Definition – Function Declaration – Category of Functions – Nesting of Functions – Recursion – Passing Arrays to Functions – Passing strings to Functions.

Unit IV: Structures, Unions And Files **9**

Defining a Structure – Declaration – Initialization – Array of Structures – Structures within Structures – Unions. Files: Defining and Opening a file – Input/Output Operations on Files – Error Handling during I/O Operations – Random access to files.

.

Unit V: Pointers **9**

Pointers: Introduction – Declaring Pointer Variables – Initialization – Chain of Pointers – Pointer Expressions –Pointers and Arrays – Pointers and Character Strings – Array of Pointers – Pointers and Structures.

TOTAL: 45 + 15 = 60 HOURS

TEXT BOOK

1. E. Balagurusamy, "Programming in ANSI C", Eighth Edition, McGrawHill Education (India) Private Limited, 2019.

REFERENCES:

1. Dr. Ashish Sasankar, Prof. Prachi A. Sasankar, "Programming in C - A Practical Approach", First Edition, Global Education, 2020.
2. Byron S. Gottfried, "Programming with C - Schaum's Outlines", Fourth Edition, McGrawHill Education, 2018.
3. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGrawHill Education, 2017.

CA3602	DIGITAL ELECTRONICS	L	T	P	C
		3	1	0	4

OBJECTIVES

- To study the basics of different number systems.
- To familiarize with the logic gates and combinational circuits utilized in the different digital circuits and systems.
- Describe use of flip- flops in common sequential *logic* designs- *counters,* shift *registers.*

Course Outcome		Cognitive Skill
CO-01	Familiarize with the different number systems.	R, U, A, An, E
CO-02	Able to derive basic logic gates, adder, and subtractor using universal gates.	R,U,A,E
CO-03	Know the concepts of combinational circuits.	R,U,A,E

CO-04	Design various flip flops, shift registers and determining outputs.	R,U,A,E
CO-05	Analyze the operation of counters.	R, U, A, An, E, S

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	L	S	S	S	M	L	S	S	S	M
CO-02	M	M	M	M	S	M	M	M	L	M	S	S	M
CO-03	M	S	M	S	S	M	S	S	M	M	S	S	M
CO-04	S	S	S	M	S	S	S	M	M	M	S	S	M
CO-05	S	L	M	S	S	M	M	M	S	M	S	M	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Number System **9**

Number Systems and Codes: Binary - Octal and hexadecimal conversions - ASCII code - Excess -3 code - Gray code - Error detection and correction – Parity generators and checkers – Fixed point and floating point arithmetic. Binary addition and subtraction - unsigned and signed numbers - 1's complement and 2's complement arithmetic.

Unit II: Logic Circuits **9**

TTL logic and CMOS logic - Logic gates - Universal gates - Boolean Laws and theorems - Sum of Products method - Product of Sum method - K map representation and simplification(upto four variables) – Pairs – Quads – Octets - Don't care conditions.

Unit III: Combinational Circuits **9**

Combinational circuits: Adders - Full adder and half adder – Subtractors - half subtractor and full subtractor – Carry Lookahead adders – ALU (block diagram only). Multiplexers - De-multiplexers – Encoders - BCD to decimal decoders.

Unit IV: Sequential Circuits and Asynchronous Counters **9**

Sequential circuits: Flipflops – SR – JK - D and T flipflops - JK Master Slave Flipflop - Conversion of flip-flops - Registers – SISO – SIPO – PISO - PIPO. Counters: Asynchronous Counters – Modulus of a counter – Mod N counters.

Unit V: Synchronous Counters and State Machines **9**

Synchronous counters: Preset and clear modes - Counter Synthesis - Ring counter - Johnson Counter - Mod N counter - Decade counter. State Machines: State transition diagram - Moore and Mealy Machines – Design equation and circuit diagram.

TOTAL: 45 + 15 = 60 HOURS

TEXT BOOK

1. M. Morris Mano, "Digital Logic and Computer Design", Prentice-Hall of India Pvt. Ltd.

REFERENCES:

1. D. P. Leach and A. P. Malvino, "Digital Principles and Applications", Tata McGraw, Hill Publishing Co. Ltd.
2. V. Vijayendran and S. Viswanathan "Digital Fundamentals", (Printers & Publishers) Pvt. Ltd.

GE3603	VALUE BASED EDUCATION	L	T	P	C
		2	0	0	2

OBJECTIVES

- To enable the students to understand the social realities and to inculcate an essential value system towards building a health society.
- To study the ethical and social values in respect of different cultures.

Course Outcome		Cognitive Skill
CO-01	Students will able to identify, describe and analyze important social issues.	R, An
CO-02	To develop awareness of how human rights can be translated into social and political reality.	A, An
CO-03	To promote the social and cultural welfare of the members.	R, U
CO-04	Able to understand effective communication strategies graphically.	U, An
CO-05	Students to identify and analyze ethical issues in the media.	R, An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	L	S	L	M	S	S	S	L	S	L
CO-02	S	S	S	M	S	S	M	S	S	S	M	S	S
CO-03	S	S	S	M	S	M	M	S	S	S	M	S	M
CO-04	S	S	M	M	S	M	M	S	S	M	M	S	M
CO-05	S	S	M	L	S	S	M	S	S	M	L	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Social Justice **6**

Definition – Need – Parameters of Social Justice – Factors Responsible for Social Injustice – Caste and Gender – Contributions of Social Reformers. Concept of Human Values - Self - Introspection- Self-Esteem.

Unit II: Human Rights and Marginalized People **6**

Concept of Human Rights – Principles of Human Rights – Human Rights and Indian Constitution – Rights of Women and Children – Violence Against Women – Rights of Marginalized People – Like Women - Children – Dalits – Minorities - Physically Challenged Etc.

Unit III: Social Issues and Communal Harmony **6**

Social Issues – Causes and Magnitude – Alcoholism - Drug Addiction – Poverty -Unemployment Etc – Communal Harmany –Concept –Religion and its Place in Public in Public Domain – Separation of Religion from Politics –Secularism Role of Civil Society

Unit IV: Media Education and Globalized World Scenario **6**

Mass Media –Functions –Characteristics –Need and Purpose of Media Literacy – Effects and Influence - Youth and Children – Media Power – Socio Cultural and Political Consequences Mass Mediated Culture - Consumeristic Culture – Globalization – New Media- Prospects and Challenges

.

Unit V: Values and Ethics **6**

Personal Values – Family Values – Social Values – Cultural Values – Professional Values – and overall Ethics – Duties and Responsibilities

TOTAL: 30 HOURS

REFERENCES:

1. T.Kanagaraj and D. Calis, "Social Value Education", Sathana Publications.(2010)
2. Dr.Mohana and Lr.Palkani, "Value Based Education", Saras Publication.
3. T.Anchukandam and J. Kuttainimathathil(Ed) "Grow Free Live Free", KrisituJyotiPublications, Bangalore(2013)
4. Mani Jacob(Ed) "Resource Book for Value Education, Institute for Value Education", New Delhi 2012.
5. DBNI, NCERT,SCERT, "Dharma Bharti National Institute of Peace and Value Education", Secunderabad, 2011
6. Daniel and Selvamony- "Value Education Today, (Madras Christian College, Tambaram and ALACHE", New Delhi, 2000)

CA3671	C PROGRAMMING LABORATORY	L	T	P	C
		0	0	2	2

OBJECTIVES

- Provide complete knowledge of C language.
- Learning the basic programming constructs of C language.
- Give Knowledge to write program in C Language

Course Outcome		Cognitive Skill
CO-01	Able to develop logics which will help them to create programs.	R, U, A, An
CO-02	Able to write simple C programs	R,U,A,E
CO-03	Ability to work with textual information, characters and strings.	R,U,A,E
CO-04	To impart writing skill of C programming to design the calculator functions.	R,U,A,E
CO-05	Able to write any complex program using structure in C language.	R, U, A, An, E,

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	M	S	S	M	M	M	S	S	S	M
CO-02	S	M	M	M	S	S	M	M	S	S	S	S	M
CO-03	S	M	M	M	S	S	S	M	S	S	S	S	M
CO-04	S	M	M	M	S	S	M	M	S	S	S	M	M
CO-05	S	M	M	M	S	S	M	M	S	S	S	M	M

S-Strong, M-Medium,L-Low,N-Not relevant

List of Experiments

1. Program using if statement.
2. Program using while statement.
3. Program using for loop statement.
4. Program using switch statement.

5. Program using one dimensional array.
6. Program using two dimensional arrays
7. Program using functions.
8. Program using String Library Function.
9. Program for string manipulation.
10. Program using structures.
11. Program using union.
12. Program for reading and writing files.
13. Program for updating file.

TOTAL: 45 HOURS

REFERENCES:

1. E. Balagurusamy, "Programming in ANSI C", Eighth Edition, McGrawHill Education (India) Private Limited, 2019.
2. Dr. Ashish Sasankar, Prof. Prachi A. Sasankar, "Programming in C - A Practical Approach", First Edition, Global Education, 2020.
3. Byron S. Gottfried, "Programming with C - Schaum's Outlines", Fourth Edition, McGrawHill Education, 2018.
4. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGrawHill Education, 2017.

CA3672	OFFICE AUTOMATION LABORATORY - I	L	T	P	C
		0	0	2	2

OBJECTIVES

- Learn the features of professional word documents.
- Creating and formatting a simple document using bulleted and numbered list and document.
- Create multiple letters envelope and nametags using the information stored in a file using mail merge in MS Word.
- Creating a Power Point Presentation with animation effects.

Course Outcome		Cognitive Skill
CO-01	Learn common tasks in Word, such as opening, viewing, editing, saving, and printing documents.	R, U, A
CO-02	Apply pre-designed Styles and format text with fonts and colors, work with bullets, indents etc.	U,A
CO-03	Able to create a letter to send 10 members using Mail Merge.	R,U,A,E

CO-04	Able to create simple presentations	R,U,A,E
CO-05	Utilize all the advanced tools and features that Microsoft PowerPoint has to offer.	R, U, A, An, E,

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	M	S	S	M	M	S	M	S	S
CO-02	S	S	S	M	M	M	S	S	S	S	M	M	S
CO-03	M	S	S	M	S	S	S	S	S	S	M	M	S
CO-04	S	S	S	M	S	S	S	S	M	S	M	M	S
CO-05	M	M	M	M	M	M	M	M	M	M	M	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

List of Experiments

1. Design a Bio-data in MS Word
2. Design an Invitation in MS Word
3. Newspaper formatting in MS Word
4. Bullets, Numbering, Margin, header and footers in MS Word
5. Mail Merge
6. Design document with different header by using section/page break
7. Create a simple presentation using MS-Power Point
8. Presentation using Themes
9. Presentation using Animation
10. Presentation by linking multiple files
11. Presentation including charts and graphs
12. Presentation including multimedia effects.

TOTAL: 45 HOURS

REFERENCES:

1. Freddy Beverly, “Microsoft Office 365 Bible 15 in 1” 24th Edition.
2. Harjit Suman, “Microsoft Office 365”.

SEMESTER II

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	MS36T2/ MS36M2/ MS36H2	Tamil-II / Malayalam-II / Hindi - II	3	0	0	3
2.	EG3602	English – II	3	0	0	3
3.	MA3606	Mathematical Foundations of Computer Science	3	1	0	4
4.	CA3603	Object Oriented Programming Using C++	3	1	0	4
5.	CA3604	Computer Architecture	3	1	0	4
6.	GE3602	Environmental Studies	2	0	0	2
PRACTICAL						
7.	CA3673	Object Oriented Programming Laboratory	0	0	2	2
8.	CA3674	Office Automation Laboratory - I I	0	0	2	2
TOTAL			17	3	4	24

MS36T2	TAMIL II	L	T	P	C
		3	0	0	3

Course Outcome		Cognitive Skill
CO-01	செய்யுள் பகுதி மூலம் மாணவர்கள் சைவம், வைணவம், நீதி நூல்களை கற்று அறிவு பெற்றனர்.	U
CO-02	இலக்கணப் பகுதி மூலம் மாணவர்கள் சொல்லின் பொது இலக்கணத்தை கற்று பிழையின்றி பயன்படுத்த கற்றனர் .	A
CO-03	உரைநடை பகுதி மூலம் மாணவர்கள் படித்தாலே இனிக்கும், வெட்டி அருகில் தான் போன்ற தத்துவங்களை கற்றுக் கொண்டனர்.	R
CO-04	வாழ்க்கை வரலாறு பகுதி மூலம் மனோன்மணியம் சுந்தரனார் வாழ்வும் பணியும் கற்று வாழ்க்கையை முறைப்படுத்திக் கொண்டனர்.	U
CO-05	இலக்கிய வரலாறு பகுதி மூலம் பன்னிரு திருமுறைகள், சமண இலக்கியங்களை கற்று வாழ்க்கையை மேம்படுத்திக் கொண்டனர்.	R

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	L	M	S	S	L	S	S	S	M	S	L	L	L
CO-02	L	L	L	S	L	S	L	M	S	S	S	S	S
CO-03	L	S	S	L	L	L	S	S	M	S	S	S	M
CO-04	L	S	L	M	L	L	L	S	M	S	M	S	S
CO-05	S	M	S	M	S	S	S	M	S	S	S	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

அலகு: 1 செய்யுள் **9**

சமய இலக்கியங்கள்- சைவம்- தேவாரம் - திருஞானசம்பந்தர்- திருநாவுக்கரசர்- சுந்தராதிருவாசகம் - மாணிக்கவாசகா- திருமந்திரம் - (அன்புடைமை) திருமூலர்- திருவருட்பா–வள்ளலார்- **வைணவம்-**

திருப்பாவை–ஆண்டாள்- **கிறித்தவம்-** கிறிஸ்து மொழிக்குறள் - திரு.வி.க- **இசுலாமியம்-** இறைஞ்சு இயல்பு - அப்துல் கபூர்- **நீதி இலக்கியங்கள்- பதினெண்கீழ்க்கணக்கு நூல்கள் -** திருக்குறள் - திருவள்ளுவர்- நாலடியார் - சமணமுனிவர்கள்- இன்னாநாற்பது–கபிலர்- இனியவைநாற்பது– பூதஞ்சேந்தனார்- முதுமொழிக் காஞ்சி–மதுரைகூடலூர்க்கிழார்

அலகு: 2 இலக்கணம் **9**

சொல்லின் பொது இலக்கணம்- பெயர்ச் சொல் - அறுவகைப் பெயர்கள்- வினைச்சொல் - ஏவல், வியங்கோள், செய்வினை, செயப்பாட்டுவினை, தன்வினை, பிறவினை- இடைச்சொல் - ஏ, ஓ, உம் இடைச்சொற்கள்- உரிச்சொல்- கடிதங்கள்

அலகு: 3 உரைநடை - இலக்கியஉலா (ம.திருமலை) **9**

படிப்பதுஎப்படி.- ஹைக்கூக் கவிதைகளில் இயற்கை.- கூட்டுக் குஞ்சுகள் (ராஜம் கிருஷ்ணன்)-நாவலில் தொழிலாளர் நிலை.- மகாகவிவள்ளத்தோள்.- மாணிக்கவாசகரின் சிவபுராணம்.

அலகு: 4 வாழ்க்கைவரலாறு **9**

பாட்டாளிக் கவிஞர் பட்டுக்கோட்டைகல்யாணசுந்தரம் - (கார்த்திகேயன்)

அலகு: 5 இலக்கியவரலாறு **9**

நீதி நூல்களும் சமய இலக்கியங்களும்- பதினெண்கீழ்க்கணக்கு நூல்கள்- பன்னிருதிருமுறைகள்- கிறித்தவம், இசுலாமியம் தமிழுக்குசெய்ததொண்டு.

TOTAL: 45 HOURS

பார்வை நூல்கள்

1. உரைநடை - இலக்கியஉலா– ம. திருமலை
2. வாழ்க்கைவரலாறு- பட்டுக்கோட்டைகல்யாணசுந்தரனார் - தொகுப்பாசிரியர் கார்த்திகேயன்
3. இலக்கியவரலாறு– மு. வரதராசனார்

MS36H2	HINDI II	L	T	P	C
		3	0	0	3

OBJECTIVES

- To acquire knowledge regarding fundamental concepts in Hindi grammar.
- To acquire the ability to master translation skills.
- To develop writing skills for official documentation –Letter, Banking terminologies

Course Outcome		Cognitive Skill
CO-01	In depth knowledge regarding the one act plays	An,E
CO-02	Identify eminent modern Hindi poets	R,An
CO-03	Framing Sentences	E
CO-04	Applications of mass media – Advertisement .	R,U
CO-05	Comprehension..	A, An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	L	M	S	S	L	S	S	S	M	S	L	L	L
CO-02	L	L	L	S	L	S	L	M	S	S	S	S	S
CO-03	L	S	S	L	L	L	S	S	M	S	S	S	M
CO-04	L	S	L	M	L	L	L	S	M	S	M	S	S
CO-05	S	M	S	M	S	S	S	M	S	S	S	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

UNIT 1 : ONE ACT PLAY

- Dus Hassar
- Dus Minute
- Bor ka Thara

UNIT II : MODERN POETRY

- Iago Phir Ek Baar
- Kya Poojan Kya Archan Re
- Kitne Navvon mein Kitne Baar
- Waqt

UNIT III : GRAMMAR

- Kriya Visheshan
- Sampantha Bodhan Abhvyay
- Sammuchak Bodha Avyay
- Vismayathi Bodhak Avyay

UNIT IV : MEDIA AND ADVERTISEMENT

UNIT V : COMPREHENSION

TEXT BOOKS :

1. Ekangi Panjamruth-Dr Ram Kumar - Published by Jawahar Pusthakaly Madurai 2. Kavya Ras-Dr. V Bhaaskar Published by Pachorri Press, Sadar Bhazar, Madurai

2. Vyakaran Pradeep - Ram Dev MA-Published by Hindi Bhavan, Allahabad
3. Prayojan Moolak Hindi Dariyaganj, New Delhi Published by Sinthant Aur Prayog Vani Publication

EG3602	ENGLISH – II	L	T	P	C
		3	0	0	3

OBJECTIVES

- To make the learners acquire basic knowledge in English with communicative competence
- To enable them to communicate effectively in English.
- To make them understand and assimilate the genres of poetry, prose, and short story and grammar, and imbibe the basics of non-verbal communication.

Course Outcome		Cognitive Skill
CO-01	The students will be able to learn the various themes, styles and the nuances of modern English prose written by great masters of prose writing.	R
CO-02	The students will be able to grasp the poetical language, the rhythm and cadence of poetry, the themes and styles of different masters of English poetry.	U
CO-03	The students will be able to understand the elements of a short story, narrative techniques employed and its brevity and wisdom from the great masters of storytelling.	U
CO-04	The students will learn basic grammar and vocabulary that will enrich their communicative competence.	A
CO-05	The students will have a broader understanding of Non-Verbal communication and a focused view of the various components of non-verbal communication such as eye contact, postures, gestures, etc.	A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	M	L	M	M	M	L	L	M	M	M	M
CO-02	M	S	M	L	M	L	L	M	M	M	M	M	M
CO-03	M	S	M	L	M	M	M	L	L	M	M	M	M
CO-04	M	M	M	L	M	M	M	M	M	M	M	S	S

CO-05	M	M	M	L	M	M	M	M	M	M	M	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Prose - A Galaxy Of Precious Prose: (Detailed) **12**

1. On Saying Please – A. G. Gardiner
2. My visions for India – A. P. J. Abdul Kalam
3. Water the Elixir of Life – C. V. Raman
4. An Astrologer's Day – R. K. Narayan
5. Hazards of Sensual Drugs – Hardin B. Jones

Unit II: Poetry - Harmony (Detailed) **12**

1. La Belle Dame Sans Merci – John Keats
2. All the World's a Stage – William Shakespeare
3. Palanquin Bearers – Sarojini Naidu
4. Tithonus – Alfred Lord Tennyson
5. If – Rudyard Kipling

Unit III: Short Story - Popular Short Stories (Non-Detailed) **6**

1. The Necklace – Guy De Maupassant
2. The World Renowned Nose – Vaikkam Muhammad Basheer
3. The Selfish Giant – Oscar Wilde

Unit IV: Grammar **6**

1. Functional English - Tense - Active Voice - Passive Voice - Conditional Clauses – Direct Speech - Indirect Speech
2. Vocabulary - Homonyms - Homophones - Word Formation - Derivatives

.

Unit V: Non-Verbal Communication **9**

Facial Expressions - Eye Contact - Posture - Gestures - Paralanguage - Proxemics - Use of Body - Body Movements or Kinesics - Physiological Changes

TOTAL: 45 HOURS

REFERENCES:

1, Galaxy of English Prose, Ed. Dr. B. Symala Rao, Blackie Books, Madras.
2. An Anthology of Poems, Harmony, Ed. Biyot K. Tripathy.

MA3606	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	L	T	P	C
		3	1	0	4

OBJECTIVES

- To familiarize symbolic logic concepts
- To learn set theory and its applications
- To learn differentiation and its applications
- To gain concepts of two dimensional geometry

Course Outcome		Cognitive Skill
CO-01	Translate ordinary English language statements and arguments into symbolic form. Use formal methods of propositional and predicate logic for analyzing the logical structures of ordinary language statements, and for determining the validity of deductive arguments.	R, U, A, An, E, S
CO-02	Understand the basic principles of sets and operations in sets. Apply the operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion.. Demonstrate an understanding of relations and functions and be able to determine their properties. Determine when a function is 1-1 and "onto"	R, U, A, An, E, S
CO-03	Describe binary relations between two sets .Solve counting problems by applying elementary counting techniques using the product and sum rules, permutations, combinations Apply counting principles to determine probabilities. Understand the concept of Boolean Algebra.	R, U, A, An, E, S
CO-04	Explain the relationship between the derivative of a function as a function and the notion of the derivative as the slope of the tangent line to a function at a point. Compare and contrast the ideas of continuity and differentiability. Finding maxima and minima, critical points and inflection points of functions and to determine the concavity of curves.	R, U, A, An, E, S
CO-05	Study of lines in 2dimension. Finding equation in various form of line, pair of straight lines and circle	R, U, A, An, E, S

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	M	S	S	S	S	S	S	S	L	L
CO-02	S	S	M	S	S	M	S	M	S	S	S	M	M
CO-03	S	M	S	M	M	S	L	L	M	M	M	S	S

CO-04	S	S	S	S	S	M	L	M	M	S	S	S	S
CO-05	M	S	M	M	S	S	M	L	M	L	L	M	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Symbolic Logic **9**

Proposition - Logical operators – conjunction – disjunction – negation - conditional and bi-conditional operators – converse – Inverse - Contra Positive - logically equivalent - tautology and contradiction - Arguments and validity of arguments.

Unit II: Set Theory **9**

Sets - set operations - Venn diagram - Properties of sets - number of elements in a set - Cartesian product - relations and functions - Relations: Equivalence relation - Equivalence class - partially and totally ordered sets - Functions: Types of Functions - Composition of Functions.

Unit III: Binary Operations **9**

Types of Binary Operations: Commutative – Associative - Distributive and identity - Boolean algebra: simple properties - Permutations and Combinations.

Unit IV: Differentiation **9**

Simple problems using standard limits – Differentiation - successive differentiation - Leibnitz theorem - partial differentiation - Applications of differentiation - Tangent and normal - angle between two curves - Maximum and Minimum values (Second derivative test) - Curvature and radius of Curvature (Cartesian coordinates) - Envelopes.

Unit V: Two Dimensional Analytical Geometry **9**

Straight Lines – Pair of Straight Lines – Circles.

TOTAL: 45 + 15 = 60 HOURS

TEXT BOOKS

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers,40th Edition.
2. KennethH.Rosan,"DiscreteMatematicsanditsapllicatuions",Fifth Edition,TataMcgraw– Hill,2003
3. Manicavachagom Pillay and Natarajan. "Analytical Geometry part I - Two Dimension" – S. Viswanathan (printers and publication) Put Ltd.,1991.

REFERENCES:

1. P.R.Vittal, "Mathematical Foundations" – Margham Publication, Chennai.
2. U. Rizwan, "Mathematical Foundation" – Sci Tech, Chennai
3. V.Sundaram and Others, "Dircrete Mathematical Foundation" - A.P.Publication,sirkali.
4. P.Duraipandian and Others, "Analytical Geometry2 Dimension", Emerald publication1992 Reprint.

CA3603	OBJECT ORIENTED PROGRAMMING USING C++	L	T	P	C
		3	1	0	4

OBJECTIVES

- Study the basic programming and OOPs concepts.
- Able to Write C++ programs.
- Develop classes for simple applications.
- Study files management and templates in C++

Course Outcome		Cognitive Skill
CO-01	Acquire a fundamental understanding of the OOPs concepts,	U, A, An
CO-02	Learn the concept of class and object using C++ and develop classes for simple applications	R,U,A,E
CO-03	Able to create class hierarchies using the object-oriented design process	R,U,A,E
CO-04	Understanding inheritance and virtual functions in C++.	R,U,A,E
CO-05	Implement Object Oriented Programs using templates and exceptional handling concepts.	R, U, A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	S	S	S	S	S	S	M	M	M	S	S
CO-02	S	M	S	M	M	S	S	S	S	M	S	S	S
CO-03	S	M	S	S	S	M	S	M	S	M	S	S	M
CO-04	S	M	M	M	M	S	S	S	S	M	M	M	M
CO-05	S	M	M	M	M	M	M	M	M	M	M	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: OOPs Concept **9**

Principles of Object Oriented Programming –Software Crisis – Software Evolution – Procedure Oriented Programming – Object Oriented Programming Paradigm – Basic Concepts and Benefits of OOP – Object Oriented Languages – Applications of OOP – Beginning with C++ – Structure of C++ – Applications of C++ – Tokens – Keywords – Basic Data types – Declaration of variables – Operators in C++ – Manipulators – Control Structures.

Unit II: Functions, Classes and Objects **9**

Function in C++ : Function Prototyping – Call by Value and Reference – Inline Functions – Default and const Arguments – Function Overloading – Classes and Objects – Member Functions – Nesting of Member Functions – Private Member Functions – Memory Allocation of Object – Array with in a Class – Static Data Members – Static Member Functions – Array of Objects – Objects as Function Arguments – Friend functions – Pointers to Members.

Unit III: Constructors and Operator Overloading **9**

Constructors – Parameterized Constructors – Multiple Constructor – Constructor with Default Parameters – Copy and Dynamic Constructors – Destructors – Operator Overloading – Overloading Unary and Binary Operators – Operator Overloading using Friend Function – Rules for overloading operators.

Unit IV: Inheritance and Virtual Functions **9**

Inheritance – Defining Derived Classes – Single Inheritance – Multilevel Inheritance – Multiple Inheritance – Hierarchical Inheritance – Hybrid Inheritance – Virtual Base Classes – Abstract Classes – Constructors in Derived Classes – Nesting of Classes – this Pointer – Virtual Functions – Pure Virtual Functions – C++ Stream Classes – Unformatted and Formatted I/O Operations.

Unit V: Files and Templates **9**

Classes for File Stream Operations – Opening and Closing a File – File modes – Sequential Input and Output Operations – Random Access – Error Handling during File Operations – Command Line Arguments – Templates – Class Templates – Function Templates.

TOTAL: 45 + 15 = 60 HOURS

TEXT BOOK

1. E. Balagurusamy, “Object Oriented Programming with C++”, Eighth Edition, Tata McGraw Hill, 2020.

REFERENCES:

1. D. Ravichandran, “Programming with C++”, Third Edition, McGraw Hill Education, 2017.
2. Herbert Schildt, “The Complete Reference – C++”, Fourth Edition, McGraw Hill Education, 2017.

CA3604	COMPUTER ARCHITECTURE	L	T	P	C
		3	1	0	4

OBJECTIVES

- To understand the structure, function and characteristics of computer systems.
- To understand the design of the various functional units and components of computers.
- To identify the elements of modern instructions sets and their impact on processor design.
- To explain the function of each element of a memory hierarchy,
- To identify and compare different methods for computer I/O.

Course Outcome		Cognitive Skill
CO-01	Understand the basics structure of computers, operations and instructions.	R, U, A, An, E, S
CO-02	Study the arithmetic and logic unit.	U, A, An, E,
CO-03	Understand pipelined execution and design control unit.	RU, A, An, E, S
CO-04	Understand parallel processing architectures	R, U, A, An, E,
CO-05	Understand the various memory systems and I/O communication.	R, U, A, An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	M	M	M	M	S	S	S	S	M	S
CO-02	S	S	M	M	M	M	S	M	M	M	M	S	M
CO-03	S	S	M	M	S	M	S	S	S	S	S	M	S
CO-04	S	S	S	M	M	M	M	S	S	M	S	M	S
CO-05	S	S	S	M	M	M	M	S	S	M	S	M	S

Mapping of Course Outcome with Programme Outcome

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Basic Structure of a Computer System **9**

Functional Units – Basic Operational Concepts – Performance – Instructions - Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.

Unit II: Arithmetic for Computers **9**

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Sub word Parallelism.

Unit III: Processor and Control Unit **9**

A Basic MIPS implementation – Building a Data path – Control Implementation Scheme – Pipelining – Pipelined data path and control – Handling Data Hazards & Control Hazards – Exceptions.

Unit IV: Memory **9**

Characteristics of memory system - Memory hierarchy - Cache Memory - Cache memory principles - Elements of cache design - cache address – size - mapping functions - Replacement algorithms - write policy - Internal Memory - semiconductor memory - External Memory - Hard Disk organization – RAID.

.

Unit V: I/O Systems **9**

I/O modules - Module function and I/O module structure - Programmed I/O - Polling I/O - Interrupt driven I/O - DMA function - Synchronous and Asynchronous serial data communication - Computer peripherals like keyboard – mouse – printer - scanner and display devices.

TOTAL: 45 + 15 = 60 HOURS

TEXT BOOKS

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.

REFERENCES:

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

GE3602	ENVIRONMENTAL STUDIES	L	T	P	C
		2	0	0	2

OBJECTIVES

- To understand the complexity of ecosystems and possibly how to sustain them
- To understand the relationships between humans and the environment.
- To understand major environmental problems including their causes and consequences.

Course Outcome		Cognitive Skill
CO-01	Students will able to understand to interpret the lithosphere, hydrosphere, atmosphere and biosphere.	R, U
CO-02	Students will understand the interrelationships between landforms and ecosystems.	R, U
CO-03	Able to understand the pollution and how to prevention of pollution.	U, A
CO-04	Gain knowledge of global warming and environmental acts.	R, U, A
CO-05	Students should understand and apply the role of IT in EVS.	U, A, An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-FS	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	S	S	L	S	M	S	S	S	S	S
CO-02	S	S	M	S	S	L	S	M	S	S	S	S	S
CO-03	S	S	M	S	S	M	S	L	S	S	M	S	S
CO-04	S	S	M	S	S	L	S	S	S	S	M	S	S
CO-05	S	S	M	S	S	L	S	M	S	S	S	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction **6**

Environmental Sciences - Relevance - Significance - Public awareness - Forest resources - Water resources - Mineral resources - Food resources - conflicts over resource sharing - Exploitation - Land use pattern - Environmental impact - fertilizer - Pesticide Problems - case studies.

Unit II: Demand Theory and Analysis **6**

Ecosystem - concept - structure and function - producers, consumers and decomposers - Food chain - Food web - Ecological pyramids - Energy flow - Forest, Grassland, desert and aquatic ecosystem. Biodiversity - Definition - genetic, species and ecosystem diversity - Values and uses of biodiversity - biodiversity at global, national (India) and local levels - Hotspots, threats to biodiversity - conservation of biodiversity.

Unit III: Pricing And Market Structure **6**

Environmental Pollution - Causes - Effects and control measures of Air, Water, Marine, soil, solid waste, Thermal, Nuclear pollution and Disaster Management - Floods, Earth quake, Cyclone and Landslides. Role of individuals in prevention of pollution - pollution case studies.

Unit IV: Macro Economic Analysis **6**

Urban issues - Energy - water conservation - Environmental Ethics - Global warming - Resettlement and Rehabilitation issues - Environmental legislations - Environmental production Act. 1986 - Air, Water, Wildlife and forest conservation Act

.

Unit V: International Trade **6**

Population growth and Explosion - Human rights and Value Education - Environmental Health - HIV/AIDS - Role of IT in Environment and Human Health - Women and child welfare - Public awareness - Case studies.

TOTAL: 30 HOURS

REFERENCES:

1. Gupta N.C.; "Social Auditing of Environmental Law in India, edited book", New Century Publications, Delhi-2003.
2. Divan, Shyam and RosenCeranz; "Armin. Environmental Law and Policy in India, Cases, materials and statutes", second edition, Oxford University Press, 2001.
3. Uberoi, N.K.; "Environmental Management", Excel Books, New Delhi, 2000.
4. Agarwal, A, Narain; "S. State of India's Environment", Published by Centre for Science and Environment, New Delhi, 1999.
5. Joseph, Casio, Woodside, Gayle and Mitchell, Philip.; "ISO 14000 guide- The new Environmental Management Standards", McGraw Hill, New York, 1996.

CA3673	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	2	2

OBJECTIVES

- To implement C++ object-oriented features.
- To learn to implement constructors, destructors and classes.
- To implement the syntax and semantics of the C++ programming language.
- To learn to implement inheritance, friend functions and files.

Course Outcome		Cognitive Skill
CO-01	Ability to create simple programs using classes and objects in C++.	U, A, An
CO-02	Learn how to write inline functions for efficiency and performance.	R,U,A,E
CO-03	Acquire a fundamental understanding of the OOPs concepts, input/output data management, arrays in C++, functions, classes, objects.	R,U,A
CO-04	Able to design in C++ using dynamic memory allocation. Constructor, Destructor, copy constructors. Operator overloading, friend functions.	R,U,A
CO-05	Understand object oriented programming and advanced C++ concepts inheritance and polymorphism, file I/O, exception handling.	R, U, A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	S	S	S	M	M	M	M	M	M	M	S
CO-02	M	S	S	S	M	M	S	S	S	S	S	M	S
CO-03	M	M	S	M	M	M	S	S	S	S	M	S	S
CO-04	M	M	S	M	M	M	M	M	M	M	M	M	S
CO-05	M	M	S	S	S	S	S	S	S	S	S	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

List of Experiments

1. Program using Control Structures.
2. Program using Arrays.
3. Program using Default Arguments.
4. Program using Function Overloading.
5. Program using Class and Objects.
6. Program using Array of Objects.
7. Program using Constructor and Destructor.
8. Program using Operator Overloading.
9. Program using Friend Function.
10. Program using Inheritance.
11. Program using Files.
12. Program using Templates.

TOTAL: 45 HOURS

REFERENCES:

1. E. Balagurusamy, "Object Oriented Programming with C++", Eighth Edition, Tata McGraw Hill, 2020.
2. D. Ravichandran, "Programming with C++", Third Edition, McGraw Hill Education, 2017.
3. Herbert Schildt, "The Complete Reference – C++", Fourth Edition, McGraw Hill Education, 2017.

CA3674	OFFICE AUTOMATION LABORATORY - II	L	T	P	C
		0	0	2	2

OBJECTIVES

- Examine spread sheet concepts and explore the Microsoft Office Excel environment.
- Learn to use functions and formulas in Excel.
- Study and apply the features of MS Access.

Course Outcome		Cognitive Skill
CO-01	Understand the usefulness and know how to use most *Excel* formulas	U, A, An
CO-02	Able to know a range of lookup and reference functions.	U,A,E
CO-03	Understand the main database objects: such as Tables, Queries, Forms, and Reports in Ms Access.	R,U,A,E
CO-04	Understand database concept for developing applications.	R,U,A,E
CO-05	Use Access to generate reports.	R, U, A ,An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	M	S	S	S	M	M	S	S	S	M	M	M
CO-02	M	M	S	S	S	S	S	M	M	M	M	M	M
CO-03	M	M	S	S	S	S	S	S	S	M	S	S	S
CO-04	M	M	S	S	S	S	S	S	M	S	S	M	M
CO-05	M	M	S	S	S	S	S	S	S	S	M	S	M

S - Strong, M -Medium,L-Low,N-Not relevant

List of Experiments

1. Mark sheet preparation using MS-Excel
2. Mathematical Functions using MS-Excel
3. Text functions using MS-Excel
4. Chart preparation using MS-Excel

5. Measure of central tendency: Mean, median, mode
6. Data Analysis using PivotTables and Pivot Charts
7. Electricity Bill Preparation using Access
8. Form Generation using Access
9. Searching for values using filters. Sorting records. Creating a form that contains a sub form.
10. Payroll Processing using Access
11. Report Generation using Access
12. Creating, previewing and printing customized reports. Creating database applications. Creating startup forms. Automating repetitive tasks using macros and the Command Button Wizard.

TOTAL: 45 PERIODS

REFERENCES:

1. Freddy Beverly, "Microsoft Office 365 Bible 15 in 1" 24th Edition.
2. Harjit Suman, "Microsoft Office 365".

SEMESTER III

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	CA3605	Programming with Java	3	1	0	4
2.	CA3606	Web Designing	3	1	0	4
3.	MA3607	Fundamentals of Statistics	3	1	0	4
4.	CA3607	Software Engineering	3	0	0	3
5.	CA3608	Computer Graphics	3	0	0	3
PRACTICAL						
6.	CA3675	JAVA Programming Lab	0	0	2	2
7.	CA3676	Web Designing Lab	0	0	2	2
TOTAL			15	3	4	22

CA3605	PROGRAMMING WITH JAVA	L	T	P	C
		3	1	0	4

OBJECTIVES

- To understand the basic concepts and fundamentals of platform independent object oriented language.
- To demonstrate skills in writing programs using exception handling techniques and multithreading.
- To understand streams and efficient user interface design techniques.

Course Outcome		Cognitive Skill
CO-01	Use the syntax and semantics of java programming language and basic concepts of OOP.	R,U,A
CO-02	Develop reusable programs using the concepts of inheritance including methods in Java	R,U,A
CO-03	Apply the concepts of packages, interfaces and thread.	R,U,A
CO-04	Apply the concepts of applets in GUI and event handling.	R,U,A
CO-05	Design event driven GUI and web related applications which mimic the real word scenarios.	R,U,A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	L	M	S	S	M	M	L	M	M	M
CO-02	M	M	M	S	S	M	M	M	S	M	M	S	M
CO-03	S	M	S	S	M	M	M	M	S	S	M	L	M
CO-04	M	S	M	M	M	S	S	M	M	S	M	M	M
CO-05	S	M	S	M	M	M	M	S	S	S	M	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Data Types, Variables and Arrays **9**

Data Types, Variables and Arrays: Primitive Data Types – Integers – Floating Point Types – Characters – Booleans – A Closer Look at Literals – Variables – Type Conversion and

Casting – Automatic Type Promotion in Expressions – One Dimensional Arrays – Multi Dimensional Arrays. Introducing Classes: Class Fundamentals – Declaring Objects – Assigning object reference variables – Introducing Methods – Constructors – Garbage Collection – Finalize() Method.

Unit II: Methods and Classes **9**

Methods and Classes: Overloading Methods – Using Objects as Parameters – Argument Passing – Returning Objects – Recursion – Introducing Access Control – Understanding Static – Introducing final – Nested and Inner Classes – String Class – Using Command line Arguments. Inheritance: Inheritance Basics – Using Super – Creating Multilevel Hierarchy – Method overriding.

Unit III: Packages, Exception and Multithreading **9**

Packages and Interfaces: Packages – Access Protection – Importing Packages – Interfaces. Exception Handling: Introduction – Exception Types – Uncaught Exceptions – Using try and catch – Multiple catch clauses – Nested try statements – throw – throws – finally. Multithreaded Programming: Java Thread Model – Main Thread – Creating a Thread – Creating Multiple Threads.

Unit IV: Applet and Event Handling **9**

The Applet Class: Applet Basics – Applet Architecture – Applet Skeleton – Applet Display Method – Requesting Repainting – HTML Applet Tag – Passing Parameters to Applet. Event Handling: Event Handling Mechanisms – Delegation Event Model – Event Classes (The Action Event, Item Event, Key Event, Mouse Event) – Sources of Events – Event Listener Interfaces (Action Listener, Item Listener, Key Listener, Mouse Listener).

Unit V: AWT Controls **9**

Introducing the AWT: AWT Classes – Window Fundamentals – Working with frame Windows – Working with Graphics – Working with Color – Working with Fonts. Using AWT Controls: Controls Fundamentals – Labels – Using Buttons – Applying Checkboxes – Checkbox Group – Choice Controls – Using a Text Field – Using a Text Area – Understanding Layout Managers [Flow Layout Only] – Menu Bars and Menus.

TOTAL: 45 + 15 = 60 HOURS

TEXT BOOK

1. Herbert Schildt, "Java the Complete Reference", Tata Mcgraw Hill Publications.9th Edition, 2014

REFERENCES:

1. C. Muthu, " Programming with Java", McGraw Hill Education,2008
2. C. Xavier, " Java Programming A Practical Approach", Tata Mcgraw Hill Publications, 2011
3. SachinMalhotra, SaurabhChoudhary, " Programming in Java", Oxford University Press,2013

CA3606	WEB DESIGNING	L	T	P	C
		3	1	0	4

OBJECTIVES

- Students use their learned skills, knowledge and abilities to develop web sites for the internet.
- Apply basic design principles to present ideas, information, products, and services on websites.
- Apply basic programming principles to the construction of websites.
- Effectively manage website projects using available resources.
- Demonstrate communication skills, service management skills, and presentation skills.

Course Outcome		Cognitive Skill
CO-01	Apply the basic concepts of web designing and HTML	R,U,A
CO-02	Apply the tags related to forms and images	R,U,A
CO-03	Apply the concepts of XML and DHTML	R,U,A
CO-04	Apply java script in web designing	R,U,A
CO-05	Apply Ajax and how it is used in Java script	R,U,A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	M	L	M	S	S	M	M	L	M	M	L
CO-02	M	M	M	S	S	M	M	M	S	M	S	S	M
CO-03	S	S	S	S	M	S	M	S	S	S	M	L	M
CO-04	L	S	M	M	M	S	S	M	M	L	L	M	M
CO-05	M	L	S	S	L	M	M	S	S	S	M	S	L

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: HTML **9**

HTML – Introduction - tag basics - page structure - adding comments working with texts - paragraphs and line break. Emphasizing test - heading and horizontal rules – list - font size - face and color – alignment links – tables – frames.

Unit II: Forms and Images using HTML **9**

Graphics: Introduction - How to work efficiently with images in web pages - image maps - GIF animation - adding multimedia - data collection with html forms textbox – password – list box - combo box - text area - tools for building web page front page.

Unit III: XML and DHTML **9**

Cascading style sheet (CSS) - what is CSS - Why we use CSS - adding CSS to your webpages - Grouping styles-extensible markup language (XML). Dynamic HTML: Document object model (DCOM) - Accessing HTML & CSS through DCOM Dynamic content styles & positioning –Event bubbling - data binding.

Unit IV: Java Script **9**

Client side scripting - What is JavaScript - How to develop JavaScript - simple JavaScript – variables – functions – conditions - loops and repetition - Advance script - JavaScript and objects – JavaScript own objects - the DOM and web browser environments - forms and validations.

.

Unit V: AJAX **9**

Introduction - advantages & disadvantages - Purpose of it - AJAX based web application - alternatives of AJAX. Java Script & AJAX: Introduction to array-operators, making statements - date & time - mathematics strings - Event handling - form properties. AJAX. Introduction to jQuery and AngularJS

TOTAL: 45 + 15 = 60 HOURS

TEXT BOOKS

1. Pankaj Sharma, “Web Technology”, SkKataria& Sons Bangalore 2011.(UNIT I, II, III & IV).
2. Mike Mcgrath, “Java Script”, Dream Tech Press 2006, 1st Edition. (UNIT V: JAVASCRIPT)
3. Achyut S Godbole&AtulKahate, “Web Technologies”, 2002, 2nd Edition. (UNIT V: AJAX)

REFERENCES:

1. N. P. Gopalan , J. Akilandeswari ,”Web Technology : A Developers Perspective3.43”, PHI Learning, 2014
2. Kogent, “Learning Solutions,Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book”, 2013.

MA3607	FUNDAMENTALS OF STATISTICS	L	T	P	C
		3	1	0	4

OBJECTIVE

- To have the fundamental knowledge of basic statistical and probability concepts, the standard distributions and equip the students with different statistical techniques which are essential to solve practical problems.

	Course Outcome	Cognitive Skill
CO-01	Define the basic concepts of sampling, Categorize the different sampling methods, know the complementary relationship of skewness with measures of central tendency and dispersion in describing a set of data, 'moments' as a convenient and unifying method for summarizing several descriptive statistical measures.	R, U, A, An, E, S
CO-02	Apply the axioms of probability in assigning probabilities to the basic outcomes in a sample space, Compute conditional probabilities using Bayes' theorem and the law of total probability, probability mass functions for discrete random variables and continuous random variables and expectation.	R, U, A, An, E, S
CO-03	Calculate the moments and formulate the Moment Generating Function, Describe the characteristics and compute probabilities using Binomial, Poisson, Uniform, Exponential and Normal distributions.	R, U, A, An, E, S
CO-04	Calculate and interpret the correlation between two variables, Determine whether the correlation is significant, the simple linear regression equations for a set of data	R, U, A, An, E, S
CO-05	Understand problem of statistical inference, Conduct hypothesis test about population mean and proportions using sample tests, To understand how to use *F*-test to judge whether two population variances are equal	R, U, A, An, E, S

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	M	S	M	M	S	S	M	S	S	M
CO-02	S	S	S	M	M	L	S	M	M	S	M	L	S
CO-03	S	M	M	M	M	M	S	M	M	M	S	M	L
CO-04	S	S	S	S	M	S	L	S	S	S	S	M	S
CO-05	S	M	S	S	S	S	S	S	L	S	S	L	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Descriptive Statistics **9**

Introduction to Statistics - Basic concepts - population and sample - Collection of data - census and sampling - Methods of sampling - Random and Non random sampling methods - Frequency distributions -Measures of central tendency - measures of dispersion – moments - skewness and kurtosis.

Unit II: Probability and Random Variables **9**

Axioms of probability - Conditional probability – Independent Events - Total probability – Baye's theorem- Random variables - Probability mass functions - Probability density functions - Properties – Expectation.

Unit III: Standard Distributions **9**

Moments and Moment generating function – Binomial – Poisson – Uniform - Exponential and Normal distributions (simple problems only).

Unit IV: Correlation and Regression Analysis **9**

Scatter diagram - Types of correlation - Karl Pearson's correlation coefficient - properties of correlation coefficient - Rank correlation - Linear regression.

.

Unit V: Testing of Hypothesis **9**

Sampling distribution – Standard error – Sample size – Type I error and Type II error - One tailed and two tailed tests – Proportions – means – Small sample tests – student's t-test – Single mean, difference of means – F test for variances.

TOTAL: 45 + 15 = 60 HOURS

TEXT BOOKS

1. Gupta, S.C, and Kapur, J.N., "Fundamentals of Mathematical Statistics", Sultan Chand, Ninth Edition , New Delhi ,1996.

REFERENCES:

1. Hogg R.V & Craig A.L. "Introduction to Mathematical Statistics", American publishing Co Pvt Ltd.
2. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi , 2002.
3. Lipschutz. S and Schiller. J, "Schaum's outlines - Introduction to Probability and Statistics",
McGraw-Hill, New Delhi, 1998.

CA3607	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES

- Demonstrates agility in solving software and system challenges with a comprehensive set of skills appropriate to the needs of the dynamic global computing-based society.
- Capable of diverse team and organizational leadership in computing project settings.
- Demonstrates ethical principles in the application of computing-based solutions to societal and organizational problems.
- Continually acquires skills and knowledge to support a professional pathway, including (but not limited to) communication, analytic, and technical skills.

Course Outcome		Cognitive Skill
CO-01	To discuss software engineering concept basic steps to develop software.	R,U
CO-02	To discuss the concept of requirement analysis, developing use cases and building analysis models.	R,U,An
CO-03	To discuss the design models and its analysis.	R,U,A
CO-04	To explain the different software testing methods and its usage	A,An,E
CO-05	To define the software quality assurance, Reliability and Quality standards.	A,An,E,S

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	L	M	S	S	M	M	L	M	M	L
CO-02	M	L	M	S	S	M	L	M	S	M	M	S	M
CO-03	S	M	S	S	M	M	L	M	S	S	M	L	M
CO-04	S	S	M	L	M	S	S	M	M	L	M	M	L
CO-05	M	L	S	M	L	M	L	S	S	S	L	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction **9**

A Generic View of Process – Process Models - The Waterfall Model - Incremental Model - Spiral Model -Software Cost Estimation – Planning – Risk Analysis – Software Project Scheduling.-Rapid Prototyping.

Unit II: Requirement Analysis **9**

System Engineering Hierarchy – System Modeling – Requirements Engineering: Tasks-Initiating The Process - Eliciting Requirements - Developing Use Cases - Negotiating Requirements - Validating Requirements – Building the Analysis Models: Concepts.

Unit III: Software Design **9**

Design Concepts – Design Models – Architectural Design – Component Level Design – object oriented design - Class Based and Conventional Components Design – User Interface – Analysis and Design.

Unit IV: Software Testing **9**

Software Testing – Strategies: Conventional - Object Oriented – Validation Testing – Criteria – Alpha – Beta Testing - System Testing – Recovery – Security – Stress – Performance Testing Tactics – Testing Fundamentals - Black Box – White Box – Basis Path - Control Structure.

.

Unit V: SCM and Quality Assurance **9**

Software Configuration And Management – Features - SCM Process - Software Quality Concepts – Quality Assurance – Software Review – Technical Reviews – Formal Approach To Software Quality Assurance – Reliability – Quality Standards – Software Quality Assurance Plan.

TOTAL: 45 HOURS

TEXT BOOKS

1. RohitKhurana," Software Engineering: Principles and Practices ", Second edition, VIKAS Publishing House PVT Ltd,2007
2. Roger Pressman.S., "Software Engineering: A Practitioner's Approach", 7thEdition, Mcgraw Hill, 2010.

REFERENCES:

1. I. Sommerville, "Software Engineering" , 9th Edition: Addison Wesley, 2011.
2. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli, "Fundamentals of Software Engineering", Prentice Hall of India 1991.

CA3608	COMPUTER GRAPHICS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn fundamental computer graphics techniques;
- To learn image generation techniques

Course Outcome		Cognitive Skill
CO-01	To evaluate and analyze overview of computer graphics system	R,U
CO-02	To apply and understand output primitives and attributes	U,A
CO-03	To understand and apply two dimensional graphics transformations and viewing	U,A
CO-04	To synthesis and apply three dimensional graphics and viewing	S,A
CO-05	To synthesis and analysis illumination and rendering methods	S,An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	M	M	L	S	M	L	M	M	M	M
CO-02	M	M	S	M	S	M	S	M	M	L	M	M	L
CO-03	S	L	S	M	S	S	M	S	M	S	S	S	S
CO-04	S	M	M	M	M	M	S	S	S	S	M	M	L
CO-05	S	M	M	M	L	S	S	M	S	M	M	M	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Overview Of Computer Graphics System **9**

Overview of Computer Graphics System – Video display devices – Refresh Cathode Ray tubes - Raster Scan and random scan system – Input devices – Hard copy devices.

Unit II: Output Primitives And Attributes **9**

Drawing line - circle and ellipse generating algorithms – Scan line algorithm – Character generation – attributes of lines - curves and characters – Anti aliasing.

Unit III: Two Dimensional Graphics Transformations And Viewing **9**

Two Dimensional Geometric Transformations – Windowing and Clipping – Clipping of lines and clipping of polygons - Viewing pipeline - viewing coordinate reference frame - window to viewport transformation – Curve and Text clipping algorithms.

Unit IV: Three Dimensional Graphics And Viewing **9**

Three dimensional concepts – Object representations - Polygon table - Quadric surfaces – Splines - Bezier curves and surfaces – Geometric and Modeling transformations – Viewing pipeline - viewing coordinates - Parallel and perspective projections.

Unit V: Illumination and Rendering Methods **9**

Light Sources - Basic Illumination models - Displaying light intensities - Halftone patterns and dithering techniques – Polygon rendering methods - ray Tracing Methods – Adding surface details.

TOTAL: 45 HOURS

TEXT BOOK

1. Hearn, D. and Pauline Baker, M., "Computer Graphics (C- ersion)" ,2nd Edition, PearsonEducation, Delhi ,2009.

REFERENCES:

1. Roger, D.F., "Procedural elements for Computer Graphics", McGraw Hill Book Co., 2010.
2. Arun D. Udai,Amerandra N. Sinha., "Computer Graphics", TMH, NewDelhi,2008
3. Floey, J.D., Van Dam, A, Feiner, S.K. and Hughes, J.F, "Computer Graphics", PearsonEducation, New Delhi,2011.

CA3675	JAVA PROGRAMMING LAB	L	T	P	C
		0	0	2	2

OBJECTIVES

- To write programs using abstract classes.
- To write programs for solving real world problems using java collection frame work.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To impart hands on experience with java programming.

Course Outcome		Cognitive Skill
CO-01	Able to write programs for solving real world problems using java collection frame work.	A, An
CO-02	Able to write programs using overloading and inheritance.	R, U, A, AN
CO-03	Write programs in interface and packages	A, An, E, C

CO-04	Able to write programs in exception handling and applets.	A, An, E, C
CO-05	Able to write GUI programs using AWT controls in Java	A, An, E, C

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	S	S	S	S	S	S	M	M	M	S	S
CO-02	S	M	S	M	M	S	S	S	S	M	S	S	S
CO-03	S	M	S	S	S	M	S	M	S	M	S	S	M
CO-04	S	M	M	M	M	S	S	S	S	M	M	M	M
CO-05	S	M	M	M	M	M	M	M	M	M	M	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

List of Experiments

1. Write a Java program using control structures
2. Write a Java program using arrays
3. Write a Java program using method overloading
4. Write a Java program using inheritance
5. Write a Java program using interfaces
6. Write a Java program using command line arguments
7. Write a Java program using Packages
8. Write a Java program using Exception Handling
9. Write a Java program that describes the life cycle of an applet.
10. Write a Java program to create a simple calculator using AWT.
11. Write a Java program using thread.
12. Write a Java program to create menu bar and pull down menus.

TOTAL: 45 HOURS

REFERENCES:

1. C. Muthu, " Programming with Java", McGraw Hill Education,2008

2. C. Xavier, " Java Programming A Practical Approach", Tata Mcgraw Hill Publications, 2011

3. SachinMalhotra, SaurabhChoudhary, " Programming in Java", Oxford University Press,2013

CA3676	WEB DESIGNING LAB	L	T	P	C
		0	0	2	2

OBJECTIVES

- To develop webpage using HTML.
- To write programs for creating web pages for real world problems.

Course Outcome		Cognitive Skill
CO-01	Able to develop web pages for solving real world problems using basic HTML tags.	A, An
CO-02	Able to develop web pages with GUI controls.	R, U, A, AN
CO-03	Develop Web pages with client and server pages	A, An, E, C
CO-04	Develop Web pages with database connectivity	A, An, E, C
CO-05	Develop Web pages using XML	A, An, E, C

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	M	L	M	S	S	M	M	L	M	M	L
CO-02	M	M	M	S	S	M	M	M	S	M	S	S	M
CO-03	S	S	S	S	M	S	M	S	S	S	M	L	M
CO-04	L	S	M	M	M	S	S	M	M	L	L	M	M
CO-05	M	L	S	S	L	M	M	S	S	S	M	S	L

S-Strong, M-Medium,L-Low,N-Not relevant

List of Experiments

1. Create a HTML page, which has properly aligned paragraphs with image along with it.
2. Write a program to display list of items in different styles.
3. Design simple calculator.
4. Create a web page that navigated through multiple pages with selection controls.
5. A web application based on the selection of role of employee.
6. Create both client side and server side image maps.
7. Create your own style sheets and use them in your web page.

8. Create a form with various fields and appropriate front and validations using any one of the scripting languages.
9. Write a program to store the form fields in a database, use any appropriate Server Slide Scripting.
10. Create a web page using XML.
11. Write a program to connect a XML web page to any database engine.

TOTAL: 45 HOURS

REFERENCES:

1. Pankaj Sharma, “Web Technology”, SkKataria& Sons Bangalore 2011
2. Mike Mcgrath, “Java Script”, Dream Tech Press 2006, 1st Edition.
3. Achyut S Godbole&AtulKahate, “Web Technologies”, 2002, 2nd Edition.

SEMESTER IV

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	CA3609	Data structures	3	1	0	4
2.	CA3610	Computer Networks	4	0	0	4
3.	CA36**	Elective I	3	0	0	3
4.	CA3611	Python Programming	3	1	0	4
5.	CA3612	Operating System	3	0	0	3
PRACTICAL						
6.	CA3677	Data structures Lab	0	0	2	2
7.	CA3678	Python Programming Lab	0	0	2	2
TOTAL			16	2	4	22

CA3609	DATA STRUCTURES	L	T	P	C
		3	1	0	4

OBJECTIVE

- The general objective of this course is to provide fundamental concepts of data structures, different algorithms and their implementation.

	Course Outcome	Cognitive Skill
CO-01	Implement abstract data types using arrays and linked list.	R,U,A
CO-02	Apply the different linear data structures like stack and queue to various computing problems.	R,U,A
CO-03	Implement different types of trees and apply them to problem solutions.	R,U,A
CO-04	Discuss graph structure and understand various operations on graphs and their applicability.	R,U,A
CO-05	Analyze the various sorting and searching algorithms. CO6 Understand the hashing technique and hash functions.	R,U,A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	L	M	S	S	M	M	L	M	M	L
CO-02	M	L	M	S	S	M	M	M	S	M	M	S	M
CO-03	S	M	S	S	M	M	M	M	S	S	M	L	M
CO-04	S	S	M	M	M	S	S	M	M	L	M	M	L
CO-05	M	M	S	M	M	M	L	S	S	S	M	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction **9**

Dynamic aspects of operations on data - Characteristics of data structures - Creation and manipulation of data structures - Operations on data structures - Types of data structures – linear and nonlinear.

Unit II: Arrays and Linked List **9**

Arrays: Dynamic memory allocation - one-dimensional arrays - multidimensional arrays - operations on arrays - Linked lists: types of linked lists – singly - doubly and circularly linked lists - operations on linked lists.

Unit III: Stacks and Queues **9**

Stacks: Implementation of stacks – array and linked list - operations on stacks - Applications of Stacks - Notations – infix - prefix and postfix. Queues: Implementation of queues – array and linked list - operations on queues - Types of queues – queue - double ended queue and priority queue.

Unit IV: Trees and Graphs **9**

Trees: Binary tree - Binary search tree - Threaded binary tree - Height balanced trees – Trees – Heaps - Hash tables. Graph traversals: Breadth First Search - Depth First Search - Shortest path: Depth first search in directed and undirected graphs.

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Unit V: Searching and Sorting **9**

Searching: Linear search - Binary search and Hashing. Algorithms and data structures for sorting: Insertion Sort - Bubble sort - Selection Sort - Merge sort - Quick Sort.

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TOTAL: 45 + 15 = 60 HOURS

TEXT BOOKS

1. E. Horowitz and S. Sahni, “Fundamentals of Data Structures”, Publisher Computer Science Press, Second Edition, 2008.
2. E. Balagurusamy, “Data Structures Using C”, Tata McGraw Hill, 2013.

REFERENCES:

1. R.L. Kruse, “Data Structure and Program Design”, Prentice Hall, Second Edition, 1996.
2. M. Tanenbaum, Y. Langsam, M. J. Augenstein, “Data Structures Using C”, Pearson Education, 1990.

CA3610	COMPUTER NETWORKS	L	T	P	C
		4	0	0	4

OBJECTIVES

- To understand the basic networking concepts, types of addresses, data communication, protocols etc.
- To understand wired and wireless networks, its types, functionality of each layer.
- To understand importance of network security and cryptography.

Course Outcome		Cognitive Skill
CO-01	To study the basic concepts of networking with hardware and software.	R,U, An
CO-02	To be familiar with physical layer concepts.	R,U, An
CO-03	To understand the concepts of data link layer with protocols.	R,U, An
CO-04	To be familiar with network layer concepts with its protocol.	R,U, An
CO-05	To be familiar with application layer and security.	R,U, An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	M	L	M	S	S	M	M	L	M	M	L
CO-02	M	M	M	S	S	M	M	M	S	M	M	S	M
CO-03	S	M	S	S	M	M	M	M	S	S	M	L	M
CO-04	L	S	M	M	M	S	S	M	M	L	M	M	M
CO-05	M	L	S	M	L	M	M	S	S	S	M	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Network hardware and software **12**

Uses of computer Networks - Network hardware: LAN – WAN - MAN – Wireless – Home Networks. Network Software: Protocol Hierarchies – connection oriented and connection less services. Reference Models: OSI Reference Model - TCP/IP reference Model - Comparison of OSI and TCP/IP.

Unit II: Physical Layer **12**

Guided Transmission Media: Twisted Pair Cable - Coaxial Cable - Fiber-Optic Cable.Wireless Transmission: Electro Magnetic Spectrum - Radio Transmission - Microwave Transmission. Communication Satellites - Public Switched Telephone Network - The Mobile Telephone System.

Unit III: Data Link Layer **12**

Data Link Layer Design Issues - Error Detection and Correction – Elementary data link protocols - Sliding Window Protocols – Example Data Link Protocols.

Unit IV: Network Layer **12**

Network Layer Design Issues - Routing Algorithms - Congestion Control Algorithms - Quality of Service – Internetworking. Transport Layer: Transport Services – Elements of transport protocols – Performance issues.

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Unit V: Application Layer **12**

DNS – Email, network security: cryptography – symmetric key algorithms – public key algorithms - digital signatures.

TOTAL: 60 HOURS

TEXT BOOK

1. Andrew S.Tanenbaum, "Computer Networks", David J.Wetherall, Fifth edition, Pearson Education , 2011

REFERENCES:

1. Bhushan Trivedi, "Computer Networks" Oxford University Press.
2. Achut Godbole, "Data communication and Networks" –2007 PHI.
3. "Computer Networks Protocol, Standards and Interfaces" – Uyless Black, 2 nd Edition PHI.

CA3611	PYTHON PROGRAMMING	L	T	P	C
		3	1	0	4

OBJECTIVES

- To understand the principles of python and acquire skills in programming in python.
- To develop the emerging applications of relevant field using python.
- Interpret the fundamental python syntax and semantics and be fluent in the use of python control flow statements.

Course Outcome		Cognitive Skill
CO-01	To demonstrate an understanding the basic role of python programming.	R,U,A
CO-02	Describe the core syntax and semantics of python programming language.	R,U,A
CO-03	Discover the need for working with the strings and functions.	R,U,A

CO-04	Understand and apply Lists, Tuples and Dictionaries	R,U,An
CO-05	Develop programs in files and modules	R,U,E

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	L	M	S	S	M	M	L	M	M	M
CO-02	M	M	M	S	S	M	M	M	S	M	M	S	M
CO-03	S	M	S	S	M	M	M	M	S	S	M	L	M
CO-04	M	S	M	M	M	S	S	M	M	S	M	M	M
CO-05	S	M	S	M	M	M	M	S	S	S	M	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Basics of Python Programming **9**

History of Python – Features of Python – Literal constants – Variables – Identifiers – Keywords – Built in data types – Output Statements – Input Statements – Comments – Indentation – Operators – Expressions – Type Conversions.

Unit II: Control Statements **9**

Selection / Conditional Branching Statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: While loop, for loop, Nested loops. Jump Statements: Break, Continue and Pass Statements. Python Arrays: Defining and Processing Arrays – Array Methods.

Unit III: Functions **9**

Function Definition – Function Call – Variable scope and its lifetime – Return Statement. Function Arguments: Required Arguments – Keyword Arguments – Default Arguments and Variable length arguments – Recursion. **Python Strings:** String Operations – Immutable Strings – Built in String Methods and Functions – String Comparison.

Unit IV: Lists, Tuples and Dictionaries **9**

Lists: Creating a List – Access Values in list – Updating Values in lists – Nested lists – Basic list operations – List Methods. Tuples: Creating, Accessing, Updating and Deleting elements in a tuple – Nested Tuples – Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting elements in a dictionary – Dictionary Functions and Methods – Difference between lists and dictionaries.

Unit V: File Handling and Modules **9**

Python File Handling: Types of files in Python – Opening and Closing files – Reading and Writing files: Write() and Writelines() Methods – Append() Method – read() and readlines() Methods – With Keyword – Splitting words. Modules: Import Statement – The Python module –dir() Function – Modules and namespace – Defining our own modules.

TOTAL: 45 + 15 = 60 HOURS

TEXT BOOKS

1. ReemaThareja, "Python Programming using problem solving Approach", First Edition, 2017, Oxford University Press.
2. Dr. R. NageswaraRao, "Core Python Programming", First Edition 2017, Dreamtech Publishers.

REFERENCES:

1. VamsiKurama, " Python Programming: A Modern Approach", Pearson Edition.
2. Mark Lutz, "Learning Python Powerful Object Oriented Programming", O'reilly, Media 2018, 5th Edition.

CA3612	OPERATING SYSTEM	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the fundamental concepts and role of Operating System.
- To learn the Process Management and Scheduling Algorithms
- To understand the Memory Management policies
- To gain insight on I/O and File management techniques

Course Outcome		Cognitive Skill
CO-01	Understand the structure and functions of Operating System	R,U
CO-02	Understand the concept of process synchronization	R,U
CO-03	Understand how the memory management done in operating system.	R,U
CO-04	Understand how the virtual memory management in operating system.	R,U
CO-05	Analyzes source management techniques	R,U, An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	M	L	M	S	S	M	M	L	M	M	L
CO-02	M	M	M	S	S	M	M	M	S	M	M	S	M
CO-03	S	M	S	S	M	M	M	M	S	S	M	L	M
CO-04	L	S	M	M	M	S	S	M	M	L	M	M	M
CO-05	M	L	S	M	L	M	M	S	S	S	M	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction to Operating System **9**

What is an operating system - Operating system components and goals - OS structure? Process Management: Process -Process Scheduling - Inter-process Communication. CPU Scheduling: CPU Schedulers - Scheduling Criteria – Scheduling Algorithms.

Unit II: Process Synchronization **9**

Critical - Section Problem - Synchronization Hardware Semaphores – Classical Problems of Synchronization-Monitors. Deadlocks: Characterization-Methods for Handling Deadlocks - Deadlock Prevention – Avoidance – Detection - Recovery.

Unit III: Memory Management **9**

Hardware - Address Binding – Address Space - Dynamic Loading and Linking – Swapping – Contiguous Allocation - Segmentation- Paging – Structure of the Page Table.

Unit IV: Virtual Memory Management **9**

Demand Paging - Page Replacement Algorithms. File System: File Concept -. Access Methods - Directory and Disk Structure - Protection - File System Structures – Allocation Methods - Free Space Management.

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Unit V: I/O Systems **9**

Overview - I/O Hardware – Application I/O Interface - Transforming I/O Requests to Hardware Operations - Performance. System Disk Performance Optimization: Introduction - Why Disk Scheduling is necessary? - Disk Scheduling strategies.

TOTAL: 45 HOURS

TEXT BOOK

1. Abraham Silberschatz, Peter B Galvin,Greg Gagne, “Operating System Concepts”, Wiley India Pvt. Ltd 2018, 9th Edition,.

REFERENCES:

1. William Stallings, “Operating Systems Internals and Design Principles”, Pearson, 2018, 9thEdition.
2. Andrew S. Tanenbaum, Herbert Bos,“Modern Operating Systems”,Pearson2014,4thEdition.
3. Pramod Chandra P.Bhatt, “An introduction to Operating systems concepts and Practice”, ,PHI, Second Edition, 2008.
4. Dhananjay M.Dhamdhere, “Operating Systems, A Concept Based Approach”, Tata McGraw Hill, 3rd Edition, 2012.

CA3677	DATA STRUCTURES LAB	L	T	P	C
		0	0	2	2

OBJECTIVES

- To design and analyse simple linear and non-linear data structures
- Ability to identify and apply the suitable data structure for the given real world problem.
- To gain knowledge in practical applications of data structures

Course Outcome		Cognitive Skill
CO-01	To implement the C program for array concept.	A, An
CO-02	To write, test and debug programs for stack and queue.	R, U, A, AN
CO-03	To implement C programs for sorting and searching.	A, An, E, C
CO-04	To implement C programs for linked list.	A, An, E, C
CO-05	To implement C programs for graph traversal	A, An, E, C

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	M	L	M	S	S	M	M	L	M	M	L
CO-02	M	M	M	S	S	M	M	M	S	M	S	S	M
CO-03	S	S	S	S	M	S	M	S	S	S	M	L	M
CO-04	L	S	M	M	M	S	S	M	M	L	L	M	M
CO-05	M	L	S	S	L	M	M	S	S	S	M	S	L

S-Strong, M-Medium,L-Low,N-Not relevant

List of Experiments

1. Implement insert, delete elements in array
2. Implement search an element in an array.
3. Implementation of stack using array
4. Implementation of Queue using array
5. Conversion of given infix expression into prefix and postfix
6. Implementation of bubble sort
7. Implementation of merge sort
8. Implementation of Circular Queue
9. Implementation of Singly linked list using array
10. Implementation of doubly linked list using array
11. Implementation of linear search
12. Implementation of graph traversal.

TOTAL: 45 HOURS

REFERENCES:

1. E. Balagurusamy, “Data Structures Using C”, Tata McGraw Hill, 2013.
2. R.L. Kruse, “Data Structure and Program Design”, Prentice Hall, Second Edition, 1996.
3. A. M. Tanenbaum, Y. Langsam, M. J. Augenstein, “Data Structures Using C”, Pearson Education, 1990.

CA3678	PYTHON PROGRAMMING LAB	L	T	P	C
		0	0	2	2

OBJECTIVES

- Understand the numeric or real-life application problems and solve them.
- Apply a solution clearly and accurately in a program using Python.
- Apply the best features available in Python to solve the situational problems.

Course Outcome		Cognitive Skill
CO-01	To implement the python programming features in practical applications.	A, An
CO-02	To write, test and debug simple python programs.	R, U, A, AN
CO-03	To implement python programs with conditionals and loops.	A, An, E, C
CO-04	Use functions for structuring python programs.	A, An, E, C
CO-05	To implement python programs for file manipulation.	A, An, E, C

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	L	M	S	S	M	M	L	M	M	M
CO-02	M	M	M	S	S	M	M	M	S	M	M	S	M
CO-03	S	M	S	S	M	M	M	M	S	S	M	L	M
CO-04	M	S	M	M	M	S	S	M	M	S	M	M	M
CO-05	S	M	S	M	M	M	M	S	S	S	M	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

List of Experiments

1. Python Program using variables, I/O statements, Operators.
2. Python Program using Conditional Statements.
3. Python Program using Loops.
4. Python Program using Functions.
5. Python Program using Recursion.
6. Python Program using Arrays.
7. Python Program using Strings.
8. Python Program using Modules.

9. Python Program using Lists.
10. Python Program using Tuples.
11. Python Program using Dictionaries.
12. Python Program using Exception handling.
13. Python Program for File Handling.

TOTAL: 45 HOURS

REFERENCES:

1. ReemaThareja, “Python Programming using problem solving Approach:, First Edition, 2017, Oxford University Press.
2. Dr. R. NageswaraRao, “Core Python Programming:, First Edition 2017, Dreamtech Publishers.

SEMESTER V

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	CA3613	VB.Net Programming	3	1	0	4
2.	CA3614	Data Base Management Systems	3	1	0	4
3.	CA****	Elective II	3	0	0	3
4.	CA3615	Artificial Intelligence	3	0	0	3
5.	CA3616	Cyber Security	3	0	0	3
PRACTICAL						
6.	CA3679	VB.Net Programming Lab	0	0	2	2
7.	CA3680	DBMS Lab	0	0	2	2
8.	CA36P1	Internship	0	0	0	2
TOTAL			15	3	4	23

CA3613	VB.NET PROGRAMMING	L	T	P	C
		3	1	0	4

OBJECTIVES :

- To understand the .NET Framework, characteristics**,** components, **and its** versions**.**
- To understand the practical coding and application development skills using VB.Net.
- To Utilize variables, data types, and operators to store, manipulate, and evaluate data within VB.NET applications.
- To access the databases in VB.Net applications and use web based applications.

Course Outcome		Cognitive Skill
CO-01	Understand the basics of the Visual Basic .NET language, including syntax, programming structures, and the integrated development environment.	R,U
CO-02	Apply control structures and loops to manage the flow of execution and perform repetitive tasks efficiently.	U,A
CO-03	Develop and use functions and subroutines to organize code into reusable blocks, enhancing modularity and readability.	A,An
CO-04	Access, manipulate and manage data from databases, and understand the use of SQL within VB.NET applications.	U,An,E
CO-05	Design user interfaces for window, mobile and web based applications.	A,E,An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	L	M	S	M	L	M	S	M	S
CO-02	L	M	S	M	S	S	S	S	L	M	S	M	S
CO-03	M	M	S	S	S	S	L	M	S	M	M	M	L
CO-04	M	L	M	M	M	S	S	S	S	S	S	S	S
CO-05	L	S	S	S	S	M	M	M	M	M	M	M	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: INTRODUCTION TO .NET **12**

.Net framework overview - Common type system - Common intermediate language – Namespace - Encapsulation – Polymorphism – Interfaces –XML - ADO.NET. Our First VB.Net Program: The solution explorer window - Class view window –Toolbox - Output Window- Task list Window. Data Types and Operators: Literals – Variables - Data types - Declaration of Variables – Constants – Statements – Operators – Keywords –Comments - Scope of Variables - Console application in VB.Net.

Unit II: Control Statements **12**

If Statement – Looping - Select Case- Go To statement- Intrinsic Control list form control- Events- label- Textbox- Group box- check box- radio button -Scroll bar- Ctype- Track bar- Timer- Picture box- Working with mouse input Link Label- Date time Picker- Month Calendar. Arrays: One dimensional Array- Array Initialization- Redim Statement- Multi dimensional Array- Array of array- List box control- Checked list box control- Combo Box control.

Unit III: Procedures and Structures **12**

Subroutine procedures- Functions- Value returned by its function name- the return statement- Calling a function- Call by reference- Functions with arrays- Functions with Param arrays- Function Overloading- Sub Procedure-Structure- Functions inside the Structure- Nested Structures- Message box functions- Input box function. Creating Menus and using Dialog boxes: Menu- MDI form- Context Menu- Rich Text box- Color Dialog control- Font Dialog control.

Unit IV: Data Access With ADO.NET **12**

Database- Relational database- Table Creation- Record insertion- Displaying data- Deleting Data- Modifying Data- Drop Table-Special Features of ADO.NET- Difference between ADO & ADO.NET Connections- Commands- Data Reader- Data Set- Using Data Grid- Using Data Adapter configuration wizard- XML &ADO.NET- XML document to ADO.NET data- Filtering data using Data View- Complex data binding Command parameters property- Using stored procedures with a command.

Unit V: Web Application with Vb.Net And ASP.NET **12**

Our first web application- Server controls- Validation Summary ControlADO.NET& Data Binding. Advanced Controls and Making Reports in VB.NET: Tab Control- Toolbar Control- Error Provider Control- Tree View Control- Creating a user control in VB.NET- Adding a user control in VB.NET- Making Reports in VB.NET.

TOTAL: 60HOURS

TEXT BOOKS

1. VB.NET by P.Radhaganesan, Scitech Publications, Chennai, 2012
2. Visual Basic .Net Programming Black Book by STEVEN HOLZNER, Dreamtech Press,2017
3. Visual Basic 6 from the Ground Up by Gary Cornell, Osborne Mcgraw Hill.,2017
4. Programming VB .NET: A Guide for Experienced Programmers Gary Cornell and Jonathan Morrison,2001

REFERENCES:

1. Greg Buczek, “ASP .NET Developer’s Guide”, Tata McGraw – Hill.,2002

CA3614	DATABASE MANAGEMENT SYSTEM	L	T	P	C
		3	1	0	4

OBJECTIVES:

- Explore and comprehend the essential concepts of database management.
- Learn the principles of the Relational Data Model and the Entity-Relationship Model for effective data representation.
- Design database schemas with a focus on normalization and the relationships among data entities.
- Construct and manage databases using Structured Query Language (SQL), including various join operations and techniques for handling multiple tables.
- Acquire foundational knowledge of PL/SQL and create programs that utilize cursors and exception handling.

Course Outcome		Cognitive Skill
CO-01	To study and understand the basic concepts of database	R, U
CO-02	Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	R,U
CO-03	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language	U, An
CO-04	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables	R, U, A
CO-05	Learn basics of PL/SQL and develop programs using Cursors, Exceptions	R, U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	L	S	S	M	S	S	S	M	M	S	S	S	L
CO-02	M	L	S	M	S	S	S	M	S	S	S	S	M
CO-03	S	M	S	L	S	S	S	S	M	S	S	M	M
CO-04	M	M	S	M	S	S	S	L	M	S	L	M	S
CO-05	M	S	S	L	S	S	S	L	S	S	L	L	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Database Concepts **12**

Database Systems - Data vs Information – Introducing the database -File system - Problems with file system - Database systems.Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction

Unit II: Design Concepts **12**

Relational database model - logical view of data-keys - Integrity rules - relational set operators - data dictionary and the system catalog- relationships -data redundancy revisited -indexes - codd's rules - Entity relationship model - ER diagram. Relational Algebra - Selection and projection set operations - renaming - Joins - Division - Examples of Algebra overviews - Relational calculus - Tuple relational Calculus - Domain relationalcalculus.

Unit III: Introduction to normalization and SQL **12**

Functional Dependencies - Non-Loss Decomposition Functional Dependencies- Database tables and Normalization - The Need for Normalization- Data Definition Commands - Data ManipulationCommands - SELECT Queries - Additional Data Definition Commands - Additional SELECT Query Keywords - Joining Database Tables.

Unit IV: Advanced SQL **12**

Relational SET Operators: UNION - UNION ALL - INTERSECT - MINUS.SQL Join Operators: Cross Join - Natural Join - Join USING Clause - JOIN ON Clause - Outer Join. Sub Queries andCorrelated Queries: WHERE - IN - HAVING - ANY and ALL - FROM.

SQL Functions: Date and Time Function - Numeric Function - StringFunction - Conversion Function.

Unit V:PL/SQL **12**

A Programming Language: History - Fundamentals - BlockStructure - Comments - Data Types - VariableDeclaration - Assignment operation - Arithmetic operators. Control Structures - Nested

Blocks - SQL in PL/SQL - Data Manipulation - Transaction Control statements.PL/SQL Cursors - Implicit Cursors, ExplicitCursors and Attributes - Cursor FOR loops.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition Book

REFERENCES:

1. Ramez Elmsari, Shamkant B Navathe, “Fundamentals of Database Systems”, Pearson Education, 7th Edition
2. Silberschatz, Korth, Sudarshan, “Database System Concepts”, McGraw Hill Publication. 5th Edition
3. S K Singh, “Database Systems : Concepts, Design and Applications”, Pearson Education
4. Peter Rob, Carlos Coronel, “Database Systems : Design, Implementation and Management”, Cengage Learning.
5. C J Date, A Kannan, S Swaminathan, “An Introduction to Database Systems”, Pearson Education, 8th Edition.

CA3615	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Explore the core concepts and principles underlying artificial intelligence.
- Analyze the essential techniques and components of Natural Language Processing.
- Learn the basic concepts and structure of expert systems within AI.

Course Outcome		Cognitive Skill
CO-01	Study the fundamentals of Artificial Intelligence	U
CO-02	Understand the prologs of AI	U
CO-03	To analyze the details of Natural Language Processing	A
CO-04	To study the details of Recurrent Neural Networks	U
CO-05	Learn the basics of Expert systems	U

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	S	S	S	S	M	S	M	S	M	S
CO-02	S	M	S	M	S	M	S	M	S	M	S	M	S
CO-03	M	S	S	S	S	S	S	M	M	M	S	S	M
CO-04	M	S	S	S	S	S	S	S	M	M	M	S	M
CO-05	S	M	M	S	M	M	S	M	S	M	S	M	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction to Artificial Intelligence **9**

Introduction –Definition – Components - Future of artificial intelligence – Intelligent Agent: - Characteristics of intelligent agents – Design – Task environment –PEAS - Typical intelligent agents – Problem solving approach to AI problems – Real world problems.

Unit II: Problem Solving Methods **9**

Search Strategies : Uninformed Search techniques - Breadth first search - Depth first search – Iterative deepening search - Heuristic Search Techniques – Greedy best –first search - A* search – Heuristic functions – Local Search Algorithms: Hill Climbing – Simulated annealing – Adversarial search - Constraint satisfaction problem - Measure of performance and analysis of algorithms

Unit III: Knowledge Representation **9**

Knowledge representation – Approaches - First order logic – Syntax and semantics – Knowledge engineering- Propositional and First order inference – Unification - Forward chaining and backward chaining – Resolution - Introduction to Prolog – Semantics –Ontological engineering - Categories and Objects - Reasoning systems for categories - Description logic – Game Playing.

Unit IV: Expert Systems **9**

Expert System Architecture - Rule-based Systems - Non-production System Architectures - Associative or Semantic Networks - Frame Architecture - Feature Models - Associative Models - Knowledge Acquisition and Validation - Methods for Knowledge Acquisition - Validation of Knowledge - Distinguishing Features of Expert Systems - Utility of Expert Systems.

Unit V: Applications **9**

AI applications – Language models – Information retrieval – Information extraction – Natural Language processing – Machine translation – Speech recognition – Robot – Hardware –Perception – planning – Moving – Robotic Software architecture.

TOTAL: 45 HOURS

TEXT BOOKS:

1. S. Russel and P. Norvig, 2003,"ArtificialIntelligence – A Modern Approach", second

Edition, Pearson Education
2. Artificial Intelligence: By R.Ruhin Kouser
3. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-GrawHill

REFERENCES:

1. Introduction to AI & Expert System: Dan W.Patterson, PHI.
2. Artificial Intelligence by Luger (Pearson Education)
3. Russel & Norvig, Artificial Intelligence: A Modern Approach, Pearson Education.

CA3616	CYBER SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand various types of cyber-attacks and cyber-crimes.
- To learn threats and risks within context of the cyber security.
- To have an overview of the cyber laws & concepts of cyber forensics.
- To study the defensive techniques against these attacks.

Course Outcome		Cognitive Skill
CO-01	Analyze cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.	R, U, An
CO-02	Interpret and forensically investigate security incidents.	R, U, A, An
CO-03	Apply policies and procedures to manage Privacy issues.	R, U, A
CO-04	Design and develop secure software modules	R, U, A, An
CO-05	To understand the concept of data linking, profiling and privacy policies.	R,U, A, An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	S	M	S	S	S	L	S	S	S
CO-02	S	S	S	M	S	S	S	M	S	M	S	S	S
CO-03	S	S	S	S	S	S	L	S	S	M	S	S	S

CO-04	S	S	S	M	S	S	M	S	S	M	S	S	S
CO-05	S	S	S	M	S	S	S	S	S	L	S	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction to Cyber Security **9**

Basic Cyber Security Concepts - layers of security – Vulnerability – Threat - Harmful acts - Internet Governance – Challenges and Constraints - Computer Criminals - CIA Triad - Assets and Threat - Motive of attackers -Active attacks -Passive attacks - Software attacks -Hardware attacks - Cyber Threats-Cyber Warfare - Cyber Crime - Cyber terrorism - Comprehensive Cyber Security Policy.

Unit II: Cyberspace and the Law & Cyber Forensics **9**

Introduction - Cyber Security Regulations - Roles of International Law - The INDIAN Cyberspace - National Cyber Security Policy – Introduction - Historical background of Cyber forensics - Digital Forensics Science - The Need for Computer Forensics - Cyber Forensics and Digital evidence - Forensics Analysis of Email - Digital Forensics Lifecycle - Forensics Investigation - Challenges in Computer Forensics.

Unit III: Cybercrime **9**

Mobile and Wireless Devices: Introduction - Proliferation of Mobile and Wireless Devices - Trends in Mobility - Credit card Frauds in Mobile and Wireless Computing Era, -Security Challenges Posed by Mobile Devices - Registry Settings for Mobile Devices - Authentication service Security - Attacks on Mobile/Cell Phones - Organizational security Policies and Measures in Mobile Computing Era.

Unit IV: Organizational Implications **9**

Organizational Implications: Introduction cost of cybercrimes and IPR issues - Web threats for organizations - Security and Privacy implications - Social media marketing: Security risks and perils for organizations - Social computing and the associated challenges for organizations.

Unit V: Privacy Issues **9**

Basic Data Privacy Concepts: Fundamental Concepts - Data Privacy Attacks - Datalinking and profiling -Privacy policies and their specifications -Privacy policy languages -Privacy in different domains –Medical -Financial, etc.

TOTAL: 45 HOURS

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, “Cyber Security Understanding Cyber Crimes,Computer Forensics and Legal Perspectives”,Wiley
2. B.B.Gupta, D.P.Agrawal, Haoxiang Wang,”Computer and Cyber Security Principles, Algorithm, Applications, and Perspectives”, CRC Press, 2018.

REFERENCES:

1. James Graham, Richard Howard and Ryan Otson, “Cyber Security Essentials”, CRC Press.
2. Chwan-Hwa(john) Wu,J. David Irwin, “Introduction to Cyber Security”, CRC Press T&FGroup.

CA3679	VB.NET PROGRAMMING LAB	L	T	P	C
		0	0	2	2

OBJECTIVES:

- Students should gain a strong understanding of VB.NET syntax, including data types, variables, constants, operators, and control structures.
- Develop problem-solving skills by applying programming concepts to solve real-world problems through coding exercises and projects.
- Ability to design, develop, and debug VB.NET applications, ranging from simple console applications to more complex GUI-based applications with forms and controls.
- Understand how to integrate databases into VB.NET applications using ADO.NET or Entity Framework, including connecting to databases, executing queries, and handling data.

Course Outcome		Cognitive Skill
CO-01	Learn how to use control structures such as if statements, loops (for, while, do-while), and switch statements to control the flow of execution in a program.	U, A, An
CO-02	Understand how to create and use procedures (subroutines) and functions to organize code into reusable modules.	R,U,A,E
CO-03	Students will develop problem-solving skills by applying programming concepts and techniques to solve real-world problems efficiently and creatively using VB.NET.	R,U,A
CO-04	Learn and apply software development best practices such as code organization, documentation, error handling, and testing to write maintainable and robust VB.NET code.	R,U,A
CO-05	Learn how to connect to and manipulate databases using ADO.NET or Entity Framework in VB.NET.	R, U, A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	S	S	S	M	M	M	M	M	M	M	S
CO-02	M	S	S	S	M	M	S	S	S	S	S	M	S
CO-03	M	M	S	M	M	M	S	S	S	S	M	S	S
CO-04	M	M	S	M	M	M	M	M	M	M	M	M	S
CO-05	M	M	S	S	S	S	S	S	S	S	S	S	S

S-Strong, M-Medium, L-Low, N-Not relevant

LIST OF EXPERIMENTS:

1. Accept a character from console and check the case of the character.
2. Write a program to accept any character from keyboard and display whether it is vowel or not.
3. Write a VB.Net program to accept a string and convert the case of the characters.
4. Develop a menu based VB.Net application to implement a text editor with cut, copy, paste, save and close operations.
5. Write a program to implement a calculator with memory and recall operations.
6. Develop a form in VB.NET to pick a date from Calendar control and display the day, month, and year details in separate text boxes.
7. Develop a VB.Net application to perform timer based quiz of 10 questions.
8. Develop a VB.Net application using the File and Directory controls to implement a common dialog box.
9. Develop a database application to store the details of students using ADO.NET
10. Develop a database application using ADO.NET to insert, modify, update and delete operations.
11. Develop a VB.Net application using Data grid to display records.

TOTAL: 45 HOURS

REFERENCES:

1. VB.NET by P.Radhaganesan,Scitech Publications, Chennai, 2012
2. Visual Basic .Net Programming Black Book by STEVEN HOLZNER, Dreamtech Press,2017
3. Visual Basic 6 from the Ground Up by Gary Cornell, Osborne Mcgraw Hill.,2017

CA3680	DBMS LAB	L	T	P	C
		0	0	2	2

OBJECTIVES:

- Students should gain a strong understanding of SQL queries for DDL, DML and DCL in SQL PLUS
- Understand the relational database design principles.
- Familiar with the basic issues of transaction processing and concurrency control.
- Familiar with database storage structures and access techniques.

Course Outcome		Cognitive Skill
CO-01	Learn how to use DDL commands in SQL.	U, A, An
CO-02	Understand how to apply data manipulation and functions in queries.	R,U,A,E
CO-03	Students will write queries by using data and string functions	R,U,A
CO-04	Learn and apply PL/ SQL and procedural programming	R,U,A
CO-05	Learn and apply the use of functions and procedures in SQL	R, U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	S	S	S	S	M	M	M	M	M	M	S
CO-02	S	S	S	S	M	S	S	S	S	S	S	M	S
CO-03	S	S	S	M	M	S	S	S	S	S	M	S	S
CO-04	S	S	S	M	M	S	M	M	M	M	M	M	S
CO-05	S	M	S	S	S	S	S	S	S	S	S	S	S

S-Strong, M-Medium, L-Low, N-Not relevant

LIST OF EXPERIMENTS:

1. Implementation of DDL commands of SQL with suitable examples
2. DDL with Primary key constraints.
3. DDL with constraints and verification by insert command.
4. Data Manipulation of Base Tables.
5. Apply the aggregate functions and string or character functions in SQL.
6. Apply the different Date functions in SQL.
7. Apply the different Join operations in SQL.
8. Apply the group by, having and order by clauses in SQL.
9. Apply sub and complex queries in SQL.
10. Develop PL/SQL program for generating Fibonacci series.
11. Write a procedure to update the table.
12. Write a function in SQL to display the details of the marks scored by students with total marks.

TOTAL: 45 HOURS

REFERENCES:

1. SQL, PL/SQL the Programming Language of Oracle by Evan Boyross, BPB Publications
2. SQL For Beginners: SQL Made Easy; A Step-By-Step Guide to SQL Programming for the Beginner, Intermediate and Advanced User (Including Projects and Exercises) by Craig Berg.

CA36P1	INTERNSHIP	L	T	P	C
		0	0	0	2

OBJECTIVES :

- To provide opportunities for experiential learning in varied areas of the discipline beyond 'teaching-training' and enhance the professional growth of the students.
- To help students prepare for a career in computer science and develop a road map for the same.

Guidelines:

- Internships are mandatory.
- Duration: 15 to 20 days (summer vacation after the 4th semester)
- Ensure that the student has documented the entire internship experience, submitted the report to the faculty coordinator, been duly certified by the supervisor, and made a formal presentation in the department after the internship.
- Maintenance of records by students: Every student shall maintain records of their attendance and a report of the work they do. This should be certified by the head of the institution or his or her nominee where the students are undergoing an internship.
- Leave: Candidates should have an attendance rate of at least 90% during the internship period.
- The student should be able to demonstrate the following competencies:
  - Requirement Analysis
  - Software and web design
  - Coding
  - Implementation
  - Testing
  - Maintenance
- At the end of the internship, the student must submit a full-fledged, detailed internship report using the structure outlined by the department.
- Grading and evaluation of students: All internees will be assessed based on their attendance and the viva conducted by the examiner during the submission of their internship report.

SEMESTER VI

Sl. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	CA3617	PHP Programming	3	1	0	4
2.	CA3618	Introduction to Big Data	3	0	0	3
3.	CA****	Elective III	3	0	0	3
4	CA3619	Professional Ethics	3	0	0	3
PRACTICAL						
5.	CA3681	PHP Programming Lab	0	0	2	2
6.	CA36P2	Project Work	0	0	14	7
TOTAL			9	2	16	22

CA3617	PHP PROGRAMMING	L	T	P	C
		3	1	0	4

OBJECTIVES

- To get an experience on various web application development techniques.
- To learn the necessary concepts for working with the files using PHP.
- To get a knowledge on OOPs with PHP.

	Course Outcome	Cognitive Skill
CO-01	Students will able to write PHP scripts to handle HTML forms.	R, U, A
CO-02	To understand regular expressions including modifiers, operators and met characters.	R, U, A
CO-03	To create PHP program using the concept of array.	R, U, A, An
CO-04	To create PHP programs that uses various PHP library functions.	R, U, A, An
CO-05	Students will able to manipulate files and directories.	A, An, E

R-Remember, U-Understand, A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	S	S	S	M	S	L	S	S	M
CO-02	S	S	S	S	L	S	S	M	S	S	S	S	L
CO-03	S	S	S	S	L	S	S	M	S	S	S	S	M
CO-04	S	S	S	S	M	S	S	M	S	S	S	S	L
CO-05	S	S	S	S	S	S	S	M	M	S	S	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: PHP Introduction **9**

Introduction – The origin of PHP – Working concept of PHP with the Web Server – Strength of PHP – Basic PHP development –PHP Scripts work – Basic PHP Syntax – PHP variables – PHP data types – Displaying type information – Testing for a specific data type – Operators – Variable manipulation – Dynamic variables – String in PHP – Control Structures.

Unit II: Loops and Arrays **9**

Loops: The while Statement – The do while statement – The for statement – Break & Continue - For each loops. Arrays: Single dimensional arrays – Multidimensional arrays – Casting arrays – Associative arrays Functions: Introduction of functions – PHP library function – Array functions – String functions – Date and time functions – User defined functions.

Unit III: Working with the file system **9**

Creating and deleting a file - Reading and writing text files – Working with directories in PHP – Checking for existence of file – Determining file size – Opening and Closing a file – Working with forms – Importing user input – Accessing user input – Combine HTML and PHP code – Using hidden fields – Redirecting the user – File upload and scripts validation – Server side validation – Client side validation – Working with regular expressions.

Unit IV: Classes and Objects **9**

Introduction to object oriented programming – Define a class – Creating an Object – Object Properties – Object Methods – Constructors and Destructors – Class constants - Access modifier - Inheritance – Abstract classes and methods – Object Serialization – Checking for class and method existence – Exceptions.

.**Unit V:Working with MySQL with PHP** **9**

Introduction to database – Introduction to SQL – Connecting to the MYSQL – Database creation and selection – Database Table Creation – Insert, update, delete data to a table – Fetch data from table – Cookies – The anatomy of a cookie – Setting a cookie with PHP – Deleting a cookie – Creating session cookie – Working with the query string – Creating Query string.

TOTAL: 45 HOURS

TEXT BOOKS:

1. David Sklar, Nathan Torkington, “Learning PHP”, Fifth Edition, O’Reilly Publishers.
2. W. Jason Gilmore, “Beginning PHP and MySQL 5 From Novice to Professional”, APress.

REFERENCES:

1. Kevin Yank, “Building Your Own Database Driven Web Site Using PHP & MySQL”, Sitepoint.
2. Rasmus Lerdorf, Kevin Tatroe, Peter MacIntyre, “Programming PHP”, 2006, O’Reilly Publishers.
3. Luke Welling, Laura Thomson, “PHP and MySQL Web Development”, Third Edition, 2004, Sams Publishers.

CA3618	INTRODUCTION TO BIG DATA	L	T	P	C
		3	0	0	3

OBJECTIVES

- Understand the Big Data Platform and its Use cases
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS
- Understand Map Reduce Jobs

Course Outcome		Cognitive Skill
CO-01	To understand the basic concepts of big data	R, U
CO-02	To study and understand the components of Hadoop	R, U
CO-03	To study and understand the basic concepts applied in IBM Info Sphere Big Insights	R, U, An
CO-04	To study the concepts of Compression, Scheduling and Visualization	R, U, A, An
CO-05	To study and understand the concepts of streams in bigdata	R, U, A, An

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	L	S	M	S	S	S	S	S	S	L
CO-02	S	M	S	M	S	S	S	S	S	S	S	S	S
CO-03	M	S	S	M	S	S	S	L	M	S	S	M	S
CO-04	S	S	S	M	S	M	S	S	S	S	S	M	M
CO-05	S	S	S	M	S	S	L	S	S	S	S	M	L

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction to Big data **9**

Introduction - Characteristics of Big Data - Applications of BIG DATA - Tools used in BIG DATA - 5 Challenges in BIG DATA – Foundations of Big data: File System concept - Distributed File System concept - Scalable Computing Over the Internet - Popular models for big data- Step-by-Step Approach to Workflow Orchestration for Big Data

Unit II: Data Models **9**

Introduction to data format - Data Model- Benefits of Appropriate Models and Storage Environments to Big Data – Introduction to data mart - Different types of data mart - Difference between Data warehouse and Data mart- Introduction to Big Data Streaming - Data Lake – Data Lake vs. Data warehouse - Essential elements of a Data Lake and Analytics solution - Value of a Data Lake - Challenges of Data Lakes - Streaming sensor data - Uses of sensor data

Unit III: NOSQL Management **9**

Introduction to Relational Database - RDBMS vs. NOSQL - Types of NOSQL Databases - Introduction to NOSQL -Relational Model vs Aggregate Data Model - Introduction to NOSQL - Types of NOSQL Databases - Distribution Models

Unit IV: Hadoop Basics **9**

Benefits of Hadoop for Big Data - Hadoop Ecosystem Supplementary Components - Other Components - Open-Source software related to Hadoop - Benefits of Big Data - Big Data Challenges – Hadoop Administration: HDFS – Architecture – Commands

Unit V: Hadoop Architecture & Map Reduce **9**

Hadoop Distribute File System (HDFS) - Hadoop Components – Internal working of Hadoop -Hadoop Cluster – Availability of Hadoop - HDFS Architecture – Introduction to Map Reduce – MRUNIT - Developing and testing MapReduce jobs with MR Unit - Anatomy of a MapReduce Job Run - Hadoop Scheduler

TEXT BOOK:

1. Introduction to Big Data By Dr. RajniBhalla, Lovely Professional University
2. Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data By Paul Zikopoulos, Chris Eaton , Paul Zikopoulos, McGraw Hill, 2011

REFERENCES:

1. Understanding Big Data By Prof. (Dr.) R. K. Pandey, Krishna Chattanya Katkam, Dr.Gaurav, Rudra Publications 2023
2. Introduction To Big Data And Analytics by Amandeep Kaur, 2020

CA3619	PROFESSIONAL ETHICS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To cultivate a spirit of working in a diverse world by understanding workplace ethics
- To instill a sense of professional ethics which help them develop a safe comfortable and prosperous and sustainable society.
- To strengthen and enhance professional ethics through psychological approach.

Course Outcome		Cognitive Skill
CO-01	Understand moral, professional, and personal values of professional ethics.	U
CO-02	Evaluate business ethics based on psychological and philosophical perspectives.	E
CO-03	Understand the values, culture, and moral aspects carried out in an organization.	U
CO-04	Understand edge over the ethical systems in workplace.	U
CO-05	Evaluate professional ethics through psychological approach.	E

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	S	M	L	S	M	M	M	M	S	M	M
CO-02	S	M	S	M	L	S	M	M	M	M	S	M	M
CO-03	S	M	S	S	M	S	M	M	M	M	S	M	M
CO-04	S	M	S	S	L	M	M	M	M	S	S	M	M
CO-05	S	M	M	M	L	S	M	M	M	M	S	M	M

S-Strong,M-Medium,L-Low,N-Notrelevant

Unit I: Introduction to Professional Ethics **9**

Basic Concepts -Governing Ethics -Personal & Professional Ethics -Ethical Dilemmas -Life Skills -Emotional Intelligence -Thoughts of Ethics -Value Education -Dimensions of Ethics – Profession and professionalism --Professional Risks -Professional Accountabilities - Professional Success -Ethics and Profession.

Unit II: Business Ethics **9**

Philosophical approaches to Business Ethics – ethical reasoning – ethical issues in business - Social Responsibility of Business-conflictofinterest–culturalrelativism-Ethicalleadership-Resistingun-ethicalauthorityanddomination-GlobalBusinessEthics.

Unit III: Basic Theories **9**

Basic Ethical Principles - Moral Developments –Deontology - Utilitarianism - Virtue Theory Rights Theory -Casuist Theory -Moral Absolution -Moral Rationalism - Moral Pluralism - Ethical Egoism -Feminist Consequentialism - Moral Issues -Moral Dilemmas –Moral Autonomy.

Unit IV: Workplace Ethics **9**

Work Place Rights & Responsibilities - Ethics in changing domains of Research - Engineers and Managers - Organizational Complaint Procedure -Difference of Professional Judgment within the Nuclear Regulatory Commission (NRC) -the Hanford Nuclear Reservation - research misconduct distinguished from mistakes and errors - recent history of attention to research misconduct -reviewing & editing.

Unit V: Global issues in Professional Ethics: **9**

Introduction - Current Scenario - Technology Globalization of MNCs - Business Ethics and Corporate Governance - Sustainable Development Ecosystem - Energy Concerns - Ozone Deflection -Pollution - Ethics in Manufacturing and Marketing –Media Ethics - War Ethics -Bio Ethics .

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TOTAL:45 HOURS

TEXTBOOKS

1. Nagarasan. R.S. Professional Ethic sand Human Values. New Age International Publications, 2006.
2. Subramanian. R. Professional Ethics, OxfordPublication,2013.
3. Ethics in Engineering Practice & Research, CarolineWhitbeck,2e, Cambridge University Press 2015.

REFERENCES

1. The Ethics of Management, LaRue Tone Hormer, Universal Book Stall, Delhi.
2. Business Ethics, R.V. Badi and N.V. Badi, Vrinda Publication, Delhi.
3. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI,2008.

CA3681	PHP PROGRAMMING LAB	L	T	P	C
		3	0	0	3

OBJECTIVES

- To acquire the programming experience in PHP.
- To apply variables, strings and constants to a PHP a script and test it with a program.
- To design an authentication web page in PHP with MySQL.

Course Outcome		Cognitive Skill
CO-01	Design PHP programs using statements and expressions.	R, U, E
CO-02	Learn PHP programming on handling strings and arrays.	R, U, A, E

CO-03	Design web pages for different applications with MySQL.	R, U, A, E
CO-04	Handle files, sessions and cookies by downloading a file from the server.	R, U, A, E
CO-05	Develop real time applications.	R, U, A, E

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mappingof CourseOutcomewithProgramme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	S	S	S	M	S	L	S	S	M
CO-02	S	S	S	S	L	S	S	M	S	S	S	S	L
CO-03	S	S	S	S	L	S	S	M	S	S	S	S	M
CO-04	S	S	S	S	M	S	S	M	S	S	S	S	L
CO-05	S	S	S	S	S	S	S	M	M	S	S	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

LIST OF EXPERIMENTS:

1. Write a program to find the factorial of a number.
2. Write a program using conditional statements need a number N and check whether it is divisible by M.
3. Write a program to find the maximum value in a given multi-dimensional array.
4. Write a program to find the GCD of two numbers using user defined functions.
5. Design a simple web page to generate multiplication table for a given number.
6. Write a program to download a from the server.
7. Write a PHP program to read and write a file.
8. Write a program to store the current date and time in a COOKIE and display the last visited date and time on the web page.
9. Write a program to store page views count in SESSION to increment the count on each refresh and to show the count on web page.
10. Write a program to design a simple calculator.
11. Design an authentication web page in PHP with MySQL to check username and password.
12. Create a web page for Travel agency.

TOTAL: 45 HOURS

REFERENCES:

1. David Sklar, Nathan Torkington, “Learning PHP”, Fifth Edition, O’Reilly Publishers.
2. W. Jason Gilmore, “Beginning PHP and MySQL 5 From Novice to Professional”, A Press.

CA36P2	PROJECT WORK	L	T	P	C
		0	0	14	7

OBJECTIVE:

Student is expected to do an in depth study in his/her specialized area by doing a detailed literature survey, understanding different aspects of the problem, arriving at the status report in the area, carry out developmental and/or experimental Work, analyze and interpret the results to arrive the conclusions.

Project development activities (individual or group of maximum three students) with the guidelines given below:

- Problem Identification
- Develop a model for solving the problem
- A statement of system specification proposed to be developed
- Data Flow Diagram
- List of possible solution including alternatives and constraints
- Implementation phase (Hardware & Software)
- Testing & Validation of the developed system
- Report preparation
- Presentation of the project

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Develop a model to achieve the project's goal
2. Demonstrate sound technical knowledge of the selected project topic.
3. Undertake problem identification, formulation and solution.
4. Design solutions to complex problems utilising a systematic approach .
5. Appreciate the steps involved in Software development process

Elective I

S. No.	Course Code	Course Title	L	T	P	C
1.	CA36A1	Financial Accounting	3	0	0	3
2.	CA36A2	Management Information Systems	3	0	0	3
3.	CA36A3	E-Commerce	3	0	0	3
4.	CA36A4	Human Resource Management	3	0	0	3

Elective II

S. No.	Course Code	Course Title	L	T	P	C
1.	CA36A5	Introduction to Data Mining	3	0	0	3
2.	CA36A6	Cloud Computing	3	0	0	3
3.	CA36A7	Wireless Networks	3	0	0	3
4.	CA36A8	Software Testing	3	0	0	3
5.	CA36B4	Cloud Computing Fundamentals	3	0	0	3

Elective III

S. No.	**Course Code**	**Course Title**	L	T	P	C
1.	CA36A9	Robotic Process Automation	3	0	0	3
2.	CA36B1	Client Server Computing	3	0	0	3
3.	CA36B2	Enterprise Resource Planning	3	0	0	3
4.	CA36B3	Distributed Computing	3	0	0	3

CA36A1	FINANCIAL ACCOUNTING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand what economic information is conveyed in financial statements.
- To identify the main users of financial information
- To develop the awareness of emerging trends in financial accounting.
- To apply the students in the financial analysis context.

	Course Outcome	Cognitive Skill
CO-01	Understand the combine practice and theoretical knowledge of financial accounting and generally accepted accounting principles	U, A, An
CO-02	Analyze , record, and report business transactions using the accounting equation and also to apply general ledger account information to prepare trial balances	U, A, An
CO-03	Familiarize and understand the preparation of subsidiary books and to expose various methods of depreciation accounting	U, A, An
CO-04	Demonstrate how to create and interpret financial statements	U, A, An
CO-05	Evaluate the methods of preparation of single entry system of accounts	U, A, An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	M	L	M	S	S	M	M	L	M	M	L
CO-02	M	L	M	S	S	M	L	M	L	M	M	S	M
CO-03	L	M	S	S	M	M	M	M	L	S	M	M	M
CO-04	M	S	M	L	M	S	S	M	M	L	M	M	L
CO-05	M	L	S	M	L	M	L	S	S	S	S	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction to Accounting **9**

Meaning and Scope of Accounting – Objectives - Bases of Accounting – Accounting and Book -keeping - Systems of Accounting – Advantages and Limitations of Accounting – Accounting Principles.

Unit II: Recording of Transactions **9**

Introduction – Accounting Equation – Classification of Accounts – Rules of Debit and Credit – Preparation of Journal, Ledger – Trial Balance – Meaning – Preparation of Trial Balance.

Unit III: Subsidiary Books and Depreciation Accounting **9**

Introduction – Types of Subsidiary Books – Cash Book (Simple & Triple Column Cash Book) – Depreciation – Meaning – Causes - Types - Straight Line Method - Written Down Value Method - Insurance Policy Method - Sinking Fund Method and Annuity Method.

Unit IV: Final Accounts **9**

Manufacturing - Trading and Profit and Loss Account – Balance Sheet – Capital Vs Revenue – Preparation of Final Accounts with Adjustments

.

Unit V: Single Entry System **9**

Meaning – Merits and Limitations of Single Entry System – Difference Between Single Entry and Double Entry System – Preparation of Accounts from Incomplete Records - Methods of Calculation of Profit – Statement of Affairs Method – Conversion Method

TOTAL: 45 HOURS

TEXT BOOKS

1. Mukerjee and Hanif, “Advanced Accountancy”, Tata McGraw Hills, New Delhi, 2010
2. S.P.Jain and K.L.Narang, “Advanced Accountancy” (Vol I), Kalyani Publishers, New Delhi, 2008
3. M.C.Shukla and T.S.Grewal, “Advanced Accounts” (Vol I), S. Chand & Company Ltd, New Delhi.

REFERENCES:

1. Dr. M.A. Arulanandam and Dr. K.S. Raman, “Advanced Accountancy”, Himalaya Publishing House, Mumbai.
2. Gupta and Radhaswamy, “Advanced accountancy”, Sultan Chand and Sons, New Delhi,2002

CA36A2	MANAGEMENT INFORMATION SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To enable the learners to understand the basic concepts of Electronic Commerce
- To enable the learners to use various applications in Electronic Commerce.
- To learn E-Learning, E-Books, E-Government portals.

Course Outcome		Cognitive Skill
CO-01	To understand e-commerce models -its benefits and limitations.	R,U
CO-02	To use of market research tools in analyzing customer buying behavior.	R,U,An
CO-03	To analyses the web advertising modes.	R,U, An
CO-04	To understand the application of B2B e-commerce model.	R,U, An
CO-05	To critically evaluate public policy on privacy and security.	R,U, An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	M	M	M	S	S	M	M	M	M	M	L
CO-02	M	L	M	S	S	M	L	M	S	M	M	S	M
CO-03	S	M	S	S	M	M	L	M	S	S	M	L	M
CO-04	S	S	M	L	M	S	S	M	M	M	M	M	L
CO-05	M	L	S	M	M	M	L	S	S	S	L	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Foundation of Electronic Commerce **9**

Definition-– Electronic Commerce Framework - Electronic Commerce and business plan - Benefits and Limitations of EC - The impact of ECOnTraditional Retailing System.

Unit II: E-Market **9**

Places - Types of E-Markets - The role and value of Intermediaries – Electronic catalogs and other market mechanisms - Bartering and Negotiating online-E-Commerce in the Wireless Environment - Issues in e-markets.

Unit III: E-Commerce and World Wide Web **9**

Architectural Frame work for E-Commerce – WWW Architecture – Hypertext Publishing – Consumer Oriented Applications – MercantileProcess Models – Consumer's Perspective – Merchant's Perspective – Electronic Payment Systems (EPS) – Types- Designing EPS -Smart Cards and EPS – Credit Cards and EPS.

Unit IV: E-Supply Chain **9**

Supply chain problem and solutions - Corporate portals - E Government overview - Implementing E-government on line publishing - E books and blogging - E-learning.

.

Unit V: Marketing on the Internet **9**

Advertising on the Internet – Charting the On-Line Marketing Process – E- Commerce Catalogs or Directories – Information Filtering – Consumer-Data Interface Emerging Tools.

TOTAL: 45 HOURS

TEXT BOOKS

1. Turban, E., Outland, J., King, D., Lee, J. K., Liang, T., & Turban, D. C. "Electronic Commerce: A Managerial and Social Networks Perspective (Springer Texts in Business and Economics)", Springer, 2017.
2. Chaffey, D., Hemphill, T., & Edmundson-Bird, D. (2019). "Digital Business and E- Commerce Management (7th ed.)". Pearson 2018.

REFERENCES:

1. Pribyl, I., & Pribyl, R. From Nothing: "Everything You Need to Profit from Affiliate Marketing, Internet Marketing, Blogging, Online Business, e-Commerce and More. The Free Internet MarketingProject", 2019.
2. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", , 2018.
3. Chakraborty, S., & Tyagi, P. E, "Commerce for Entrepreneurs", BPB PUBN, 2021.

CA36A3	E-COMMERCE	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn Information system Fundamentals
- To be familiar with representation of system architecture
- To learn technology underlying the architecture design
- To learn advanced concepts of Decision theory
- To know about development life cycle of Information system

Course Outcome		Cognitive Skill
CO-01	Recognize contemporary MIS theory and how the information systems support business strategy, business processes, and practical applications in an organization.	R,U
CO-02	Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.	R,U
CO-03	Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives.	R,U, An
CO-04	Students can have effectively communicated strategic alternatives to facilitate decision making.	R,U
CO-05	Describe the role of information technology and information systems in business and also record the current issues of information technology and relate those issues to the firm.	R,U

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	M	S	M	M	M	S	S	M	M	M	M	M	L
CO-02	M	L	M	S	S	M	S	M	S	M	M	S	M
CO-03	M	M	S	S	M	M	M	M	S	S	M	L	M
CO-04	S	S	M	L	M	S	M	M	M	M	M	M	L
CO-05	M	L	S	M	L	M	M	S	S	S	L	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Information System and Organisation **9**

Matching the Information System Plan to the Organizational Strategic Plan - Identifying Key Organizational Objective and Processes and Developing an Information System Development - User role in Systems Development Process - Maintainability and Recoverability In system design.

Unit II: Representation and Analysis of System Software **9**

Models for Representing Systems: Mathematical, Graphical and Hierarchical (Organization Chart, Tree Diagram) - Information Flow - Process Flow - Methods and Heuristics - Decomposition and Aggregation - Information Architecture - Application of System Representation to Case Studies.

Unit III: Systems, Information and Decision Theory **9**

Information Theory - Information Content and Redundancy - Classification and Compression - Summarizing and Filtering - Inferences and Uncertainty - Identifying Information needed to Support Decision Making - Human Factors - Problem characteristics and Information System Capabilities in Decision Making.

Unit IV: Information System Application **9**

Transaction Processing Applications - Basic Accounting Application - Applications for Budgeting and Planning - Other use of Information Technology: Automation - Word Processing – Electronic Mail - Evaluation Remote Conferencing and Graphics - System and Selection - Cost Benefit - Centralized versus Decentralized Allocation Mechanism.

.

Unit V: Development and Maintenance Of Information Systems **9**

Systems analysis and design - System development life cycle - Limitation - End User Development - Managing End Users - off- the shelf software packages - Outsourcing Comparison of different methodologies.

TOTAL: 45 HOURS

TEXT BOOK

1.Laudon K.C, Laudon J.P, Brabston M.E, ”Management Information Systems - Managingthe digital firm”, Pearon Education, 2004.

REFERENCES:

1. Turban E.F, Potter R.E, ”Introduction to Information Technology”; Wiley, 2004.
2. Jeffrey A.Hoffer, Joey F.George, Joseph S. Valachich, ”Modern Systems Analysis andDesign”, Third Edition, Prentice Hall, 2002.

CA36A4	HUMAN RESOURCE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES

- To familiarize students with the Principles of Human Resources Management.
- To familiarize and acquaint the students with the knowledge of Organizational culture and to enlighten the students with the HRD Practices followed in various organizations.
- To make the students understand the importance and direction of performance in the organizational context.
- To acquire knowledge on the recent trends in HRM.

Course Outcome		Cognitive Skill
CO-01	Help students understand of the basic elements of HRM gain knowledge on various facets, the policies and practices of HRM and acquire knowledge on the recent trends in HRM.	R,U
CO-02	Impart knowledge in the functions, systems, policies and applications of Human Resource Management in organizations.	R,U
CO-03	Understand the overview of theoretical foundations of key areas associated with HR development in the organizations,	R,U
CO-04	Practice the HR skills and their ability to assess the constraints and opportunities associated with managing employees in different socio-economic and political context.	R,U
CO-05	Help students understand of the basic elements of HRM gain knowledge on various facets, the policies and practices of HRM and acquire knowledge on the recent trends in HRM.	R,U

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	L	M	S	S	M	M	L	M	M	L
CO-02	M	L	M	S	S	M	L	M	S	M	M	S	M
CO-03	S	M	S	S	M	M	L	M	S	S	M	L	M
CO-04	S	S	M	L	M	S	S	M	M	L	M	M	L
CO-05	M	L	S	M	L	M	L	S	S	S	L	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction **9**

Human resource management – meaning and definition –functions – Characteristics and Objectives – Principles of HRM – need and importance – human resource planning process. – Managerial and Operative Functions.

Unit II: Nature and scope of Human Resources Management **9**

Nature and scope of Human Resources Management – Differences between personnel management and HRM – Environment of HRM – Human resource planning – Recruitment – Selection – Methods of Selection – Uses of various tests – interview techniques in selection and placement.

Unit III: Induction **9**

Induction – Training – Methods – Techniques – Identification of the training needs – Training and Development – Performance appraisal – Transfer – Promotion and termination of services – Career development - Work life balance.

Unit IV: Remuneration **9**

Remuneration – Components of remuneration – Incentives – Benefits – Motivation – Welfare and social security measures.

.

Unit V: Industrial Relations **9**

Industrial relations – Significance - Causes - Suggestion to improve industrial relations - Workers participation in Management - Collective Bargaining - Disciplinary procedure – Grievances - Steps in Grievance Handling.

TOTAL: 45 HOURS

TEXT BOOKS

1. C. B. GUPTA, “Human Resource Management”, Sultan Chand & Sons, 2018 Edition
2. S.S. Khanka, “Human Resource Management”, Himalaya publishing House, 2003 Edition.

REFERENCES:

1. P.S. SUBBORAO, “Human Resource Management”, Himalaya Publishing House, 2010 Edition
2. Rao,S, “Essentials of Human Resource Management & Industrial Management, Text & Cases” - New Delhi: Himalaya Publication, 2014 Edition.
3. L M Prasad, “Human Resource Management”, Sultan Chand & Son's, 2018 Edition.
4. P. C. Tripathi, “Human Resource Management”, Sultan Chand & Sons, 2010 Edition.

CA36A5	INTRODUCTION TO DATA MINING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To provide the knowledge on data mining and data warehousing concepts and techniques.
- To study the basic concepts of data mining, Architecture and Comparison.
- To study a set of mining association rules, clustering, classification and data warehouses.

Course Outcome		Cognitive Skill
CO- 01	The students will be familiar with data mining concepts.	R, U
CO- 02	Design and deploy classification and clustering techniques.	R, U, A
CO- 03	Discover knowledge in web mining and data mining applications.	R, U, A
CO- 04	To understand the concept of outlier analysis and all methods related to clustering.	R, U, A, An
CO- 05	Students will be able to understand data warehousing concepts.	R, U

R- Remember,U- Understand,A- Apply,An- Analyze,E- Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO- 01	S	S	S	S	M	S	S	L	S	M	S	S	S
CO- 02	S	S	S	S	M	S	S	S	S	M	S	S	S
CO- 03	S	S	M	S	M	S	S	S	S	L	S	S	S
CO- 04	S	S	L	S	M	S	S	S	S	L	S	S	M
CO- 05	S	S	S	S	M	S	M	S	S	M	S	S	S

S- Strong, M- Medium,L- Low,N- Not relevant

Unit I: Introduction **9**

Data Mining – Introduction to KDD process – Knowledge Discovery form databases – Need for data preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and concept Hierarchy Generation.

Unit II: Mining Primitives, Languages and Architecture **9**

Mining Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining systems. Concept Description,

Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures.

Unit III: Mining Association Rule **9**

Association Rule Mining: Basic Concepts – Single dimensional Boolean Association Rules from Transaction Databases, Multilevel Association Rules from transaction databases – Multidimensional Association Rules from Relational Database.

Unit IV: Classification and Prediction **9**

Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on concepts from Association Rule Mining – Other Methods. Prediction – Introduction – Classifier Accuracy.

Unit V: Cluster Analysis **9**

Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Partitioning Methods _ Hierarchical Methods – Density Based Methods – GRID Based Method – Model Based Clustering Method.

TOTAL: 45 HOURS

TEXT BOOKS:

1. Jiawei Han and MichelineKamber, “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

REFERENCES:

1. K. P. Soman, ShyamDiwakar and V. Ajay, “Insight into Data Mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
2. Berson, Alex & Smith, Stephen J, “Data Warehousing, Data Mining and OLAP”, TMH Pub. Co. Ltd, New Delhi, 2012.
3. Ponniah, Paulraj, “Data Warehousing Fundamentals”, John Wiley & Sons, New Delhi, 2011.

CA36A6	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Make data backup, disaster recovery and business continuity.
- Data can be mirrored at multiple redundant sites on the cloud providers network,
- Know the methodologies and technologies for the development of applications.
- Developing cloud applications by utilizing Paas software.

Course Outcome		Cognitive Skill
CO-01	Understand cloud computing foundation	U
CO-02	Analyze how the IoT based Hardware can be connected to the real time cloud services.	An
CO-03	Apply various real time applications of cloud.	A
CO-04	Understand Cloud and its Architecture	U
CO-05	Evaluate the cloud environment for various applications	E

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate,S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	S	S	M	S	S	M	S	S	S	M
CO-02	M	S	S	S	S	M	M	S	S	S	S	S	M
CO-03	S	M	S	S	S	S	L	S	S	M	S	S	S
CO-04	S	S	S	S	S	S	M	S	L	S	S	S	S
CO-05	S	S	M	S	S	M	S	S	SS	S	M	S	S

S-Strong,M-Medium,L-Low,N-Notrelevant

Unit I: Cloud Computing Foundation **9**

Introduction to Cloud Computing – Move to Cloud Computing – Types of Cloud– Working of Cloud Computing.

Unit II: IoT and the Cloud **9**

Difference between Cloud Computing and IoT - Fog Computing – The Next Evolution of Cloud Computing - Role of Cloud Computing in IoT –Living on the Edge – An Abstract Edge Architecture Model – Connecting devices at the edge and to the cloud Challenges.

Unit III: Connecting Things to Cloud **9**

Various Real time applications of IoT - Connecting IoT to cloud - Cloud Storage for Iot -

Cloud-to-Device Connectivity - Device Ingress/Egress - Data Normalization and Protocol Translation - Infrastructure - APIs – The Topology of the Cloud.

Unit IV: Cloud Computing Architecture **9**

Cloud Computing Technology – Cloud Architecture -Cloud Modeling and Design-Virtualization - Foundation– Grid – Cloud and Virtualization– Virtualization and Cloud Computing.

Unit V: Cloud Applications **9**

Moving Applications to the Cloud –Microsoft Cloud Services –Google Cloud Applications – Amazon Cloud Services – Cloud Applications.

TOTAL:45 HOURS

TEXTBOOKS:

1. A.Srinivasan and J.Suresh, "Cloud Computing –A Practical Approach for Learning and Implementation", Pearson India Publications2014.
2. Biron,J.,& Follett,J.(2016).Foundational elements of an iot solution. O'Reilly Media, Incorporated
3. "Buyya,R., Broberg, J.,& Goscinski,A.M. (Eds.). (2010). Cloud computing: Principles and paradigms (Vol. 87). John Wiley & Sons.

REFERENCES:

1. Rajkumar Buyya, James Broberg, Andrzej, "Cloud Computing: Principles and Paradigms", Wiley India Publications 2011.
2. Arshdeep Bahga and Vijay Madisetti, "Cloud Computing –A Handson Approach", Universities Press (India)Pvt Ltd. 2014.
3. Cloud Application Architectures, George Reese, ISBN:184047142, Shroff O' Reilly, 2009.

CA36A7	WIRELESS NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand about wireless networks.
- To familiar with protocol stack and standards.
- To be exposed to 3G / 4G Services.

	Course Outcome	Cognitive Skill
CO-01	Students will able to remember the basic concepts of WLAN technologies.	R, U, A
CO-02	To understand Understanding mobile IP.	R, U, A
CO-03	To Apply TCP enhancements.	R, U, A, An
CO-04	To Evaluate UTMS.	R, U, A, An
CO-05	To implement 4G concepts and its applications.	A, An, E

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	S	S	S	M	S	L	S	S	M
CO-02	S	S	S	S	L	S	S	M	S	S	S	S	L
CO-03	S	S	S	S	L	S	S	M	S	S	S	S	M
CO-04	S	S	S	S	M	S	S	M	S	S	S	S	L
CO-05	S	S	S	S	S	S	S	M	M	S	S	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Digital Communication and Transmission **9**

Introduction – Baseband Systems – Messages, Characters and Symbols – Sampling Process – Pulse Amplitude Modulation – Pulse Code Modulation – Shannon Limit – Modulation – OSI Model: Upper Layers – Data Communication Services – Multiplexing – Transmission Media – Transmission Impairments.

Unit II: Multiple Access Techniques **9**

Introduction – Narrow Band Channelized Systems – Spectral Efficiency – Wideband Systems – Comparison of FDMA, TDMA and DS-CDMA – Random Access Methods – Packet Reservation Multiple Access – Error Control Schemes for Link Layer.

Unit III: Mobile Network and Transport Layer **9**

Introduction – Network Layer in the Internet – TCP/IP Suite – Transmission Control Protocol – Mobile IP and Session IP. Wide Area Wireless Networks: Introduction - GSM Evolution for Data – UMTS Network Reference Architecture – Channel Structuring in UMTS Terrestrial Radio Access Network – UMTS Terrestrial Radio Access Network Overview.

Unit IV: Wireless Application Protocol **9**

Introduction – WAP Architecture – WAP Advantages and Disadvantages – Applications of WAP – IEEE 802.15.4 Device Architecture – WLAN Technologies – IEEE802.11 WLAN - Security of IEEE 802.11 Systems – Other WLAN Standards.

Unit V: 4G Concepts **9**

4G Introduction – 4G Vision – 4G Features and Challenges – Applications of 4G – 4G Technologies: Multicarrier Modulation - Smart Antenna Techniques - OFDM – MIMO Systems - Adaptive Modulation and Coding with Time slot scheduler – Bell Labs Layered Space Time System – Software Defined Radio - Cognitive Radio.

TOTAL: 45 HOURS

TEXT BOOK:

1. Vijay Garg, "Wireless Communications and Networking", First Edition, Elsevier 2007.

REFERENCES:

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution, HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.
2. Anurag Kumar, D. Manjunath, Joy Kuri, "Wireless Networking", First Edition, Elsevier, 2011.
3. Simon Haykin, Michael Mohar, David Koilpillai, Modern Wireless Communications", First Edition, Pearson Education 2013.

CA36A8	SOFTWARE TESTING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To study fundamental concepts in software testing
- To discuss various software testing issues and solutions in software unit test, integration and system testing.
- To expose the advanced software testing topics, such as object-oriented software testing methods.

Course Outcome		Cognitive Skill
CO-01	Analyze test case suitable for software development for different domains.	A
CO-02	Evaluate test plans and test cases designed.	E
CO-03	Understand the basic concepts and the processes that lead to software testing	U
CO-04	Analyze suitable tests to be carried out.	A
CO-05	Apply automatic testing tools.	A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate,S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	S	M	S	M	S	S	M	M	M	L	M
CO-02	M	S	S	M	M	S	S	S	S	S	L	S	M

CO-03	S	M	S	M	S	S	S	S	M	M	S	L	M
CO-04	M	S	S	L	M	M	S	S	M	L	S	L	S
CO-05	M	S	M	M	S	S	M	M	M	S	S	S	S

S-Strong,M-Medium,L-Low,N-Notrelevant

Unit I: Introduction **9**

Basic definitions — Software Testing Principles—The Tester's Roleina Software Development Organization – Origins of Defects – Cost of defects – Defect Classes– The Defect Repository and Test Design–Defect Examples- Developer/Tester Support of Developing a Defect Repository.

Unit II: Test case design strategies **9**

Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis —Equivalence Class Partitioning —State based testing —Cause-effect graphing —Compatibility testing —User documentation testing —Domain testing -Random Testing —Requirements based testing–Static testing vs. Structural testing – Code functional testing

Unit III: Software development lifecycle models **9**

Phases of Software project –Quality -Quality Assurance -Quality control –Testing-Verification and Validation –Process Model to represent Different Phases -Life Cycle models -White-Box Testing–Challenges in White-Box Testing.

Unit IV: Levels of testing 9

The need for Levels of Testing — Unit Test — Unit Test Planning —Designing the Unit Tests — Integration tests —Designing Integration Tests–Integration Test Planning – Scenario testing – Acceptance testing—Performance testing—Regression Testing — Internationalization testing — Ad-hoc testing — Alpha, Beta Tests — Usability and Accessibility testing—Configuration testing–Compatibility testing.

Unit V: Test automation **9**

Software test automation —skills needed for automation —scope of automation – Design and architecture for automation —Requirements for a test tool — Challenges in automation—Test metrics and measurements – Project, progress and productivity metrics.

TOTAL:45 HOURS

TEXTBOOKS

1. Srinivasan Desikan and Gopalaswamy Ramesh, — Software Testing— Principles and Practices, Pearson Education, 2006.
2. Ron Patton, —Software Testing, Second Edition, Sams Publishing, Pearson

Education, 2007.
3. Limaye M.G., "Software Testing Principles, Techniques and Tools", Second Reprint, TMH Publishers, 2010.
4. Aditya P.Mathur, "Foundations of Software Testing", 2nd Edition, Pearson Education, 2013.

REFERENCES:

1. Effective Methods of Software Testing, William E. Perry,3rd ed, Wiley India. Edward Kit,
2. Boris Beizer Software Testing Technique – 2nd Edition, Van No strand Reinhold, New York, 1990.
3. Software Testing, Renu Rajani,Pradeep Oak,2007, TMH.

CA36A9	ROBOTIC PROCESS AUTOMATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts of Robotic Process Automation.
- To expose to the key RPA design and development strategies and methodologies.
- To learn the fundamental RPA logic and structure.
- To explore the Exception Handling, Debugging and Logging operations in RPA.
- To learn to deploy and maintain the software bot.

Course Outcome		Cognitive Skill
CO-01	Enunciate the key distinctions between RPA and existing automation techniques and platforms.	R, U
CO-02	Use UiPath to design control flows and work flows for the target process	R, U, A, An
CO-03	Implement recording, web scraping and process mining by automation	R, U, A
CO-04	Use UIPath Studio to detect, and handle exceptions in automation processes	R, U, A, An
CO-05	Implement and use Orchestrat or for creation, monitoring, scheduling, and controlling of automated bots and processes	R,U, A, An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	S	M	S	S	S	L	S	S	S
CO-02	S	M	S	M	S	S	S	M	S	M	S	S	S
CO-03	M	M	S	M	S	S	L	S	S	M	S	S	S
CO-04	S	S	S	M	S	S	M	S	S	M	S	S	S

CO-05	S	M	S	M	S	S	S	S	S	L	S	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction to Robotic Process Automation **9**

Emergence of Robotic Process Automation (RPA) - Evolution of RPA - Differentiating RPA from Automation - Benefits of RPA - Application areas of RPA - Components of RPA - RPA Platforms. Robotic Process Automation Tools – Templates - User Interface - Domains in Activities, Workflow Files.

Unit II: Automation Process Activities **9**

Sequence - Flowchart & Control Flow: Sequencing the Workflow – Activities - Flowchart - Control Flow for Decision making. Data Manipulation: Variables - Collection - Arguments - Data Table - Clipboard management - File operations Controls: Finding the control - waiting for a control - Act on a control - UiExplorer - Handling Events.

Unit III: App Integration, Recording and Scraping **9**

App Integration - Recording –Scraping, Selector - Workflow Activities. Recording mouse and keyboard actions to perform operation - Scraping data from website and writing to CSV- Process Mining.

Unit IV: Exception Handling and Code Management **9**

Exception handling - Common exceptions, Logging- Debugging techniques - Collecting crash dumps - Error reporting. Code management and maintenance: Project organization - Nesting workflows – Reusability – Templates - Commenting techniques - State Machine.

Unit V: Deployment and Maintenance **9**

Publishing using publish utility - Orchestration Server - Control bots - Orchestration Server to deploy bots - License management - Publishing and managing updates. RPA Vendors - Open Source RPA - Future of RPA

TOTAL: 45 HOURS

TEXT BOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool-UiPath by Alok Mani Tripathi, Packt Publishing,2018.
2. Tom Taulli,“ The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems ”,A press publications,2020.

REFERENCES:

1. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston(Author),IntroductiontoRoboticProcessAutomation:aPrimer,InstituteofRoboticProcessAutomation,Amazon Asia-Pacific HoldingsPrivateLimited,2018

2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited,2018
3. A Gerardus Blokd yk ,"Robotic Process Automation RpaA CompleteGuide",2020

CA36B1	CLIENT SERVER COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES

- To provide knowledge on construction of a complete end-to-end information system.
- Exposure to middleware technologies on client server environment.
- To demonstrate the concepts of groupware server.
- To provide basic knowledge on client/server distributed management.

Course Outcome		Cognitive Skill
CO-01	Understand the basic concepts of client server computing.	U
CO-02	Understand the concept of client server environment.	U
CO-03	Understanding how to set up manage and maintain servers efficiently.	U
CO-04	Remember web development technologies.	R
CO-05	Analyze the functioning of client/server distributed system.	An

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	S	M	L	L	S	S	L	M	S	S
CO-02	S	S	M	S	M	S	L	M	S	L	M	M	S
CO-0C3	S	M	S	S	M	S	S	M	S	M	M	S	S
CO-04	M	S	M	S	S	S	L	S	S	L	M	M	S
CO-05	L	M	S	S	M	S	S	M	S	L	M	S	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction to client server computing **9**

What is client/Server computing–Benefits of client/Server computing -Evolution of client server computing – Configurations in client/Server computing –Design consideration of client server - client server computing model - Components of client server Applications –-Classes of Client Server Applications-Categories of client Applications.

Unit II: Components of Client Server Applications: The Client **9**

Introduction – The Client's Role –Client services –Dynamic Data Exchange(DDE) –Object Linking and Embedding(OLE) –Component Object Model(COM) –Distributed Component Object Model(DCOM) –Object Request Broker(ORB) –Component Object Request Broker Architecture(CORBA) – GUI Design Standards –Testing Interfaces – Development Aids.

Unit III: Components of Client Server Applications: The Server **9**

Server Hardware – Categories of servers – Features of Server machines – Classes of Server machines Server'sRole -Network operating System (NOS)–Server operating System (SOS) - Distributed Computing Environment (DCE)– Client Server Security.

Unit IV: Client Server Networks Connectivity **9**

Peer-To-Peer Network– Client-Server Network –OSI model – Communication Interface Technology– LAN Cabling –Fiber Distributed Data Interface(FDDI) –Token Ring –Network File System –Inter Process Communication(IPC) –Integrated Services Digital Network(ISDN) –Network Management.

Unit V: Client Server System Development Hardware **9**

Introduction -Hardware/Network Acquisition-PC-Level Processing Units –MACINTOSH – NOTEBOOK –PEN -UNIX Workstation X-Terminal –X-Server –Server Hardware –LAN Hardware and Software.

TOTAL: 45 HOURS

TEXT BOOKS

1. Dan Harkey, Jeri Edwards and Robert Orfali, The Essential Client Server Survival Guide, 2nd Edition,.Galgotia Publications Pvt. Ltd., 2000.
2. Client Server Computing, Devendra Kumar.
3. Client/Server Computing, Dawna Travis Dewire, Tata McGraw-Hill

REFERENCES:

1. Distributed Computing, Principles and applications, M.L. Liu, Pearson Education.
2. Client/Server Survival Guide 3rd edition Robert Orfali Dan Harkey& Jeri Edwards, ohn Wiley & Sons.
3. Client/Server Computing D T Dewire, TMH.

CA36B2	ENTERPRISE RESOURCE PLANNING	L	T	P	C
		3	0	0	3

OBJECTIVES

- Grasp the basic concepts and components of Enterprise Resource Planning systems.
- Comprehend the key stages involved in the ERP implementation process.
- Analyze digital evidence related to data acquisition, identification, and analysis.

CourseOutcome		Cognitive Skill
CO-01	Understand the basic concepts of ERP.	R,U
CO-02	To understand the basic ERP implementation lifecycle	R,A
CO-03	Apply the ERP modules	R,U
CO-04	Evaluate the techniques of present and future directions	R,U,E
CO-05	examine digital evidences such as the data acquisition, identification analysis	R,A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate,S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	M	M	L	M	M	S	S	M	S	M	S
CO-02	S	M	S	S	S	L	M	S	M	S	S	M	S
CO-03	M	L	S	S	S	M	M	S	M	S	M	S	S
CO-04	S	M	S	S	M	S	L	S	M	S	S	M	S
CO-05	S	M	L	S	S	M	L	S	M	M	S	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Enterprise resource planning **9**

Introduction ERP, ERP General Model, Evolution of ERP, Reasons for growth of ERP, Reasons for failure, why ERP Packages are used now ? Enterprise Overview - Integrated Management Information, Business Modelling, Integrated Data Model ERP Technologies: - BPR, MIS, DSS, EIS, SCM (Supply Chain Management), ERP Generations.

Unit II: ERP implementation lifecycle **9**

Pre-evaluation screening, package evaluation, project planning phase, Gap Analysis, Reengineering, Configuration, Team training, Testing, Going live, End-user Training, Post Implementations, Role of Vendors, consultants and user's, Cost of ERP Implementation.

Unit III: ERP modules **9**

Business Modules, Finance, Plant maintenance, Quality Management, Materials Management, Manufacturing, Human resources, Sales and Distribution, ERP Software Vendors: Introduction, SAP AG, Baan, PeopleSoft Oracle and JD Edwards

Unit IV: ERP-Present and Future Directions **9**

Limitation of ERP, Implementation requirements, ERP & E-Commerce, ERP & Internet, Future Directions, ERP and Related Technologies :- Business Process Re-engineering ,Data Warehousing, Data Mining ,OLAP ,Product Lifecycle..

Unit V: CRM **9**

Essentials of Customer relationship management–Designing CRM application – Various modules of CRM application- Advantages of CRM- Advantages of CRM

TOTAL: 45 HOURS

TEXT BOOKS:

1. ERP Demystified by Alexis Leon : TMH Publication (10th edition)
2. ERP, Vinod KumarGarg and NK Venkitakrishan : PHI Publication
3. Enterprise Resource Planning , second edition by Alexis Leon, Tata McGraw Hill

REFERENCES:

1. ERP Demystified (Second Edition) Publisher: McGraw Hill By Alexis Leon
2. Enterprise Resource Planning Publisher: MacMillan Publications By Mahadeo Jaiswal and Ganesh VanapalliEnterprise Resource Planning (Edition-2008

CA36B3	DISTRIBUTED COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES

- Layout foundations of Distributed System.
- Understand in detail the system level and support required for distributed system.
- Get familiar with the idea of middleware and related issue.

Course Outcome		Cognitive Skill
CO-01	Understand the design principles in distributed systems	U
CO-02	Analyze the knowledge of basic elements and concepts related to distributed system technologies.	An
CO-03	Analyze the middleware technologies that support distributed applications.	An
CO-04	Understand the concept of Resource and process management.	U

CO-05	Apply the knowledge of Distributed File system in building large scale distributed applications	A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate,S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	S	S	M	S	S	M	S	S	S	M
CO-02	M	S	S	S	S	M	M	S	S	S	S	S	M
CO-03	S	M	S	S	S	S	L	S	S	M	S	S	S
CO-04	S	S	S	S	S	S	M	S	L	S	S	S	S
CO-05	S	S	M	S	S	M	S	S	SS	S	M	S	S

S-Strong,M-Medium,L-Low,N-Notrelevant

Unit I: Introduction to Distributed System **9**

Characterization of Distributed System –Issues -Goals -Difference between distributed computing and parallel computing -Evolution distributed computing from mainframes to cloud computing -Introduce key concepts such as latency, bandwidth. And fault tolerance and -Types of distributed system – Hardware and software concepts NOS, DOS -Examples of distributed system-Trends in distributed system.

Unit II: Communication in Distributed System **9**

System model –physical model -Architectural model -Fundamental model -Interprocess communication (IPC) -Event Synchronization -Data Representation - Remote Procedure Call (RPC) -Remote Method Invocation (RMI). –Message-Oriented Communication –Stream Oriented Communication –Group Communication

Unit III: Remote Method Invocation and Objects 9

Remote Invocation Introduction -Request-reply protocols -Remote procedure call -Remote method Invocation --Group communication – Unicasting versus Multicasting – Connectionless versus Connection-Oriented Multicast -Reliable Multicasting versus Unreliable Multicasting - Publish subscribe system -Shared memory approaches -Message Passing versus Distributed objects

Unit IV: Security **9**

Introduction -Overview of security techniques -Cryptographic algorithms -Digital Signatures - Cryptography pragmatics -Authentication and Authorization -Data Encryption -Network Security -container security –Micro services security.

Unit V: Distributed File System and Name Services 9

Introduction and features of Distributed file system- -File Models – File Accessing models - File service architecture –File Replication -Fault Tolerance -Design principles -Sun's network file system -Andrews file system -Network File System (NFS)

TOTAL:45 HOURS

TEXTBOOKS:

1.AndrewS.Tanenbaum and Maarten Van Steen, Distributed system principles Paradigms,2nd edition, Pearson Education.

2.Pradeep K.Sinha, "Distributed Operating system Concepts and design", PHI.

REFERENCES:

1.M.L. Liu, -Distributed Computing Principles and Applicational, Pearson Addison Wesley,2004.

2.George Coulourin, Jean Dollinore, Tim Kindberg, Distributed System concepts and Design",4thEdition, Pearson Education,2005.

CA36B4	CLOUD COMPUTING FUNDAMENTALS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand cloud fundamentals.
- To explore Cloud Architecture and Technologies.
- To analyze Security and Compliance in the Cloud

	Course Outcome	Cognitive Skill
CO-01	To understand the basic concepts of cloud computing	R,U
CO-02	To understand and analyze the service models and architecture	U, An
CO-03	To understand the concepts of cloud storage system	R,U
CO-04	To understand and analyze the concepts of cloud security	U, An
CO-05	To understand the concepts of virtualization	R,U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

CO / PO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	S	S	M	S	S	M	S	S	S	M
CO-02	M	S	S	S	S	M	M	S	S	S	S	S	M
CO-03	S	M	S	S	S	S	L	S	S	M	S	S	S
CO-04	S	S	S	S	S	S	M	S	L	S	S	S	S
CO-05	S	S	M	S	S	M	S	S	SS	S	M	S	S

S-Strong, M-Medium, L-Low, N-Not relevant

UNIT I: Overview of Cloud Computing **9**

Definition – Basic concepts – Example cloud services – Characteristics of Cloud computing – Cloud deployment models – Cloud service Models – Benefits of cloud computing – Challenges of cloud computing – Cloud Enabling techniques – Cloud standards

UNIT II: Service Models and Architecture **9**

Cloud service delivery models – Software as a Service – Platform as a Service – Infrastructure as a service – X as a Service – Reference framework – Role based Architecture – layer based Architecture

UNIT III: Cloud Storage System **9**

Basic concepts – Cloud storage models – mobile cloud storage – advantages and limitations – cloud storage architecture – cloud storage devices – cloud file systems – cloud data store and Access – protocols used in cloud storage – Case studies S3, GC

UNIT IV: Cloud Computing Security **9**

Significance of security – Cloud security issues identification – Issues categorization – State of the art Solutions, integrated solution – Planning for cloud adoption - security

reference architecture – Identity and Access management

UNIT V: Virtualization **9**

Need and Benefits of virtualization – Virtualization approaches – Types of virtualization – virtual machine – Types of virtual machine – Virtualization software – Resource Virtualization - Virtualization Management.

TOTAL : 45 HOURS

TEXT BOOKS:

1. Fundamentals of Cloud Computing, A. Kannammal, Cengage Learning India Pvt. Ltd., 2015
2. Cloud Computing- Black Book, Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Dr. Devan Shat, Dreamtech Press, 2014

REFERENCES:

1. Mastering Cloud Computing: Foundations and Application Programming by Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi, 2023.
2. Arshdeep Bahga and Vijay Madisetti, "Cloud Computing –A Hands on Approach", Universities Press (India) Pvt Ltd. 2014.