MUTHAYAMMAL ENGINEERING COLLEGE

An Autonomous Institution

(Approved by AICTE | Accredited by NBA & NAAC | Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

Curriculum/Syllabus

Programme Code : CY

Programme Name : B.E.-Cyber Security

Regulation : R-2023

MUTHAYAMMAL ENGINEERING COLLEGE

(Approved by AICTE | Accredited by NBA & NAAC | Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.
Ph. No.: 04287-220837
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Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

Institution Vision & Mission

Institution Vision

- To be a Centre of Excellence in Engineering, Technology and Management on par with International Standards.

Institution Mission

- To prepare the students with high professional skills and ethical values.
- To impart knowledge through best practices.
- To instill a spirit of innovation through Training, Research and Development.
- To undertake continuous assessment and remedial measures.
- To achieve academic excellence through intellectual, emotional and social stimulation.

Chairman
Board of Studies
Department of Computer Science and Engineering
MUTHAYAMMAL ENGINEERING COLLEGE
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Department Vision & Mission

Department Vision

- To educate and prepare technocrats in Cyber Security with global standard

Department Mission

- To prepare the students with excellence and ethics in Cyber Security
- To inculcate of life learning through best practice
- To excel in academic and research through innovation

Program Educational Objectives

PEO1 : Graduates will be able to exhibit as Cyber Security Professional in global standard

PEO2 : Graduates will be able to successfully adapt to new technologies, tools and methodologies for career development

PEO3 : Graduates will be able to provide technical leadership and service to their business, profession and society

Program Specific Outcomes

PSO1 : Graduates should be able to analyze and resolve security issues in networks and computer systems to secure an IT infrastructure

PSO2 : Graduates should be able to recognize professional responsibilities and computing practice based on legal and ethical principles

PSO3 : Graduates should be able to develop policies and procedures to manage enterprise security risk

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Program Outcomes

PO1 : **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 : **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.

PO3 : **Design/Development solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 : **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 : **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 : **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 : **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO8 : **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 : **Individual and team work:** Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 : **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 : **Project management and finance:** Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 : **Lifelong learning:** Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

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B.E.- Cyber Security
Grouping of Courses

I. Humanities and Social Sciences Courses (HS)

Sl.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
1.	23HSS01	Business English	HS	2	2	0	0	2
2.	23HSS02	English Communicative Skills Laboratory	HS	2	0	0	2	1
3.	23HSS03	Life Skill and Work Place Psychology	HS	2	2	0	0	2
4.	23HSS04	Technical English For Engineers	HS	2	2	0	0	2
5.	23HSS05	Communicative English for Engineers	HS	2	2	0	0	2
6.	23HSS06	Basics of Japanese Language	HS	2	2	0	0	2
7.	23HSS07	Basics of French Language	HS	2	2	0	0	2
8.	23HSS18	Professional Ethics and Human Values	HS	3	3	0	0	3

II. Basic Sciences (BS)

1.	23BSS01	Engineering Physics	BS	3	3	0	0	3
2.	23BSS02	Physics and Chemistry Laboratory	BS	2	0	0	2	1
3.	23BSS03	Bio and Nanomaterials Sciences	BS	3	3	0	0	3
4.	23BSS04	Material Sciences	BS	3	3	0	0	3
5.	23BSS05	Physics for Mechanical Engineers	BS	3	3	0	0	3
6.	23BSS11	Engineering Chemistry	BS	3	3	0	0	3
7.	23BSS12	Environmental Science and Engineering	BS	3	3	0	0	3
8.	23BSS13	Organic Chemistry	BS	3	3	0	0	3
9.	23BSS14	Physical Chemistry	BS	3	3	0	0	3
10.	23BSS15	Applied Chemistry	BS	3	3	0	0	3
11.	23BSS16	Organic Chemistry Laboratory	BS	2	0	0	2	1
12.	23BSS17	Physical Chemistry Laboratory	BS	2	0	0	2	1
13.	23BSS21	Algebra and Calculus	BS	4	3	1	0	4
14.	23BSS22	Differential Equations and Vector Analysis	BS	4	3	1	0	4
15.	23BSS23	Transform and Partial Differential Equations	BS	4	3	1	0	4
16.	23BSS24	Discrete Mathematics	BS	4	3	1	0	4
17.	23BSS25	Statistical and Queuing Model	BS	4	3	1	0	4

18.	23BSS26	Numerical Methods	BS	4	3	1	0	4
19.	23BSS27	Probability and Random Processes	BS	4	3	1	0	4
20.	23BSS28	Statistic and Numerical Methods	BS	4	3	1	0	4

III. General Engineering Science (GES)

1.	23GES01	Programming for Problem Solving Using C	GES	3	3	0	0	3
2.	23GES02	Programming for Problem Solving Technique	GES	3	3	0	0	3
3.	23GES03	Programming in C Laboratory	GES	2	0	0	2	1
4.	23GES04	Programming in C and Python Laboratory	GES	2	0	0	2	1
5.	23GES05	Electrical and Electronic Sciences	GES	3	3	0	0	3
6.	23GES06	Mechanical and Building Sciences	GES	3	3	0	0	3
7.	23GES07	Computer Aided Drafting Laboratory	GES	2	0	0	2	1
8.	23GES08	Python Programming	GES	3	3	0	0	3
9.	23GES09	Programming in Python Laboratory	GES	2	0	0	2	1
10.	23GES10	Soft Skills Laboratory	GES	2	0	0	2	1
11.	23GES11	Electronic Devices	GES	3	3	0	0	3
12.	23GES12	Electronic Simulation Laboratory	GES	2	0	0	2	1
13.	23GES13	Electric Circuits	GES	3	2	1	0	3
14.	23GES14	Electric Circuits Laboratory	GES	2	0	0	2	1
15.	23GES15	Manufacturing Process	GES	3	3	0	0	3
16.	23GES16	Manufacturing Process Laboratory	GES	2	0	0	2	1
17.	23GES17	Mechanical and Building Sciences Laboratory	GES	2	0	0	2	1
18.	23GES18	Construction Materials	GES	3	3	0	0	3
19.	23GES19	Concepts in Product Design	GES	3	3	0	0	3
20.	23GES20	Renewable Energy Sources	GES	3	3	0	0	3
21.	23GES21	Electrical Drives and Control	GES	3	3	0	0	3
22.	23GES22	Electrical Drives and Control Laboratory	GES	2	0	0	2	1
23.	23GES23	Analog and Digital communication	GES	3	3	0	0	3
24.	23GES24	Digital Principles and System Design	GES	3	3	0	0	3
25.	23GES25	Digital Principles and System Design Laboratory	GES	2	0	0	2	1
26.	23GES26	Engineering Drawing	GES	5	1	0	4	3
27.	23GES27	Engineering Geology	GES	3	3	0	0	3
28.	23GES28	Engineering Mechanics	GES	4	3	1	0	4
29.	23GES29	Wireless Communication	GES	4	3	1	0	4
30.	23GES30	Electronics and Microprocessor	GES	3	3	0	0	3
31.	23GES31	Electronics and Microprocessor Laboratory	GES	2	0	0	2	1
32.	23GES32	Data Structures using Python	GES	3	3	0	0	3

IV. Professional Core (PC)

1.	23CYC01	Data Structures	PCC	3	3	0	0	3
2.	23CYC02	Data Structures Laboratory	PCC	2	0	0	2	1
3.	23CYC03	Object Oriented Programming in Java	PCC	3	3	0	0	3
4.	23CYC04	Object Oriented Programming in Java Laboratory	PCC	2	0	0	2	1
5.	23CYC05	Computer Networks	PCC	3	3	0	0	3
6.	23CYC06	Computer Organization and Architecture	PCC	3	3	0	0	3
7.	23CYC07	Database Management Systems	PCC	3	3	0	0	3
8.	23CYC08	Database Management Systems Laboratory	PCC	2	0	0	2	1
9.	23CYC09	Cryptography and Network security	PCC	3	3	0	0	3
10.	23CYC10	Cryptography and Network security Laboratory	PCC	2	0	0	2	1
11.	23CYC11	Operating Systems	PCC	3	3	0	0	3
12.	23CYC12	Operating Systems Laboratory	PCC	2	0	0	2	1
13.	23CYC13	Information security	PCC	3	3	0	0	3
14.	23CYC14	Digital Forensics	PCC	3	3	0	0	3
15.	23CYC15	Introduction to Cyber Laws	PCC	3	3	0	0	3
16.	23CYC16	Cyber Crime Investigations and Digital Forensics	PCC	3	3	0	0	3
17.	23CYC17	Cloud Computing	PCC	3	3	0	0	3
18.	23CYC18	Cloud Computing Laboratory	PCC	2	0	0	2	1
19.	23CYC19	Web and mobile application security	PCC	3	3	0	0	3
20.	23CYC20	Web and mobile application Laboratory	PCC	2	0	0	2	1
21.	23CYC21	Wireless sensor network security	PCC	3	3	0	0	3
22.	23CYC22	Wireless sensor network Laboratory	PCC	2	0	0	2	1
23.	23CYC23	Forensic Analysis Tools	PCC	3	3	0	0	3
24.	23CYC24	Forensic Analysis Tools Laboratory	PCC	2	0	0	2	1
25.	23CYC25	Data Base Security	PCC	3	3	0	0	3
26.	23CYC26	Data Base Security Laboratory	PCC	2	0	0	2	1
27.	23CYC27	Cyber Defense	PCC	3	3	0	0	3
28.	23CYC28	Risk Management	PCC	3	3	0	0	3
29.	23CYC29	Intrusion Detection and Prevention System	PCC	3	3	0	0	3
30.	23CYC30	Cyber Laws and Ethics	PCC	3	3	0	0	3
31.	23CYC31	Software Engineering	PCC	3	3	0	0	3
32.	23CYC32	Object Oriented Programming	PCC	3	3	0	0	3
33.	23CYC33	Object Oriented Programming Laboratory	PCC	2	0	0	2	1
34.	23CYC34	Design and Analysis of Algorithms	PCC	3	3	0	0	3
35.	23CYC35	Design and Analysis of Algorithms Laboratory	PCC	2	0	0	2	1
36.	23CYC36	Block chain Technology	PCC	3	3	0	0	3

37.	23CYC37	Mobile Communication	PCC	3	3	0	0	3
38.	23CYC38	Internet of Things	PCC	3	3	0	0	3
39.	23CYC39	Internet of Things Laboratory	PCC	2	0	0	2	1
40.	23CYC40	Artificial Intelligence	PCC	3	3	0	0	3
41.	23CYC41	Principles of Compiler Design	PCC	3	3	0	0	3
42.	23CYC42	Compiler Design Laboratory	PCC	2	0	0	2	1
43.	23CYC43	Data warehousing and Data Mining	PCC	3	3	0	0	3
44.	23CYC44	Machine Learning	PCC	3	3	0	0	3
45.	23CYC45	Software Engineering and its Methodology	PCC	3	3	0	0	3
46.	23CYC46	Foundation of Data Science	PCC	3	3	0	0	3

V. Professional Elective (PE)

1.	23CYE01	C# and .Net Framework	PEC	3	3	0	0	3
2.	23CYE02	Software Project Management	PEC	3	3	0	0	3
3.	23CYE03	Salesforce CRM and Platform	PEC	3	3	0	0	3
4.	23CYE04	Salesforce CRM and Platform Laboratory	PEC	2	0	0	2	1
5.	23CYE05	Biometric Systems & Biometric Image Process	PEC	3	3	0	0	3
6.	23CYE06	AWS Academy Cloud Developing	PEC	3	3	0	0	3
7.	23CYE07	AWS Academy Cloud Developing Laboratory	PEC	2	0	0	2	1
8.	23CYE08	AWS Academy Cloud Architecting	PEC	3	3	0	0	3
9.	23CYE09	AWS Academy Cloud Architecting Laboratory	PEC	2	0	0	2	1
10.	23CYE10	AWS Academy Cloud Foundation	PEC	3	3	0	0	3
11.	23CYE11	AWS Academy Cloud Foundation Laboratory	PEC	2	0	0	2	1
12.	23CYE12	Ethical Hacking And Cyber Forensics	PEC	3	3	0	0	3
13.	23CYE13	Ethical hacking Laboratory	PEC	2	0	0	2	1
14.	23CYE14	Computer Forensics Analysis& Investigation	PEC	3	3	0	0	3
15.	23CYE15	Computer Forensics Laboratory	PEC	2	0	0	2	1
16.	23CYE16	Semantic Web	PEC	3	3	0	0	3
17.	23CYE17	Network Programming and Management	PEC	3	3	0	0	3
18.	23CYE18	Business Intelligence	PEC	3	3	0	0	3
19.	23CYE19	Wireless Sensor Networks	PEC	3	3	0	0	3
20.	23CYE20	Information Retrieval Techniques	PEC	3	3	0	0	3
21.	23CYE21	Service Oriented Architecture	PEC	3	3	0	0	3
22.	23CYE22	Agile Technology	PEC	3	3	0	0	3
23.	23CYE23	Social Network Analysis	PEC	3	3	0	0	3
24.	23CYE24	Game Programming	PEC	3	3	0	0	3
25.	23CYE25	Natural Language Processing	PEC	3	3	0	0	3
26.	23CYE26	Big data Analytics	PEC	3	3	0	0	3
27.	23CYE27	Ad hoc and Sensor Networks	PEC	3	3	0	0	3
28.	23CYE28	Management Information System	PEC	3	3	0	0	3
29.	23CYE29	Software Quality Assurance	PEC	3	3	0	0	3

30.	23CYE30	Bioinformatics	PEC	3	3	0	0	3
31.	23CYE31	Docker and Kubernetes	PEC	3	3	0	0	3
32.	23CYE32	Open Stack Essentials	PEC	3	3	0	0	3
33.	23CYE33	User Centric Design	PEC	3	3	0	0	3
34.	23CYE34	Software Testing	PEC	3	3	0	0	3
35.	23CYE35	Soft computing	PEC	3	3	0	0	3
36.	23CYE36	Real Time Systems	PEC	3	3	0	0	3
37.	23CYE37	Machine Learning	PEC	3	3	0	0	3
38.	23CYE38	High Speed Networks	PEC	3	3	0	0	3
39.	23CYE51	MERN Stack Development	PEC	3	3	0	0	3
40.	23CYE52	MERN Stack Development Laboratory	PEC	3	3	0	0	2

VI. Open Elective (OE)

1.	23MEE07	Industrial Automation Robotics	OEC	3	3	0	0	3
2.	23MEE18	Power Plant Engineering	OEC	3	3	0	0	3
3.	23MEC26	Total Quality Management	OEC	3	3	0	0	3
4.	23ECE06	Telecommunication Switching Networks	OEC	3	3	0	0	3
5.	23ECE08	Mobile Ad-Hoc Networks	OEC	3	3	0	0	3
6.	23PC-CED11	Water Supply Engineering	OEC	3	3	0	0	3
7.	23PE-CEE05	Health Monitoring of Structures	OEC	3	3	0	0	3

VII. Employability Enhancement Courses (EEC)

1.	23CYP01	Project Work Phase I	EEC	6	0	0	6	5
2.	23CYP02	Project Work Phase II	EEC	18	0	0	12	10
3.	23CYP03	Comprehension	EEC	2	0	0	2	1
4.	23CYP04	Technical Seminar	EEC	4	0	4	0	2
5.	23CYP05	Entrepreneurship Development	EEC	3	3	0	0	3
6.	23CYP06	Professional Practices	EEC	6	0	0	6	3
7.	23CYM01	NPTEL- Internetwork Security	NPTEL	-	-	-	-	-
8.	23CYM02	NPTEL- Systems and Usable Security	NPTEL	-	-	-	-	-
9.	23CYM03	NPTEL- Ethical Hacking	NPTEL	-	-	-	-	-
10.	23CYM04	NPTEL-Computer Networks and Internet Protocol	NPTEL	-	-	-	-	-

VIII. Mandatory Courses (MC)

1.	23CYA01	Indian Constitution	Audit Course	-	-	-	-	-
2.	23CYA02	Value Education	Audit Course	-	-	-	-	-
3.	23CYA03	Disaster Management	Audit Course	-	-	-	-	-
4.	23CYA04	Pedagogy Studies	Audit Course	-	-	-	-	-
5.	23CYA05	Stress Management by Yoga	Audit Course	-	-	-	-	-

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B.E.- Cyber Security
Curriculum | UG - R2023
Semester -I

Sl.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Theory								
1.	23HSS01	Technical and Communicative English I	HS	3	2	0	2	2
2.	23BSS21	Algebra and Calculus	BS	4	3	0	0	4
3.	23BSS01	Engineering Physics	BS	3	3	0	0	3
4.	23GES01	Programming for Problem Solving Using C	GES	3	3	0	0	3
5.	23GES06	Electrical and Electronics Sciences	GES	3	3	0	0	3
6.	23HSS08	Heritage of Tamils	HS	1	1	0	0	2
Practical								
7.	23BSS02	Physics Laboratory	BS	2	0	0	2	2
8.	23GES02	Programming in C Laboratory	GES	1	0	0	1	1
							Total Credit	**20**

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Semester -II

Sl.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Theory								
1.	23HSS02	Technical and Communicative English II	HS	3	3	0	3	2
2.	23BSS22	Advanced Calculus and Complex Analysis	BS	4	3	1	0	4
3.	23BSS11	Engineering Chemistry	BS	3	3	0	0	4
4.	23GES03	Python Programming	GES	3	3	0	0	3
5.	23GES04	Computer Peripherals and Programming Essentials	GES	3	3	0	0	3
6.	23HSS09	Tamils and Technology	HS	1	1	0	0	2
Practical								
7.	23BSS12	Chemistry Laboratory	BS	2	0	0	2	1
8.	23GES05	Python Programming Laboratory	GES	1	0	0	2	1
							Total Credit	**20**

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Semester -III

Sl.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Theory								
1.	23BSS24	Transform and Boundary Value Problems	BS	5	3	1	0	4
2.	23CYC07	Database Management Systems	PCC	3	3	0	0	3
3.	23CYC06	Computer Organization and Architecture	PCC	3	3	0	0	3
4.	23CYC01	Data Structures and Algorithm using C	PCC	3	3	0	0	3
5.	23CYC03	Objected Oriented Programming in Java	PCC	3	3	0	0	3
6.	23CYC40	Introduction to Artificial Intelligence	PCC	3	3	0	0	3
Practical								
7.	23CYC08	Professional Skills-II-DBMS Laboratory	PCC	2	0	0	2	1
8.	23CYC02	Data Structures using C Laboratory	PCC	2	0	0	2	1
9.	23CYC04	Objected Oriented Programming in Java Laboratory	PCC	2	0	0	2	1
10.	23CYP05	Mini Project Front End	PCC	2	0	0	2	1
							Total Credit	**23**

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Semester -IV

Sl.No	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Theory								
1.	23BSS25	Discrete Mathematics	BS	4	3	1	0	4
2.	23CYE51	MERN Stack Development	PEC	3	3	0	0	3
3.	23CYC46	Foundations of Data Science	PCC	3	3	0	0	3
4	23CYC11	Operating Systems	PCC	3	3	0	0	3
5.	23CYC44	Machine Learning	PCC	3	3	0	0	3
6.	23CYC05	Computer Networks	PCC	3	3	0	0	3
Practical								
7.	23CYE52	MERN Stack Development Laboratory	PEC	2	0	0	2	1
8.	23CYC47	Data Science using Python Laboratory	PEC	2	0	0	2	1
9.	23CYC12	Operating Systems Laboratory	PCC	2	0	0	2	1
10.		Quantitative Appetitive	PCC	2	0	0	2	1
							Total Credit	**23**

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Semester -V

Sl.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Theory								
1.	23CYC45	Software Engineering and its Methodology	PCC	3	3	0	0	3
2.	23CYC17	Cloud Computing using AWS	PCC	3	3	0	0	3
3.	23CYC38	Internet Of Things	PCC	3	3	0	0	3
4.	23CYC44	Cryptography and Network Security	PCC	3	3	0	0	3
5.	23CYE12	Elective – I- Ethical Hacking and Cyber Forensics	PEC	3	3	0	0	3
6.	23CYM06	Elective – II- NPTEL-Distributed Systems	PEC	3	3	0	0	3
Practical								
7.	23CYC39	Internet Of Things Laboratory	PCC	1	0	0	2	1
8.	23CYC18	Internship-II-Cloud Computing Laboratory	PCC	1	0	0	2	1
9.	23CYE13	Elective – I- Ethical Hacking Laboratory	PEC	1	0	0	2	1
							Total Credit	**21**

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(Approved by AICTE | Accredited by NBA & NAAC | Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

B.E.- Cyber Security
Curriculum | UG - R2023

Semester -VI

Sl.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Theory								
1.	23CYC29	Intrusion Detection and Prevention System	PCC	3	3	0	0	3
2.	23CYC19	Web and Mobile Application Security	PCC	3	3	0	0	3
3.	23CYC36	Block Chain Technology	PCC	3	3	0	0	3
4.	23CYE03	Elective-III- Salesforce CRM and Platform	PEC	3	3	0	0	3
5.	23CYE01	Elective-IV- C# and .Net Framework	PEC	3	3	0	0	3
6.	NPTEL	Open Elective-NPTEL	EEC	3	3	0	0	3
Practical								
7.	23CYP03	Design Project	EEC	2	0	2	2	1
8.	23CYE04	Salesforce CRM and Platform Laboratory	PCC	1	0	0	2	1
9.	23CYC26	Web and Mobile Application Security Laboratory	PCC	1	0	0	2	1
							Total Credit	**21**

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B.E.- Cyber Security
Curriculum | UG - R2023
Semester -VII

Sl.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Theory								
1.	23HSS12	Professional Ethics and Human Values	HS	5	5	0	0	3
2.	23CYE24	Game Programming	PEC	5	5	0	0	3
3.	23CYE31	Elective – V – Docker and Kubernets	PEC	5	5	0	0	3
4.	NPTEL	Elective – VI – NPTEL – Cyber Security and Privacy	PCC	2	2	0	0	3
5.	23MEE07	Open Elective – II – Industrial Automation Robotics	OEC	5	5	0	0	3
6.	23CYE46	DEVOPS	PEC	5	5	0	0	3
Practical								
7.	23CYP01	Project work–Phase I	EEC	0	0	6	6	3
							Total Credit	**21**

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B.E.- Cyber Security
Curriculum | UG - R2023
Semester -VIII

Sl.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week/ Credit			
					L	T	P	C
Practical								
1.	23CYP02	Project Work Phase II	EEC	18	0	0	12	12
							Total Credit	**12**

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Summary of Course Component

Sl.No.	Course Area	Semesters								Total Credits	% of Credits
		I	II	III	IV	V	VI	VII	VIII		
1.	HS	4	4					3		11	6.8
2.	BS	9	9	4	4					26	16.1
3.	GES	7	7							14	8.6
4.	PC			19	14	14	11	3		61	37.8
5.	PE				5	7	6	9		27	16.8
6.	OE							3		3	1.86
7.	EEC						4	3	12	19	11.8
8.	MC										-
9.	NPTEL										-
Total		**20**	**20**	**23**	**23**	**21**	**21**	**21**	**12**	**161**	**100.00**

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23CYC01 **DATA STRUCTURES**

L	T	P	C
3	0	0	3

Course Objectives

- The basic structure concept such as Abstract Data Types, Linear and Non Linear Data structures.
- The behavior of data structures such as stacks, queues, trees, hash tables, search trees, Graph and their representations.
- To choose the appropriate data structure for a specified application
- To solve problems using data structures such as array, linked lists, queues, trees graphs, hash tables, search trees.
- To analyze various searching and sorting algorithms

Course Outcomes

23CYC01.CO1 Identify the appropriate data structure for given pointer and list
23CYC01.CO2 Illustrate the problems using stack and queues.
23CYC01.CO3 Apply the application of Tree in Data Structure.
23CYC01.CO4 Predict the Graph and hashing techniques.
23CYC01.CO5 Generalize the problems using various searching and sorting techniques.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC01.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC01.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC01.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC01.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC01.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: INTRODUCTION AND LIST **9**

Definition, ADT, Types of Data Structures- Linear & Non Linear Data Structures. Array: Representation of arrays, structure and Pointers, Applications of arrays, structure and Pointer, Dynamic Memory Allocation Functions and Recursion function. Linked List: Definition, Types of List, Singly Linked List operations, Doubly Linked list operation, Circular linked list operation, Applications of linked list.

UNIT II: STACK AND QUEUE **9**

Stack: Stack-Definitions & Concepts, array and Linked implementation of Stack Operations on Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression And Their Compilation, Recursion, Tower of Hanoi. Queue: Representation Of Queue, array and Linked implementation of Queue Operations on Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Double Ended Queue, Applications of Queue.

UNIT III: TREE AND BINARY SEARCH TREE **9**

Trees: Basic terminologies of trees – Node, Root, Parent, Child, Link, Sibling, Level, Height, Depth, Leaf, Degree; Binary tree – Full Binary tree, Complete Binary tree; Representation of binary tree – Linear representation, linked representation, Advantages and Disadvantages of both representations; Binary tree traversal – Inorder, Preorder, Postorder traversals; Operations on Binary tree - creation, insertion of left and right child; Tree representation of an arithmetic expression, inorder, Preorder and Postorder expressions from expression tree. Binary Search Tree – Definition, Creation of Binary search tree for a given set of values; Searching for an item – Minimum, Maximum or any given value; Applications of Binary search tree. Max Heap-Definition, Insertion into a Max Heap, Deletion from a Max Heap

9

UNIT IV: GRAPHS

Definition – Graph terminologies – Directed and Undirected graph, Weighted graph, Adjacent Vertices, Self-loop, Parallel edges, Path, Cycle, in degree, out degree; complete graph, Connected graph; Representation of graph – Set representation – Adjacency matrix representation – Linked representation – Comparison of representations. Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree and Hamiltonian circuit

UNIT V: HASHING, SEARCHING AND SORTING **9**

Hashing: Introduction, Hash table, Hash function, Collision, Collision resolution – separate chaining, open addressing; Rehashing – Extendible hashing. Searching: Definition – Algorithm and Example for sequential search and binary search. Sorting: Definition – Algorithm and Example for selection sort, bubble sort, insertion sort, quick sort, merge sort, radix sort and Heap Sort

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	E.Horowitz, S.Sahni Susan Anderson-Freed	Fundamentals of Data structures in C,	Universities Press.	2008
2.	Mark Allen Weiss	Data structure and Algorithm Analysis in C	Pearson India	2012

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	R. F. Gilberg, B. A. Forouzan	Data Structures	2nd Edition, Thomson India	2005
2.	R.Kruse, C.L.Tondo and B.Leung,	Data structures and Program Design in C	2nd Edition Prentice-Hall	2006
3.	A.M.Tanenbaum, Y. Langsam, M.J.Augenstein	Data Structures using C and C++	2nd Edition , PHI Learning	2015
4.	R. Krishnamoorthy	Data Structures Using C	Tata McGraw-Hill Education	2008
5.	E Balagurusamy	Data Structures Using C	Tata McGraw - Hill Education	2013

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23CYC02 **DATA STRUCTURES LABORATRORY**

L	T	P	C
0	0	2	1

Course Objectives

- Be familiar with C programming
- Be exposed to implementing abstract data types
- To use files in real time problems
- To implement sorting algorithms
- Construct searching algorithms

Course Outcomes

23CYC02.CO1 Implementing stacks, queues and linked lists in C Programming

23CYC02.CO2 Apply the different data structures for implementing solutions to practical problems

23CYC02.CO3 Formulate the real time problem using traversal, Graph and Tree

23CYC02.CO4 Develop searching programs.

23CYC02.CO5 Create sorting programs

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC02.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC02.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC02.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC02.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC02.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No	List of Experiments
1	Implement a menu driven program to implement operations on the singly linked list.
2	Implement a menu driven program to implement operations on the doubly linked list
3	Implement a menu driven program to implement operations on the circular linked list
4	Implement a program for stack that performs operations using array
5	Implement a program to convert infix notation to postfix notation using stack.
6	Implement a program to QUEUE using arrays that performs operations
7	Implement a program to stack using linked list.
8	Implement a program to queue using linked list.
9	Implement recursive and non-recursive tree traversing methods ignored, preorder and post-order traversal
10	Implement a program to create and operation on binary search tree.
11	Implement a program to Queue Sort.
12	Implement a program to Merge Sort.

Total : 30

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23CYC03 **OBJECT ORIENTED PROGRAMMING IN JAVA**

L	T	P	C
3	0	0	3

Course Objectives

- To develop distributed applications in core Java
- To generalize the different protocols used in web
- To illustrate about the Bean Development KIT in java
- To analyze server side programming concepts
- To formulate swings

Course Outcomes

23CYC03.CO1 Understand the java fundamentals with database connectivity.

23CYC03.CO2 Interpret code TCP/IP and RMI

23CYC03.CO3 Apply the BDK concepts and swing

23CYC03.CO4 Determine Server side programming using Servlet

23CYC03.CO5 Create forms using swing controls and able to do database programming

`

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC03.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC03.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC03.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC03.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC03.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: OBJECT ORIENTED PROGRAMMING **9**

Abstraction – objects and classes - Encapsulation- Inheritance – Polymorphism - OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods-accessspecifiers-staticmembers - Comments, Data Types, Variables, Operators, Control Flow, Arrays, Packages – Java Doccomments.

UNIT-II: INHERITANCE **9**

Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces – Object cloning – inner classes,

ArrayLists –Strings.

UNIT- III: EXCEPTIONS **9**

exception hierarchy – throwing and catching exceptions – built-inexceptions, creating own exceptions, Stack Trace Elements. Input/Output Basics – Streams – Byte streams and Character streams– Reading and Writing Console – Reading and Writing Files

UNIT-IV: I/O BASICS **9**

Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class JavaFX Event Handling, Controls And Components.

UNIT-V: GRAPHICS PROGRAMMING **9**

Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling- event handlers - adapter classes - actions - mouse events - AWT event hierarchy – Introduction to Swing– layout management - Swing Components– Text Fields, Text Areas – Buttons - Check

Boxes – Radio Buttons – Lists – choices – Scrollbars – Windows – Menus – Dialog Boxes.

Total : 45

Text books:

S.No.	Author(s)	Titleofthe Book	Publisher	Year of Publication
1.	HerbertSchildt	Java The complete reference,8th Edition	McGrawHill Education	2011
2.	CayS.Horstmann, Gary cornell	Core Java Volume – Fundamentals, 9th Edition	PrenticeHall	2013

Reference Books:

SI.NO	Author(s)	Titleofthe Book	Publisher	Yearof Publications
1.	Paul Deitel, Harvey Deitel	Java SE 8for programmers",3rd Edition	Pearson, Education	2015
2.	StevenHolzner,	Java2Blackbook	Dreamtech press	2011
3.	Timothy Budd	UnderstandingObject-oriented programming with Java	Pearson Education	2000
4.	Robert Lafore	Object-oriented programming in MicrosoftC++	Pearson Education	2191
5.	Vaskaran Sarcar	Interactive Object-Oriented Programming in Java: Learn and Test Your Programming Skills	Apress	2016

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23CYC04 OBJECT ORIENTED PROGRAMMING IN JAVA LABORATORY

L	T	P	C
0	0	2	1

Course Objectives

- Understand the basic Object Oriented Programming concepts.
- Develop solutions to problems by using of Data Abstraction, Encapsulation and Inheritance.
- Ability to implement one or more patterns involving realization of an abstract interface.
- Utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching.
- To comprehend the art of programming, the structure and the meaning of basic Java programs

Course Outcomes

23CYC04.CO1	Apply syntactic constructs of JAVA to solve logic based problems
23CYC04.CO2	Develop application programs using object oriented programming features
23CYC04.CO3	Solve real time problems using interfaces, packages, Exception Handling, Collection framework and Multithreading
23CYC04.CO4	Develop GUI Applications using Swings, Event handling mechanisms.
23CYC04.CO5	Work independently and in team to solve problems with effective communication.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC04.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC04.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC04.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC04.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC04.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No	List of Experiments
	COMMAND-LINE ARGUMENTS:
1	Demonstrate the following programs using command line arguments: a) Write a program that computes the sum of all its integer arguments. b) Write a program to input n integers and perform sorting between them.
2	RECURSIVE FUNCTIONS AND OVERLOADING: a) The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 0, 1.Every subsequent value is the sum of the 2 values preceding it. Write a Java program that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence? b) Write and test overloaded methods to find sum of three integers, sum of three double values and sum of four integers. c) Write a program to define a class student with name, registration number and marks for three subjects as instance variables and describe a constructor to initialize them. Also define a method display to print all the values.
3	DATA TYPES (ARRAYS AND STRINGS): a) Write a program to print the element of an array that has occurred highest number of times. b) Write a program to count tokens- number of words and characters in a string.
4	SCANNER AND ABSTRACT CLASSES: a) Write a program that displays a menu with options 1. Add 2. Sub. Based on the options chosen, read

2 numbers and perform the relevant operation. After performing the operation, the program should ask the user if he wants to continue. If the user presses y or Y, then the program should continue displaying the menu else the program should terminate. [Use Scanner class].

b) Write a program to create an abstract class named Shape that contains an empty method named numberOfSides ( ). Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method number Of

Sides( ) that shows the number of sides in the given geometrical figures.

PACKAGES AND INTERFACES:

5 a) Write a program that imports the User-defined package P1 and access the member variables andmethods of classes that contained in the package P1.

b) Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throwa Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception

Display the exception in a message dialog box.

6 A University awards some grace marks to students who participate in the Inter University games. Therefore, total marks awarded = Exam_ Marks +Sports_ Grace_ Marks. If total marks scored are greaterthan maximum marks, then the final marks awarded will be equal to the maximum marks. An Object Oriented based implementation will contain a class called Results, which extends a class called Exam, which itself extends a class called Student. It will also contain an interface called Sports, which is implemented by the Results class. The Results class will be responsible for computing the final

marks scored by the students. Write a Java program along with an interactive driver class.

EXCEPTION HANDLING:

7 a) Write a program to handle Arithmetic Exception, Array Out Of Bounds Exception using try andmultiple catch statements.

b) Write a java program to throw a user defined exception called Negative, if the entered input is anegative number.

MULTI-THREADING:

8 a) Write a Java program that creates three threads. First thread displays – Good Morning for every one second, the second thread displays - Hello for every two seconds and the third thread displays - Welcomefor every three seconds.

b) Write a Java program that correctly implements producer consumer problem using the concept ofinter-thread communication.

c) Write a java program to implement multithreading using lambda expression.

HASHSET (COLLECTION FRAMEWORK):

9 Write a program create a class ―Book‖ with name, id, author, publisher and quantity as instance variables and a constructor to initialize them. Create a HashSet object of type Book and three Book instances b1, b2 and b3. Add these instances into HashSet and display them.

10 EVENT HANDLING:

a) Write a java program that simulates a traffic light. The program lets the user select one of three lights:red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be onat a time No light is on when the program starts.

b) Write a java program that handles all mouse and key events and shows the event name at the center ofthe window when mouse event is fired (Use Adapter classes).

Total : 30

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23CYC05 **COMPUTER NETWORKS**

L	T	P	C
3	0	0	3

Course Objectives

- Understanding the basic concepts of computer networking
- Generalize the MAC protocols
- Appraise the switching concepts and Routing Techniques
- Distinguish about UDP & TCP
- Formulate the Application Layer

Course Outcomes

23CYC05.CO1	Interpret the functionality and protocols operating in each layer of OSI reference model with topology.
23CYC05.CO2	Illustrate Various Encoding Technique and its Protocol
23CYC05.CO3	Analyze error control, flow control and routing protocols
23CYC05.CO4	Construct IP, TCP and UDP header formats.
23CYC05.CO5	Determine the Network traffic characteristics and congestion control mechanism.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC05.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC05.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC05.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC05.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC05.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: DATA COMMUNICATIONS **8**

Data Communication – The OSI Model – TCP/IP Protocol Suite – Addressing – Transmission Media – Networking devices – Network Topologies.

UNIT II: DATA LINK LAYER **10**

Encoding - Error Detection – Reliable Transmission – MAC protocols – CSMA/CD – CSMA/CA

UNIT III: NETWORK LAYER **9**

Circuit Switching – Packet Switching – Bridges and LAN Switches: Spanning Tree algorithm – Internetworking – IPv4 - Sub netting – IPv6 – Routing Techniques: Distance vector (RIP) – Link state (OSPF) –– Inter-domain Routing (BGP.

UNIT IV: TRANSPORT LAYER **9**

UDP – TCP – Congestion Control and Resource Allocation: TCP Congestion Control – Congestion Avoidance Mechanisms – Quality of Service: Integrated Services – Differentiated Services – Network Traffic Analysis.

UNIT V: APPLICATION LAYER **9**

Domain Name System – Electronic Mail (SMTP, MIME, IMAP) – File Transfer (FTP) – WWW (HTTP).

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Data and Computer Communications	Pearson Education	2013
2.	Behrouz A Forouzan	Data Communications and Networking	Tata McGraw–Hill, New Delhi	2013

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Larry L. Peterson, Bruce S. Davie	Computer Networks: A Systems Approach	Morgan Kaufmann Publishers Inc.,	2011
2.	James F. Kurose, Keith W. Ross	Computer Networking, A Top–Down Approach Featuring the Internet	Pearson Education	2012

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		L	T	P	C
23CYC06	**COMPUTER ORGANIZATION AND ARCHITECTURE**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the basic hardware and software issues of computer organization
- To estimate the arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations
- To provide the concept of pipelining and hazards
- To familiarize the students with memory system including virtual memories and cache memories
- To exposé the students with I/O devices and standard I/O interfaces

Course Outcomes

23CYC06.CO1 Understand the abstraction of various components of a computer.
23CYC06.CO2 Design arithmetic and logical unit.
23CYC06.CO3 Analyze pipelined control units.
23CYC06.CO4 Evaluate the performance of memory systems.
23CYC06.CO5 Determine the I/O devices and interfaces

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC06.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC06.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC06.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC06.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC06.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: INTRODUCTION **9**

Introduction-Technologies for building Processors and Memory-Performance-The Power Wall-Operations of the Computer Hardware-Operands Signed and Unsigned numbers, Representing Instructions, Logical Operations, Instructions for Making Decisions.

UNIT II: ARITHMETIC OPERATIONS **9**

MIPS Addressing for 32-Bit Immediate and Addresses-Parallelism and Instructions: Synchronization, Translating and Starting a Program, Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword Parallelism, Streaming SIMD Extensions

UNIT III: PIPELINING AND HAZARDS **9**

Building a Datapath - A Simple Implementation Scheme-Overview of Pipelining-Pipelined Datapath-Data Hazards: Control Hazards, Exceptions-Parallelism via Instructions-Instruction Level Parallelism and Matrix Multiply Hardware Design language.

UNIT IV: MEMORY SYSTEM **9**

Memory Technologies-Basics of Caches-Measuring and Improving Cache Performance-Memory hierarchy- Virtual Memory-Secondary storage -Redundant Arrays of Inexpensive Disks-Implementing Cache Controllers

UNIT V: INPUT & OUTPUT ORGANIZATION **9**

Accessing I/O Devices-Interrupts-Interrupt Hardware-Enabling and Disabling Interrupts-Handling Multiple Devices-Controlling Device Requests-Exceptions-Direct Memory Access-Buses -Standard I/O Inter faces – PCI Bus, SCSI Bus, USB.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David A. Patterson and John L. Hennessey	Computer Organization and design	Morgan auffman / lsevier	2014
2.	Smruti Ranjan Sarangi	Computer Organization and Architecture	Tata McGraw Hill	2015

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky	Computer Organization	McGraw-Hill Inc	2012
2.	William Stallings	Computer Organization and Architecture	Pearson Education	2010
3.	Vincent P. Heuring, Harry F. Jordan	Computer System Architecture	Pearson Education	2011
4.	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, and Naraig Manjikian	Computer Organization and Embedded Systems	McGraw Hill Higher Education	2011
5.	John P. Hayes	Computer Architecture and Organization	Tata McGraw Hill	2014

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23CYC07 **DATABASE MANAGEMENT SYSTEMS**

L	T	P	C
3	0	0	3

Course Objectives

- Understand database requirements and determine the entities involved in the system and their relationships.
- Formulate solutions to a broad range of query and data update problems using SQL.
- Analyze the basic issues of transaction processing and concurrency control.
- Explain and implement the fundamental concepts of a relational database system
- Analyze database requirements and determine the entities involved in the system and their relationships.

Course Outcomes

23CYC07.CO1 Recognize ER diagrams for new databases and apply for database applications.

23CYC07.CO2 Implement a database schema for a given problem-domain.

23CYC07.CO3 Normalize a database with non-loss decomposition.

23CYC07.CO4 Apply concurrency control techniques for database transactions.

23CYC07.CO5 Design different database access techniques

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC07.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC07.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC07.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC07.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC07.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: INTRODUCTION TO DBMS **9**

Database System Applications-Purpose of Database Systems -View of data - Database Languages - Database System Architecture - Data models - Entity-Relationship model - Extended E-R Features - Introduction to relational databases- Keys - Integrity Constraints - Relational Algebra - Fundamental Operations - Additional Operations- Domain Relational Calculus - Tuple RelationalCalculus.

UNIT II: SQL & QUERY OPTIMIZATION **9**

SQL Standards - Data types - Basic Structure of SQL Queries - DDL-DML-DCL-TCL - Views- Advanced SQL - Embedded SQL - Static Vs Dynamic SQL - Query Processing - Query Optimization- Heuristic and Cost based Query Optimization

UNIT III: RELATIONAL DATABASE DESIGN AND TRANSACTIONS **9**

Functional Dependencies - Codd's Rule - Normalization - Non-loss decomposition- 1NF to 5NF – DomainKeyNormalForm–Denormalization –TransactionConcepts-ACIDProperties–Serializability- Concurrency Control - Locking Mechanisms - Two Phase Commit Protocol - Deadlock.

UNIT IV: SYSTEM ARCHITECTURE **9**

Overview of Physical Storage Media - RAID - Tertiary storage - File Organization - Organization of Records in Files - Indexing and Hashing - Ordered Indices - B+ Tree Index Files - B Tree Index Files - Static Hashing - Dynamic Hashing - Distributed Databases - Distributed Data Storage – DistributedTransactions

UNIT V: DATABASE SECURITY **9**

Database Security - Data Classification - Threats and risks - Database Access Control - Types of Privileges - Security of Statistical Databases Parallel Databases- Spatial and Multimedia Databases - Mobile and Web databases - Object Oriented Databases- XMLDatabases.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Abraham Silberschatz, Henry F. Korth	Database System Concepts	Tata McGraw-Hill	2013
2.	Ramez Elmasri Shamkant	Fundamentals of Database Systems	Pearson Education	2011

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Raghu RamakrishnanJohannes Gehrke	Database Management Systems	Tata McGraw-Hill	2014
2.	Hector Garcia-Molina Jeffrey D. Ullman Jennifer	Database Systems: The Complete book	Pearson Education	2013
3.	Shefali Naik	Concepts of Database Management Systems	Pearson Education	2013
4.	G.K.Gupta	Database Management Systems	Tata McGraw Hill	2011
5.	Rob Cornell	Database Systems Design and	Cengage Learning	2011

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23CYC08	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	2	1

Course Objectives

- To create and use a database
- Be familiarized with a query language
- Experience on DDL Commands
- Understanding of DML Commands and DCL commands
- Familiarize advanced SQL queries

Course Outcomes

23CYC08.CO1 Design database schema for a given problem-domain
23CYC08.CO2 Apply the integrity constraints in query using database
23CYC08.CO3 Create tables using PL/SQL.
23CYC08.CO4 Formulate the reports.
23CYC08.CO5 Implement VB as front end and SQL as backend

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC08.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC08.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC08.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC08.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC08.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. Data Definition Language commands in RDBMS
2. Data Manipulation Language and Data control Language commands
3. Apply Integrity constraints and Domain constraints for a Database
4. Creation of Views, Nested Queries and Join Queries
5. Study of PL/SQL blocks
6. High level programming language extensions (Control structures and Procedures)
7. Implementation of Functions
8. Implementation of Triggers
9. Design and Implementation of Banking System
10. Design and Implementation of Student Information System
11. Design and Implementation of Payroll Processing System

Total : 30

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23CYC09 **CRYPTOGRAPHY AND NETWORK SECURITY**

L	T	P	C
3	0	0	3

Course Objectives

- To define the OSI security architecture and classical encryption techniques
- To demonstrate various block cipher and stream cipher models.
- To provide necessary Approaches and Techniques to build protection mechanisms.
- To estimate the principles of public key cryptosystems, hash functions and digital signature
- To create the techniques used for message authentication and confidentiality maintenance

Course Outcomes

23CYC09.CO1	Understand the fundamentals of networks security, security architecture, threats and Vulnerabilities.
23CYC09.CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms.
23CYC09.CO3	Analyze the different cryptographic operations of public key cryptography.
23CYC09.CO4	Evaluate the various Authentication schemes to simulate different applications.
23CYC09.CO5	Design various Security practices and System security standards.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC09.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC09.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC09.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC09.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC09.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: INTRODUCTION **9**

Computer Security Concepts - OSI Security Architecture - Security Attacks - Services - Mechanisms - Model for Network Security - Classical Encryption Techniques: Symmetric Cipher Model, Substitution: Ceaser cipher, Playfair cipher, Hill Cipher, Vigenere cipher, Vernam cipher - Transposition Techniques: Rail fence, Row and Column Transposition - Steganography.

UNIT II: SYMMETRIC KEY CRYPTOGRAPHY **9**

Number Theory and Finite Fields: The Euclidean Algorithm, Modular Arithmetic, Groups, Rings, and Fields - Traditional Block Cipher Structure - Data Encryption Standard, The Strength of DES - Advanced Encryption Standard - Block Cipher Operation

UNIT III: ASYMMETRIC CIPHERS **9**

Number Theory: Prime Numbers, Fermat's and Euler's Theorems, Primality Testing, The Chinese Remainder Theorem, Public-Key Cryptography: Principles of Public-Key Cryptosystems, The RSA Algorithm - Diffie-Hellman Key Exchange- Elliptic Curve Arithmetic - Elliptic Curve Cryptography

UNIT IV: DATA INTEGRITY ALGORITHMS AND MUTUAL TRUST **9**

Authentication requirement - Authentication function - MAC - Hash function - Security of hash function and SHA – MD5 -Digital Signatures: DSS - Elgamal Digital Signature Scheme - Key Management and Distribution: X.509 Certificates - Kerberos.

UNIT V: INTERNET AND SYSTEM SECURITY **9**

Electronic Mail security - PGP- IP security - Web Security: SSL - SET- System Security: Malicious Software - Intruders - Firewalls.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William Stallings	Cryptography and Network Security: Principles and Practice	Pearson Education	2014
2.	Atul Kahate	Cryptography and Network Security	Tata McGraw Hill	2013

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	CharlesB. Pfleeger, Shari Lawrence P fleeger	Security in Computing	Pearson Education	2011
2.	Behrouz A. Foruzan	Cryptography and Network Security	Tata McGraw Hill	2007
3.	William Stallings	Cryptography and Network security Principles and Practices	Pearson Education	2006
4.	Javier López, Gene T sudik	Applied Cryptography and Network Security	Springer	2011
5.	Niels Ferguson	Cryptography Engineering: Design Principles and Practical Applications	JohnWiley	2010

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23CYC10 CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

L	T	P	C
0	0	2	1

Course Objectives

- To learn different cipher techniques
- Develop the Various Security Algorithm
- To study network security tools and vulnerability assessment tools
- To generate different open source tools for network security and analysis
- Create the network security system

Course Outcomes

23CYC10.CO1 Develop code for classical Encryption Techniques to solve the problems

23CYC10.CO2 Build cryptosystems by applying symmetric and public key encryption algorithms

23CYC10.CO3 Construct code for authentication algorithms

23CYC10.CO4 Develop a signature scheme using Digital signature standard

23CYC10.CO5 Demonstrate the network security system using open source tools

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC10.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC10.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC10.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC10.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC10.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No	List of Experiments
1.	Perform encryption, decryption using the following substitution techniques (i) Ceaser cipher, (ii) Playfair cipher iii) Hill Cipher iv) Vigenere cipher
2.	Perform encryption and decryption using following transposition technique - Row & Column Transformation
3.	Implement the practical applications for the following algorithm DES
4.	Implement the practical applications for the following algorithm AES
5.	Implement RSA Algorithm using HTML and JavaScript
6.	Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7.	Implement the (i) Message Digest Algorithm – MD5 (ii) Secure Hash Algorithm – SHA 1
8	Implement the SIGNATURE SCHEME - Digital Signature Standard.
9	Setup a Honey Pot and Monitor the Honeypot on Network
10	Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w

Total : 30

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23CYC11 **OPERATING SYSTEMS**

L	T	P	C
3	0	0	3

Course Objectives

- To understand the basic concepts Operating System.
- To understand the fundamental Operating System abstractions such as processes, process scheduling
- To understand the principles of concurrency and synchronization, and apply them to write concurrent programs/software
- To Implement basic resource management techniques (scheduling or time management, space management) and principles
- To describe the types of I/O management, disk scheduling, disk management and swap space management

Course Outcomes

23CYC11.CO1	Enumerate structures of Operating System.
23CYC11.CO2	Apply fundamental Operating System abstractions such as processes, process scheduling, Semaphores, IPC abstractions, shared memory regions, deadlock and threads.
23CYC11.CO3	Illustrate the principles of concurrency and synchronization and apply them to write concurrent programs/software.
23CYC11.CO4	Implement basic resource management techniques (scheduling or time management, space management) and principles
23CYC11.CO5	Recognize the file system concept and storage management

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC11.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC11.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC11.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC11.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC11.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: INTRODUCTION **9**

Introduction – What Operating System Do – Operating System Structure – Operating system Operations – Operating System Components: Process Management – Memory Management – Storage Management – I/O Management – Network Management - Protection and Security.
Classes of Operating Systems: Mainframe Systems – Single Processor System - Multiprocessor Systems - Desktop Systems –- Distributed Systems – Clustered Systems – Real-Time Systems – Handheld Systems - Open Source Operating Systems.
Operating System Structures: Operating System Services – User and Operating System Interface – System Calls– Types of System Calls**.**

UNIT II: PROCESS MANAGEMENT AND THREADING **9**

Processes: Process concept – Process scheduling – Operation on Processes - Inter-process Communication: Shared Memory Systems - Message Passing Systems.
Process Scheduling: Basic Concepts – Scheduling Criteria – Scheduling Algorithms: First-Come, First-Served – Priority – Round-Robin – Multilevel Queue – Multilevel Feedback Queue.
Threads: Overview – Multithreading models - Threading issues..

UNIT III: PROCESS SYNCHRONIZATIONAND DEADLOCKS **9**

Process Synchronization: Background - The critical-section problem (Software based solution and hardware based solution) – Semaphores – Classic Problems of Synchronization – Monitors.
Deadlocks: System model - Deadlock Characterization – Methods for Handling Deadlocks -Deadlock Prevention– Deadlock Avoidance – Deadlock Detection – Recovery from Deadlocks.

UNIT IV: MEMORY MANAGEMENT **9**

Management Strategies: Background – Swapping – Memory allocation: Contiguous Memory Allocation –Non-Contiguous Memory Allocation: Segmentation - Paging – Segmentation with Paging - Structure of the Page Table.

Virtual Memory: Background - Demand Paging – Page Replacement – Allocation of Frames – Thrashing.

UNIT V: FILE SYSTEM AND STORAGE MANGEMENT **9**

System Interface: File Concept – Access Methods – Directory and Disk Structure – Protection.

File System Implementation: File System Structure – File System Implementation – Directory Implementation - Allocation Methods – Free Space Management.

Mass Storage Structure: Overview of Mass Storage Structure – Disk Structure - Disk Scheduling – Disk Management - Swap Space Management.

Case Study: Windows, Linux and Android operating Systems

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne,	Operating System Concepts	John Wiley & Sons (ASIA) Pvt. Ltd, 9th Edition	2015
2.	Harvey M. Deitel	Operating Systems	Pearson Education, 3rd Edition.	2007

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Andrew S. Tanenbaum	Modern Operating Systems	Prentice Hall of India,	2009
2	William Stallings	Operating Systems: Internals and Design Principles	Prentice Hall of India,	2009
3	D M Dhamdhere	Operating Systems: A Concept-Based Approach	Tata Mc-graw Hill Publishing	2012
4	Charles Crowley	Operating System: A Design-Oriented Approach	Tata Mc-graw Hill Publishing,	2009
5	Evi Nemeth , Garth Snyder, Trent R. Hein , Ben Whaley , Dan Mackin	UNIX and Linux System Administration Handbook	Prentice Hall of India,	2010

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23CYC12	OPERATING SYSTEMS LABORATORY	L	T	P	C
		0	0	2	1

Course Objective:

- Shell programming and the use of filters in the UNIX environment.
- Exposed to programming in C using system calls.
- To use the file system related system calls.
- To process creation and inter process communication.
- Implementation of CPU Scheduling Algorithms, page replacement algorithms and Deadlock

Course Outcomes:

23CYC12.CO1 Implement deadlock avoidance, and Detection Algorithms

23CYC12.CO2 Compare the performance of various CPU Scheduling Algorithm

23CYC12.CO3 Analyze the performance of the various page replacement algorithms

23CYC12.CO4 Create processes and implement IPC

23CYC12.CO5 Develop various algorithms for CPU scheduling and for deadlock avoidance

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC12.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC12.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC12.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC12.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC12.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No	List of Experiments
1.	File exploring basic commands under Linux Operating systems
2.	Program using Shell scripts.
3.	Basic process management algorithms.
4.	Process synchronization algorithms.
5.	Implementing various memory allocation methods.
6.	Implementing paging and segmentation
7.	Implementing various page replacement policies
8.	Implementation of file system calls.
9.	Implementation of Pattern matching.
10.	Implementation of disk scheduling algorithms.

Total Periods: 30

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23CYC13 **INFORMATION SECURITY**

L	T	P	C
3	0	0	3

Course Objectives

- To understand the basics of information security.
- To describe the legal, ethical and professional issues in information security.
- To estimate the level of security risk faced by an organization and the counter measures to handle the risk.
- To understand the logical design and security models.
- To implement the physical design and implementation of information security

Course Outcomes

23CYC13.CO1 Explore the basic concept of information security models.
23CYC13.CO2 Analyze the need for security issues.
23CYC13.CO3 Use the security policies for information security.
23CYC13.CO4 Design logical structure of the information systems.
23CYC13.CO5 Implement physical structure of information security system by using security tools

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC13.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC13.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC13.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC13.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC13.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: INTRODUCTION **9**

Introduction to Information Security: History- Aspects of Security- NSTISSC Security Model, Components of Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT II: SECURITY INVESTIGATION **9**

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

UNIT III: SECURITY PRACTICE **9**

Vulnerability Analysis-Auditing-Anatomy of an Auditing System-Design of Auditing Systems-Auditing Mechanisms-Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk.

UNIT IV: LOGICAL DESIGN **9**

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

UNIT V: PHYSICAL DESIGN AND IMPLEMENTATION **9**

Security Technology, IDS, Honey Pots, Honey Nets, and Padded Cell Systems, Scanning and Analysis Tools, Access Control Devices, Implementing Information Security, Project Management for Information Security, Technical Topics of Implementation, Nontechnical Aspects of Implementation

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Michael E Whitman and Herbert J Mattord	Principles of Information Security	Thomson (Cengage) Indian	2016
2.	Mark Rhodes-Ousley	Information Security: The Complete Reference	Pearson/PHI	2013

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stuart Mc Clure, Joel Scrambray, George Kurtz	Hacking Exposed	Tata McGraw-Hill	2003
2.	Micki Krause, Harold F. Tipton	Handbook of Information Security Management	CRC Press LLC	2004
3.	Charles Pfleeger,Shari Lawrence Pfleeger,Devin N Paul	Security in Coding	Pearson Education	2007
4.	Wenbo Mao	Modern Cryptography Theory and Practice	Pearson Education	2004
5.	Matt Bishop	Computer Security: Art and Science	Pearson Education	2003

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23CYC14 **DIGITAL FORENSICS**

L	T	P	C
3	0	0	3

Course Objectives

- The fundamentals and importance of digital forensics.
- Digital investigation in an organized and systematic way.
- Analysis the data acquisition methods.
- Discriminate on Digital Forensics.
- Develop computer forensic tools.

Course Outcomes

23CYC14.CO1 Understand the concepts of digital forensics.

23CYC14.CO2 Analyze investigation process.

23CYC14.CO3 Interpret the inner workings of file systems.

23CYC14.CO4 Design data acquisition methods

23CYC14.CO5 Apply various forensic tools

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC14.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC14.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC14.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC14.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC14.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION

Computer forensics fundamentals- Benefits of forensics-computer crimes-computer forensics evidence and courts- legal concerns and private issues. **9**

UNIT-II: COMPUTING INVESTIGATIONS

Understanding Computing Investigations – Procedure for corporate High-Tech investigations-understanding data recovery work station and software- conducting and investigations. **9**

UNIT-III: DATA ACQUISITION

Data acquisition- understanding storage formats and digital evidence- determining the best acquisition method, acquisition tools- validating data acquisitions-performing RAID data acquisitions- remote network acquisition tools- other forensics acquisitions tools **9**

UNIT-IV: PROCESSING CRIMES

Processing crimes and incident scenes-securing a computer incident or crime-seizing digital evidence at scene-storing digital evidence-obtaining digital hash-reviewing case. **9**

UNIT-V: CURRENT COMPUTER FORENSIC TOOLS **9**

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Karlstad, Joakim	Fundamentals of Digital Forensics	Springer	2018
2.	Anders Flaglien, Inger Marie Sunde,Ausra Dilijonaite	Digital Forensics	John Wiley & Sons,	2017

REFERENCE BOOK

SI.NO	Author(s)	Title of the Book	Publisher	Year of Publications
1.	Michael Hale Ligh, Andrew Case	The Art of Memory Forensics	Wiley	2014
2.	Jack Wiles Anthony Reyes	The best damn cybercrime and digital forensics	Syngress	2007
3	Sharma, S.R	Dimensions Of Cyber Crime	Annual Publications Pvt. Ltd., 1st Edition	2004

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		L	T	P	C
23CYC15	**INTRODUCTION TO CYBER LAWS**	**3**	**0**	**0**	**3**

Course Objectives

- The basics concepts of Cyber evolution and computer technology
- Illustrate the Information Technology in current trends
- Understand of concepts of Cyber Law
- Develop the security in business
- Formulate cybercrime concepts

Course Outcomes

23CYC15.CO1 Explain the concepts of Cyberspace.

23CYC15.CO2 Analyze the various Information Technology Act

23CYC15.CO3 To Understand basics of Cyber Law related with legislation

23CYC15.CO4 Design Security in cyber space

23CYC15.CO5 Apply Various Case Studies on Real Time Crimes.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC15.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC15.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC15.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC15.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC15.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION TO CYBER LAW EVOLUTION OF COMPUTER TECHNOLOGY **9**

Emergence of Cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

UNIT-II: INFORMATION TECHNOLOGY ACT **9**

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication

UNIT-III: CYBER LAW AND RELATED LEGISLATION **9**

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating

To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

UNIT-IV: ELECTRONIC BUSINESS AND LEGAL ISSUES **9**

Evolution and development in Ecommerce, paper vs paper less contracts E-Commerce models- B2B, B2C,E security. Application area: Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

UNIT-V: CASE STUDY ON CYBER CRIMES **9**

Harassment Via E-Mails, Email Spoofing (Online A Method Of Sending E-Mail Using A False Name Or E-Mail Address To Make It Appear That The E-Mail Comes From Somebody Other Than The True Sender, Cyber Pornography (Exm.MMS),Cyber-Stalking

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	K.Kumar	Cyber Laws: Intellectual property & E Commerce, Security"	, Dominant Publisher,	2011
2.	Rodney D. Ryder	Guide To Cyber Laws	Second Edition, Wadhwa And Company,	2007

Reference Books:

SI.NO	Author(s)	Title of the Book	Publisher	Year of Publications
1.	Vakul Sharma,	Handbook Of Cyber Laws	Macmillan India Ltd, 2 ndEdition,PHI,	2003
2.	Justice Yatindra Singh,	Cyber Laws	Universal Law Publishing, 1 stEdition,New Delhi	2003
3	Sharma, S.R	Dimensions Of Cyber Crime	Annual Publications Pvt. Ltd., 1st Edition	2004

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		L	T	P	C
23CYC16	**CYBER CRIME INVESTIGATIONS AND DIGITAL FORENSICS**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the forensic concepts
- To learn computer basics
- To Identify methodology of Computer Forensics
- To learn Forensics tools concepts
- To understand working principle of Electronic evidence

Course Outcomes

23CYC16.CO1 Analyze difference between computer crime and cyber crime

23CYC16.CO2 Explain basics concepts in computer

23CYC16.CO3 Develop the security

23CYC16.CO4 Apply various forensics tools

23CYC16.CO5 Explain electronic evidence process

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC16.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC16.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC16.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC16.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC16.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: CYBER CRIME AND COMPUTER CRIME **9**

Introduction to Digital Forensics- Definition and types of cybercrimes- electronic evidence and handling-electronic media-collection-searching and storage of electronic media- introduction to internet crimes-hacking and cracking-credit card and ATM frauds-web technology- cryptography-emerging digital crimes and modules

UNIT-II: BASICS OF COMPUTER **9**

Computer organization, components of computer- input and output devices, CPU, Memory hierarchy, types of memory, storage devices, system soft wares, application soft wares, basics of computer languages.

UNIT-III: COMPUTER FORENSICS 9

Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications

UNIT-IV: FORENSIC TOOLS **9**

Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information.

UNIT-V: PROCESSING OF ELECTRONIC EVIDENCE **9**

Process of computer forensics and digital investigations, processing of digital evidence, digital images, damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	C. Altheide& H. Carvey	Digital Forensics with Open Source Tools	Syngress	2011
2.	Aaron Philipp,David Cowen	Hacking Exposed Computer ForensicsComputer Forensics	Pearson	2012

REFERENCE BOOK

SI.NO	Author(s)	Title of the Book	Publisher	Year of Publications
1.	Jack Wiles Anthony Reyes	The best damn cybercrime and digital forensics	Syngress	2007
2.	Sharma, S.R	Dimensions Of Cyber Crime	Annual Publications Pvt. Ltd., 1st Edition	2004
3	Anders Flaglien, Inger Marie Sunde,AusraDilijonaite	Digital Forensics	John Wiley & Sons,	2017

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23CYC17 **CLOUD COMPUTING**

L	T	P	C
3	0	0	3

Course Objectives

- Describe three cloud deployment models, and Overview of AWS Global infrastructure.
- Understand the different AWS core services.
- Formulate virtual firewalls with security groups.
- Review the availability differences of alternative database solutions.
- Summarize the AWS Shared Responsibility Model, Examine IAM users, groups, and roles.

Course Outcomes

23CYC17.CO1 Construct three cloud deployment models, and Overview of AWS Global infrastructure.

23CYC17.CO2 Implement the different AWS compute services.

23CYC17.CO3 Create virtual firewalls with security groups.

23CYC17.CO4 Construct the availability of different alternative database solutions.

23CYC17.CO5 Implement AWS Shared Responsibility Model, Examine IAM users, groups, and roles.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC17.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC17.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC17.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC17.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC17.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: CLOUD CONCEPTS **9**

Cloud Concepts Overview - Introduction to Cloud Computing, Advantages of Cloud Computing, CC Reference Model, Introduction to Amazon Web Services (AWS), AWS Cloud Adoption Framework (CAF). Cloud Economics - Fundamentals of Pricing, Total Cost of Ownership, AWS Global Infrastructure Overview - AWS Global Infrastructure, AWS Service and Service Category Overview.

UNIT-II: AWS CORE SERVICES **9**

Compute - Compute Services Overview, Introduction to Amazon Elastic Compute Cloud (EC2), Amazon EC2 Cost Optimization, Introduction to AWS Lambda, Introduction to AWS Elastic Beanstalk. Storage - Amazon Elastic Block Store (EBS), Amazon Simple Storage Service (S3), Amazon Elastic File System (EFS), Amazon Glacier. VPC - Amazon Virtual Private Cloud (VPC), Amazon VPC Security Groups, Amazon Cloud Front Database - Amazon Relational Database Service (RDS), Amazon DynamoDB, Amazon Redshift, Amazon Aurora. Balancing, Scaling, Monitoring - Elastic Load Balancing (ELB), Amazon CloudWatch, Auto Scaling.

UNIT-III: CLOUD SECURITY **9**

AWS Shared Responsibility Model, AWS Identity and Access Management (IAM), AWS Trusted Advisor, AWS CloudTrail, AWS Config, AWS Day One Best Practice Review, AWS Security and Compliance Programs, AWS Security Resources.

UNIT-IV: CLOUD ARCHITECTING **9**

Introduction to the Well-Architected Framework, Well-Architected Design Principles, Understanding Reliability and High Availability.

UNIT-V: CLOUD SUPPORT **9**

Introduction to AWS Organizations, AWS Cost Explorer, Overview of AWS Technical Support Plans and Costs, Microsoft azure, Google app Engine.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	KaiHwang, GeoffreyCFox, JackGDongarra	DistributedandCloud ComputingFrom Parallel Processingt otheInternetofThings	Morgan Kaufmann Publishers	2012
2.	RajkumarBuyya, Christian Vecchiola,S ThamaraiSelvi	Mastering Cloud Computing	TataMcGrawHill	2010

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	JohnW.RittinghouseAndJames F.Ransome	CloudComputing: Implementation, Management,andSecurity	CRCPress	2010
2.	Bernard Golden	Amazon Web Service For Dummies	John Wiley & Sons, Inc	2013
3.	Mitch Tulloch with the Windows Azure Team	Introducing Windows Azure	Microsoft Press	2013
4.	BarrieSosinsky	CloudComputingBible	WileyIndia	2015
5.	GautamShroff	EnterpriseCloud Computing	Cambridge	2010

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23CYC18	CLOUD COMPUTING LABORATORY	L	T	P	C
		0	0	2	1

Course Objective:

- To understand and study Amazon EC2
- To work with EBS.
- To build VPC, web server and DB server
- To build the DB Server.
- To construct scale and load balance of cloud architecture.

Course Outcomes:

23CYC18.CO1	Construct Amazon EC2
23CYC18.CO2	Working with EBS
23CYC18.CO3	Develop VPC, web server and DB server
23CYC18.CO4	Build the DB Server.
23CYC18.CO5	Implement scale and load balance of cloud architecture.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC18.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC18.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC18.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC18.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC18.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No	List of Experiments
1.	Introduction to Amazon EC2
2.	Working with EBS
3.	Build VPC and Launch a Web Server
4.	Build DB Server and Interact with DB Using an App
5.	Scale and Load Balance Architecture
6.	Introduction to AWS IAM
7.	Use GAE launcher to launch the web applications.
8.	Simulate a Cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
9.	Install Hadoop single node cluster and run simple applications like wordcount.
10.	Install Virtual box/VMware Workstation with different flavors of Linux or windows OS on top of windows7 or 8.

Total Periods: 30

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		L	T	P	C
23CYC19	**WEB AND MOBILE APPLICATION SECURITY**	**3**	**0**	**0**	**3**

Course Objectives

- To learn the characteristics of mobile applications
- Understand the intricacies of UI required by mobile applications
- To study about the design aspects of mobile application
- To learn development and programming of mobile applications.
- Describe app development tools

Course Outcomes

23CYC19.CO1	Implement the user interfaces of mobile applications.
23CYC19.CO2	Design the mobile applications that is aware of there source constraints of the mobile devices.
23CYC19.CO3	Apply advanced mobile applications that accesses the databases and the web.
23CYC19.CO4	Explain programming basics for Application
23CYC19.CO5	Develop useful mobile applications in the current scenario using Google, Android and Eclipse simulator

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC19.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC19.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC19.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC19.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC19.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Mobile Applications–CharacteristicsandBenefits–Application Model – Infrastructure and Managing Resources – Mobile Software Engineering–FrameworksandTools–Mobile devicesProfiles

UNIT-II: USER INTERFACE **9**

GenericUIDevelopment–VUIsandMobileApplications – Text to Speech techniques – Designing the right UI – Multimodaland Multichannel UI – Gesture based UIs – Screen Elements and Layouts – VoiceXML–JavaAPI.

UNIT-III: APPLICATION DESIGN **9**

Memory Management – Design patterns for limited memory – Work flow for Application Development – Techniques for composing Applications – Dynamic Linking – Plug ins and rules of thumb for using DLLs – ConcurrencyandResource Management–Lookandfeel.

UNIT-IV: APPLICATION DEVELOPMENT **9**

IntentsandServices–StoringandRetrievingdata–CommunicationviatheWeb–NotificationandAlarmsGraphics and Multimedia – Telephony – Location based services – Packaging and Deployment–SecurityandHacking.

UNIT-V: TOOLS **9**

Google Android Platform – Eclipse Simulator – Android Application Architecture – Event based programming – Apple iPhone Platform – UI tool kit interfaces– Eventhandlingand Graphicsservices– LayerAnimation

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Zigurd Mednieks, Laird Dornin,	Programming Android	O'Reilly,	2011
2.	RetoMeier	Professional Android 2 Application Development	WroxWiley	2010

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	AlasdairAllan	iPhone Programming	O'Reilly	2010
2.	Wei-Meng Lee	Beginning iPhone SDK Programming with Objective-C	Wrox Wiley	2010
3.	Poslad	Ubiquitous Computing: Smart Devices, Environments and Interactions	Wiley	2009

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23CYC20 **WEB AND MOBILE APPLICATION LABORATORY**

L	T	P	C
0	0	2	1

Course Objectives

- To know about various platforms and tools available for developing mobile applications
- To realize the differences between developing conventional applications and mobile applications.
- To learn programming skills in J2ME and Android SDK
- To study about micro browser based applications to access the Internet using Sun Java Toolkit.
- To learn creating database application using various tools

Course Outcomes

23CYC20.CO1 Install and configure Android application development tools.

23CYC20.CO2 Develop user Interfaces for the Android platform

23CYC20.CO3 Save state information across important operating system events.

23CYC20.CO4 Apply Java programming concepts to Android application development.

23CYC20.CO5 Design Application for Data base

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC20.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC20.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC20.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC20.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC20.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. To study Android Studio and android studio installation. Create "Hello World" application..
2. To understand Activity, Intent, Create sample application with login module.(Check username and password).
3. Design simple GUI application with activity and intents e.g. calculator.
4. Develop an application that makes use of RSS Feed.
5. Write an application that draws basic graphical primitives on the screen
6. Create an android app for database creation using SQLite Database.
7. Develop a native application that uses GPS location information
8. Implement an application that writes data to the SD card
9. Design a gaming application
10. Create an application to handle images and videos according to size

Total : 30

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		L	T	P	C
23CYC21	**WIRELESS SENSOR NETWORK SECURITY**	**3**	**0**	**0**	**3**

Course Objectives

- To study the Channel planning for Wireless Systems
- To study the Mobile Radio Propagation
- To learn the Equalization and Diversity
- To understand the Equalization and Diversity
- To learn theWireless Networks

Course Outcomes

23CYC21.CO1 Understand Cellular communication concepts

23CYC21.CO2 Analyze the mobile radio propagation

23CYC21.CO3 Apply various multiple schemes used in wireless communication

23CYC21.CO4 Explain wireless wide area network and their performance analysis

23CYC21.CO5 Demonstrate Wireless local area networks and their specifications

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC21.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC21.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC21.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC21.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC21.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: THE CELLULAR CONCEPT-SYSTEM DESIGN FUNDAMENTALS **9**

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.

UNIT-II: MOBILE RADIO PROPAGATION: LARGE-SCALE PATH LOSS **9**

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors,GroundReflection(Two-Ray)Model,Diffraction-FresnelZoneGeometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models-Longley-Ryce Model,Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and BertoniModel, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor),Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model,AttenuationFactorModel,Signalpenetrationintobuildings,RayTracingandSiteSpecificModeling.

UNIT-III: MOBILE RADIO PROPAGATION: SMALL–SCALE FADING AND MULTIPATH **9**

Small Scale Multipath propagation-Factors influencing small scale fading, Dopplershift, Impulse Response Modeofamultipath channel-Relationship between Band widthand Received power, Small-Scale Multipath Measurements- DirectRF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency

Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time DispersionParameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading,Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath FadingChannels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model,Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray RayleighFading Model.

UNIT-IV: EQUALIZATION AND DIVERSITY **9**

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in communication Receiver, Linear Equalizers, NonlinearEqualization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive eequalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, PracticalSpaceDiversityConsideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity,RAKE Receiver.

UNIT-V: WIRELESS NETWORKS **9**

Introduction to wireless Networks, Advantages and disadvantages of WirelessLocal Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium AccessControl, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements,WirelessPANs,HiperLan,WLL.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Theodore, S.Rappaport	WirelessCommunications Principles and Practice	2nd Ed.,PHI.	2002
2.	GottapuSasibhushanaRao	MobileCellularCommunication	PearsonEducation	2012

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	KamiloFeher	WirelessDigitalCommunications	PHI.	1999
2.	WilliamStallings	WirelessCommunicationandNetworking	PHI	2003
3.	AndreaGoldsmith	WirelessCommunications	CambridgeUniversityPress	2005

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23CYC22 **WIRELESS SENSOR NETWORK LABORATORY**

L	T	P	C
0	0	2	1

Course Objectives

- To study digital modulation concepts
- To learn various Encoder and Decoder techniques
- To study the MAT Lab software
- To learn the concept of transmitter, receiver and frequency in mobile handset
- To study theNetsimsoftware

Course Outcomes

23CYC22.CO1 Implement theadvanceddigitalmodulationtechniques
23CYC22.CO2 Design Convolutional encoder and decoder for error control coding techniques.
23CYC22.CO3 Calculate path loss for Free space, Okumura and Hatamodels for out door propagation.
23CYC22.CO4 Comprehend Cellular concepts of GSM and CDMA networks.
23CYC22.CO5 Simulate RAKE receiver for CDMA with MATLAB.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC22.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC22.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC22.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC22.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC22.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. FSK Modulation and Demodulation technique
2. QPSK Modulation and Demodulation technique
3. DQPSK Modulation and Demodulation technique
4. 8-QAM Modulation and Demodulation technique.
5. Implementation of Convolutional Encoder and Decoder
6. Simulationo f Adaptive Linear Equalizer using MATLAB software
7. Measurement of call blocking probability for GSM & CDMA networks using Net simsoftware.
8. Study of GSM hand set for various signaling and fault insertion techniques (Major GSM handset sections: clock, SIMcard, charging, LCDmodule, Keyboard, User interface).
9. Study of transmitter and receiver section in mobile handset and measure frequency
10. Simulation of RAKE Receiver for CDMA communication using MATLAB software

Total : 30

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		L	T	P	C
23CYC23	**COMPUTER FORENSIC**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the concepts of cyber crime
- To study the basic concepts of computer
- To learn computer forensics
- To become familiar with forensics tools
- To learn to analyze and validate forensics data

Course Outcomes

23CYC23.CO1 Implement real-world hacking techniques to test system security

23CYC23.CO2 Understand the basics of computer software

23CYC23.CO3 Apply a number of different computer forensic tools to a given scenario

23CYC23.CO4 Identify the vulnerabilities in a given network infrastructure

23CYC23.CO5 Analyze and validate forensics data

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC23.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC23.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC23.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC23.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC23.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: CYBERCRIMEAND COMPUTER CRIME **9**

Introduction to Digital Forensics, Definition and types of cybercrimes, electronic evidence and handling,electronic media, collection, searching and storage of electronic media, introduction to internet crimes,hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimesand modules.

UNIT-II: BASICS OF COMPUTER **9**

Computer organization, components of computer- input and output devices, CPU, Memory hierarchy, typesofmemory,storage devices,systemsoftwares,application softwares,basics ofcomputer languages.

UNIT-III: COMPUTER FORENSICS **9**

Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12,FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems,computer artefacts, Internet Artefacts, OSArtifactsandtheirforensicapplications

UNIT-IV: FORENSIC TOOLS AND PROCESSING OF ELECTRONIC EVIDENCE **9**

Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, VulnerabilityAssessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving

information,process of computer forensics and digital investigations, processing of digital evidence, digital images,damagedSIManddatarecovery,multimediaevidence,retrievingdeleteddata:desktops,laptopsandmobiles,retrievingdata fromslackspace,renamed file, ghosting, compressed files.

UNIT-V: ANALYSIS AND VALIDATION **9**

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart,	Computer Forensics and Investigations	Cengage Learning, India Edition	2016
2.	Pradeepk,Sinhapritisinh	Computer Fundamentals	BPB	2015.

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	John R.Vacca,	Computer Forensics	Cengage Learning	2005
2.	MarjieT.Britz	Computer Forensics and Cyber Crime: An Introduction	3rd Edition, Prentice Hall,	2013.
3.	Kenneth C.Brancik	Insider Computer Fraud	Auerbach Publications Taylor & Francis Group	2008

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23CYC24 **COMPUTER FORENSICLABORATORY**

L	T	P	C
0	0	2	1

Course Objectives

- To learn Image retrieval techniques
- To study the computer forensic tools
- To learn how to secure our data
- To study Autospysoftware to investigation process
- To understand the data recovering concepts

Course Outcomes

23CYC24.CO1	Implement image retrieval techniques
23CYC24.CO2	Apply various computer forensic tools in real time
23CYC24.CO3	Analyze the techniques of data security
23CYC24.CO4	Develop secure Application using Auto spy
23CYC24.CO5	Explain data recovering techniques

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC24.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC24.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC24.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC24.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC24.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. Study of Computer Forensics and different tools used for forensic investigation
2. How to Recover Deleted Files using Forensics Tools
3. Study the steps for hiding and extract any text file behind an image file/Audio file using Command Prompt.
4. How to Extract Exchange able image file format(EXIF) Data from Image Files using Exif reader Software
5. How to make the forensic image of the hard drive using EnCaseForensics.
6. How to Restoring the Evidence Image using EnCase Forensics
7. How to Collect Email Evidence in Victim PC
8. How to Extracting BrowserArtifacts
9. Comparison of two Files for forensics investigation by Compare IT software
10. Live Forensics Case Investigation using Autopsy

Total : 30

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23CYC25 **WEB SERVICES**

L	T	P	C
3	0	0	3

Course Objectives

- To Learn the basics of XML technology.
- To Understand the background of distributed information system
- To Learn the security features of web services and service composition.
- To learn concepts of semantic web services
- To understand techniques of web services

Course Outcomes

23CYC25.CO1 Create, validate, parse and transform XML documents.

23CYC25.CO2 Design a middleware solution based application.

23CYC25.CO3 Develop webservice using different technologies

23CYC25.CO4 Compose set of complex web services

23CYC25.CO5 Apply web services techniques for security

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC25.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC25.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC25.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC25.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC25.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: DISTRIBUTEDINFORMATIONSYSTEM **9**

Distributed information system– Design of IB–Architecture of IB –Communication in an IS – MiddlewareRPC – TP monitors – Objectbrokers – Message oriented middleware – EAI –EAI Middleware – Workflow –Management – benefits and limitations – Web technologies for Application Integration.

UNIT-II: WEB SERVICES BUILDING BLOCK **9**

Web Services – Definition – WebServices and EAI – Web Services Technologies – XML basics - web servicesArchitecture – SOAP – WSDL – UDDI –WS – Addressing – WS – Routing –Web service implementation– Java based web services-.NET based web services.

UNIT-III: WEB SERVICE SECURITY **9**

XML signature – XML Encryption – SAML -XKMS–WS-Security–WSPolicy–Web service security framework .NETand passport – UDDI and security - web service security in java – mobile webservice security.

UNIT-IV: SEMANTIC WEB SERVICES **9**

Semantic web service – architecture – RDFDatamodel–RDFschema–OWL–ontology–roleof ontology in web services -semantic Web service implementation issues

UNIT-V: SERVICECOMPOSITION **9**

Service Coordination andComposition coordination protocols–WS–Coordination –WS–transaction –WSCI–Service Composition – Service Composition Models – Dependencies between coordination and composition–BPEL–Currenttrends

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Uttam K. Roy	Web Technologies	Oxford University Press	2010
2.	G. Radhamani	Web Services Security and E-business	IGI Global	2007

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Martin kalin	Java Web Services	O'Reilly Media, Inc	2013
2.	Shreeraj Shah	Hacking Web Services	Charles River Media	2006
3.	James Snell, Doug Tidwell, PavelKulchenko	Programming Web Services with SOAP	O'Reilly Media	2001

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23CYC26 **WEB SERVICES LABORATORY**

L	T	P	C
0	0	2	1

Course Objectives

- To Understand the application number theory in security.
- To Study the symmetric keyand public key algorithms
- To Understand the compression techniques for security
- To learn security concepts in web service
- To understand registry methods in web services

Course Outcomes

23CYC26.CO1 Able to implement program using modules arithmetic for security

23CYC26.CO2 To implement symmetric key and public key algorithm

23CYC26.CO3 Ability to implement algorithms for digital signature and hashing

23CYC26.CO4 Develop the security in web services

23CYC26.CO5 Design the udi registry by using web services

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC26.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC26.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC26.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC26.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC26.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. Create an XML file for any domain with multiple sublevel complexity. (Example: Students data, Employee information, Product details etc..)
2. Create a DTD and XML schema for the XML file.
3. Tabulate the xml content using XSL.
4. Validate a XML file using java script with XML DOM
5. Write a java program to parsean XML file using DOM.
6. Write a java program to parse an XML file using SAX.
7. Write a program to implement XML–RPC.
8. Write a program to implement a webservice using java and .NET.
9. Write a program to implement WSDL Service (HelloService.WSDL File)
10. Write a program to implement business UDDI Registry entry

Total : 30

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23CYC27 **CYBER PHYSICAL SYSTEMS**

L	T	P	C
3	0	0	3

Course Objectives

- To understand the basic concepts of Cyber physical system
- To understand the principles of automated control design
- To understand the CPS implementation
- To explain different formal methods for safety assurance of CPS
- To understand the secure deployment of CPS

Course Outcomes

23CYC27.CO1 Understand the concepts of Cypher physical system in real world application
23CYC27.CO2 Design his own model for cyber physical system
23CYC27.CO3 Understand various modeling formalisms for CPS, such as hybrid automata, state-space methods, etc
23CYC27.CO4 Understand the basics of CPS implementation
23CYC27.CO5 Understand CPS security and safety aspects

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC27.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC27.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC27.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC27.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC27.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

Unit-I: INTRODUCTION TO CYBER PHYSICAL SYSTEMS (CPS) **9**

Cyber-Physical Systems (CPS) in the real world - Basic principles of design and validation of CPS - Industry 4.0, AutoSAR, IIOT implications - Building Automation, Medical CPS -- CPS - Platform components - CPS HW platforms - Processors, Sensors, Actuators - CPS Network – Wireless Hart, CAN, Automotive Ethernet - CPS Sw stack - RTOS - Scheduling Real Time control tasks

Unit-II: PRINCIPLES OF AUTOMATED CONTROL DESIGN **9**

Principles of Automated Control Design - Dynamical Systems and Stability - Controller Design Techniques - Stability Analysis: CLFs, MLFs, stability under slow switching - Performance under Packet drop and Noise.

Unit-III: CPS IMPLEMENTATION **9**

CPS implementation - From features to software components, Mapping software components to ECUs - CPS Performance Analysis - effect of scheduling, bus latency, sense and actuation faults on control performance, network congestion.

Unit-IV: FORMAL METHODS FOR SAFETY ASSURANCE OF CPS **9**

Formal Methods for Safety Assurance of Cyber-Physical Systems - Advanced Automata based modeling and analysis - Basic introduction and examples - Timed and Hybrid Automata - Definition of trajectories, zenoness - Formal Analysis: Flowpipe construction, reachability analysis - Analysis of CPS Software: - Weakest Pre-conditions - Bounded Model checking.

Unit-V: SECURE DEPLOYMENT OF CPS **9**

Secure Deployment of CPS - Attack models - Secure Task mapping and Partitioning - State estimation for attack detection - Automotive Case study : Vehicle ABS hacking - Power Distribution Case study : Attacks on SmartGrids.

Total : 45

Text Books :

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Rajeev Alur	Principles of Cyber-Physical Systems	MIT Press	2018
2.	E. A. Lee, Sanjit Seshia	Introduction to Embedded Systems – A Cyber–Physical Systems Approach	MIT Press	2017
3.	Platzer, Andre	Logical Foundations of Cyber-Physical Systems	Springer	2018

Referrence Books :

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Möller, Dietmar P.F	Computing Fundamentals in Cyber-Physical Systems Concepts, Design Methods, and Applications	Springer	2016

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23CYC28 **RISK MANAGEMENT**

L	T	P	C
3	0	0	3

Course Objectives

- To understand the ways in which risks are quantified and managed by financial institutions
- To study how to model the risk of portfolios emanating from fluctuations in marketprices, or market risk
- To learn an introduction to commonly used models of credit risk.
- To understand balance between a practical approach to the most popular credit risk models and their theoretical underpinnings
- To learn credit risk, in particular credit derivatives are discussed.

Course Outcomes

23CYC28.CO1 Explain the choice of parameters for VaR, and the impact of autocorrelation on VaR estimates.

23CYC28.CO2 Analyze percentage changes in all market variables over the next day are a random sample from the last N days.

23CYC28.CO3 Apply various measure volatility using trading days rather than calendar days.

23CYC28.CO4 Develop the model-building approach, which is the main alternative to historical simulation

23CYC28.CO5 Design the model building approach can be used for the situation

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC28.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC28.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC28.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC28.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC28.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

Unit-I: RISK AND ITS MANAGEMENT **9**

This study unit introduces risk, its fundamental importance to a company and the sorts of risk that investors expect companies to take. A risk management framework is introduced against a backdrop of corporate finance principles, providing an umbrella methodology for the management of risk and highlighting where different treatment is needed according to the nature of a particular risk.

Unit-II: FINANCIAL MARKET RISK: INTEREST RATES **9**

No company can escape interest rate risk and this study unit focuses on how interest rate sensitivity and its impact varies according to the type of company and business environment. The study unit provides appropriate responses to each different set of circumstances, introducing the science of the yield curve and the many instruments available for managing interest rate risk, explaining when each might be used.

Unit-III: FINANCIAL MARKET RISK: FOREIGN EXCHANGE **9**

This study unit explains the different types of foreign exchange risk that can affect a company and how each might be evaluated and responded to. It recognizes that foreign exchange risk may be fundamental to the company and that an appropriate response needs to be drawn up for each type of risk in the context of a company's broader business and shareholder objectives. It introduces instruments available for managing risk, together with

techniques for their use, giving extensive choice to business managers on how to respond to foreign exchange risk.

Unit-IV: FINANCIAL RISK: LIQUIDITY **9**

All companies have liquidity risk (the risk of the inability to make required payments company wide as they fall due) and this risk arises from many different sources. The principles for managing liquidity risk are perhaps the most difficult to generalise (as companies' funding arrangements are very individual) but this unit takes an approach similar to that for other risks and provides a structured approach to the management of this particularly difficult but crucial risk

Unit-V: OTHER FINANCIAL RISKS AND ISSUES **9**

This study unit considers some other risk-related areas commonly managed by finance professionals. In the first section we consider the risk in the counterparties with whom companies deal, ranging from customers and suppliers to banks; the risks arising from changes in commodity prices (which have similarities and links to foreign exchange risk); and risks arising from obligations to meet pension payments in defined benefit pension schemes. The study unit concludes by looking at two final issues; the control of operational risk within treasury departments and external risk reporting requirements.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
2.	Thomas S. Coleman	Quantitative Risk Management	Harrison Bauer	2012
3.	Alexander Solla	Financial Risk Management	Harrison Bauer	2015

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dan Galai, Michel Crouhy, and Robert Mark	The Essentials of Risk Management	Financial Crisis	2002
2.	Andrew J.Dubrin	Essential of Management	Thomson Southwestern	2012
3.	Margaret Woods and Kevin Dowd	Financial RiskManagementforManagementAccountants	Society of Management Accountants of Canada	2008

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23CYC29 **INTRUSION DETECTION AND PREVENTION SYSTEM**

L	T	P	C
3	0	0	3

Course Objectives

- To learn the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion DetectionSystems
- Analyze intrusion detection alerts and logs to distinguishattack types from falsealarms
- To study the installation process of snort
- To understand the working principles of snort
- To learn how to intrusion detection by using ACID

Course Outcomes

23CYC29.CO1	Explain the fundamental concepts of Network Protocol Analysis
23CYC29.CO2	Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks
23CYC29.CO3	Implement the Snort in Real time world
23CYC29.CO4	Analyze the Snort working principles
23CYC29.CO5	Develop Agent for intrusion detection by using ACID

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC29.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC29.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC29.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC29.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC29.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: HISTORY OF INTRUSION DETECTION **9**

History of Intrusion detection, Audit, Concept and definition , Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.

UNIT-II: INTRUSION PREVENTION SYSTEMS **9**

Intrusion Prevention Systems, Network IDs protocol based IDs ,Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis , techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis non credential analysis

UNIT-III: INTRODUCTION TO SNORT **9**

Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compileand Install Snort Location of Snort Files, Snort Modes Snort Alert Modes

UNIT-IV: WORKING WITH SNORT RULES **9**

Working with Snort Rules, Rule Headers, Rule Options,The Snort Configuration File etc. Plugins, Preprocessors and Output Modules, Using Snort with MySQL

UNIT-V: USING ACID **9**

Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDs andIPs.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	RafeeqRehman	Intrusion Detection with SNORT	1st Edition, Prentice Hall	2003
2.	Philippe Bune	An Introduction to intrusion detectionSystem	SANS Institute	2005

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Christopher Kruegel	Intrusion Detection and Correlation Challenges and Solutions	1st Edition Springer	2005
2.	Carl Endorf	Eugene Schultz and Jim Mellander	1st Edition, Tata McGraw-Hill	2004
3.	Rebecca Bace, Peter Mell	Intrusion detection System	NIST	2008

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23CYC30 INTRUSION DETECTION AND PREVENTION SYSTEM LABORATORY

L	T	P	C
0	0	2	1

Course Objectives

- **1** To understand the intrusion detection and prevention technologies, various types of network behavior analysis.
- To understand the honeypots, multiple IDS methods, tools to analyze various types of attacks like wireless attacks and their detection.
- To understand the attack source and also provides practical knowledge for dealing with intrusions in real world applications.
- To learn the tools that can be used to perform information gathering
- To learn the web application attacks starting from information gathering to exploitation phases.

Course Outcomes

23CYC30.CO1	To understand the intrusion detection and prevention technologies, various types of network behavior analysis.
23CYC30.CO2	To understand the honeypots, multiple IDS methods, tools to analyze various types of attacks like wireless attacks and their detection
23CYC30.CO3	To understand the attack source and also provides practical knowledge for dealing with intrusions in real world applications.
23CYC30.CO4	To understand the basic principles for Information Gathering and Detecting Vulnerabilities in the system
23CYC30.CO5	Gain knowledge about the various attacks caused using the network and communication system in an application

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC30.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC30.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC30.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC30.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC30.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. Extract the features based on various color models and apply on image and video retrieval
2. Network monitoring, packet sniffing with Wire shark and Deep Packet inspection
3. Protocol and traffic analysis with MRTG and Performance measurement using PRTG for different sensors
4. Real time environment setup with honey net and capturing intrusions and Analyzing the benchmark dataset to categorize the various kind of intrusion types
5. Analysis of SNORT IDS with ACID and Design custom rules for intrusion detection based on attack signatures with SNORT IDS various memory allocation methods.
6. Comparative study of various IP trace back schemes and Tools available for wireless attack detection and prevention
7. Set up of Kali Linux in a Virtual machine and setup with DNS info and collection of local network
8. Scan the network for Windows XP and Windows 7 Target machines in local network and virtual network
9. Identify the open ports and firewall rules setup
10. Use password guessing tools to guess a password. Use password strengthening tools to strengthen the password. Try guessing the password and tabulate the enhanced difficulty due to length of password and addition of special characters

Total : 30

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23CYC31 **CYBER LAWS AND ETHICS**

L	T	P	C
3	0	0	3

Course Objectives

- **To study evaluation of cyber law**
- To learn concepts of Information Technology Act
- To understand the cyber law and how to find threats, attacks and how to prevent from attacks
- To study the electronic business and concepts of ethics
- To learn cyber ethics concepts

Course Outcomes

23CYC31.CO1 Understand the importance of professional practice

23CYC31.CO2 Analyze the rights and responsibilities as an employee

23CYC31.CO3 Implement the cyber law in related fields

23CYC31.CO4 Explain the legal issues in e commerce

23CYC31.CO5 Apply the cyber ethics in real time world

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC31.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC31.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC31.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC31.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC31.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION TO CYBER LAW **9**

Evolution of computer technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

UNIT-II: INFORMATION TECHNOLOGY ACT **9**

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

UNIT-III: CYBER LAW AND RELATED LEGISLATION **9**

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

UNIT-IV: ELECTRONIC BUSINESS AND LEGAL ISSUES **9**

Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

UNIT-V: CYBER ETHICS **9**

The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Harrish Chander	Cyber Laws and IT Protection	PHI learning	2019
2.	Markus Christen, Michele Loi	The Ethics of Cybersecurity	PHI learning	2020

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Debby Russell	Computer Security Basics	2nd Edition, O Reilly Media	2006
2.	Thomas R. Peltier	Information Security policies and procedures	A Practitioners Reference, 2nd Edition Prentice Hall	2004
3.	Kenneth J. Knapp	Security and Global Information Assurance	Threat Analysis and Response Solutions, IGI Global	2009

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23CYC32 **OBJECT ORIENTED PROGRAMMING**

L	T	P	C
3	0	0	3

Course Objectives

- Understand the basic Object Oriented Programming concepts.
- Develop solutions to problems by usingof Data Abstraction, Encapsulation and Inheritance.
- Ability to implement one or more patterns involving realization of an abstract interface.
- Utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching.
- To comprehend the art of programming, the structure and the meaning of basic Java programs.

Course Outcomes

23CYC32.CO1	Classify basic concepts and structure of object-oriented programming.
23CYC32.CO2	Implement real time applications by using constructor, operator overloading and function over loading in C++ Programming language.
23CYC32.CO3	Demonstrate of Inheritance and polymorphism techniques in C++ Programming language.
23CYC32.CO4	Able to write simple programs in JAVA Programming language.
23CYC32.CO5	Implement real time application by using exception handling and multithreaded techniques in JAVA programming language

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC32.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC32.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC32.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC32.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC32.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: BASIC CONCEPTS OF OOP **9**

Introduction OOP: Principles of OOP, Benefits and applications of OOP - Overview of C++: Program Structure-Namespace- Identifiers-Declaration of variables-Constants-Operators- Reference Variables - Functions in C++: Inline Functions-Friend Functions - Objects and classes: Basics of object and class in C++-Private and Public Members-Static Data and Function Members-Class Scope and Accessing Class Members

UNIT-II: CONSTRUCTORS AND OVERLOADING **9**

Constructors: Types of Constructors-Destructors - Overloading: Operator Overloading: Overloading Unary and Binary Operators-Rules for Overloading Operators - Function Overloading

UNIT-III: INHERITANCE AND POLYMORPHISM **9**

Base Class and Derived Class-Types of Inheritance: Single-Multiple-Multilevel-Hierarchical-Protected Members. Derived Class Constructors–Overriding, Member Functions-Virtual Base Class-Abstract Class-Polymorphism: this pointer – Virtual Functions.

UNIT-IV: INTRODUCTION TO JAVA **9**

Basic Java Concepts: Objects – Classes – Methods and Messages –Abstraction and Encapsulation – Inheritance – Abstract Classes – Polymorphism - Access specifies – Static Members –Constructors – Finalize Method

UNIT-V: JAVA PROGRAMMING **9**

Arrays – Strings - Packages and Interfaces - Exception Handling – Multithreaded Programming- Dynamic Binding – Final Keyword – Abstract classes.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	E Balagurusamy	Object Oriented Programming with C++	Tata McGraw Hill	2012
2.	Herbert Schlitz	JAVA -The Compete Reference	Tata McGraw-Hill	2014

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	BjarneStroustrup	The C++ Programming Language	Pearson Education	2012
2.	Deitel and Deitel	C++ : How to Program	PHI	2014
3.	Herbert Schlitz	The Compete Reference C++	Tata McGraw Hill Wesley	2014
4.	Cay S. Horstmann and Gary Cornell	Core Java: Volume I – Fundamentals	Sun Microsystems Press	2008
5.	C. Thomas Wu	An introduction to Object- oriented programming with Java	Tata McGraw-Hill Publishing company Ltd	2006

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23CYC33	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	2	1

Course Objective:

- Understand the basic Object Oriented Programming concepts.
- Develop solutions to problems by using of Data Abstraction, Encapsulation and Inheritance.
- Ability to implement one or more patterns involving realization of an abstract interface.
- Utilization of polymorphism to solve problems which can take advantage of dynamic dispatching.
- To comprehend the art of programming, the structure and the meaning of basic Java programs.

Course Outcomes:

23CYC33.CO1	Classify basic concepts and structure of object-oriented programming.
23CYC33.CO2	Implement real time applications by using constructor, operator overloading and function overloading
23CYC33.CO3	Demonstrate Inheritance and polymorphism techniques in C++ Programming language.
23CYC33.CO4	Able to writes programs in JAVA Programming language.
23CYC33.CO5	Implement real time application by using exception handling and multithreaded techniques in JAVA programming language.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC33.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC33.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC33.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC33.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC33.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No	List of Experiments
1.	Pass by value, Pass by reference and Pass by address.
2.	Constructors & Destructors, CopyConstructor.
3.	Friend Function & FriendClass.
4.	Inheritance.
5.	Polymorphism & Function Overloading.
6.	Virtual Functions.
7.	Overload Unary & Binary Operators Both as Member Function & Non MemberFunction.
8.	Class Templates & FunctionTemplates.
9.	Exception HandlingMechanism.
10.	Standard Template Libraryconcept.

Total Periods: 30

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23CYC34 **DESIGN AND ANALYSIS OF ALGORITHMS**

L	T	P	C
3	0	0	3

Course Objectives

- To learn how to develop efficient algorithms for simple computational tasks.
- To learn reasoning and correctness of algorithms.
- To learn the complexity measures, different range of behaviors of algorithms and the notion of tract able and intractable problems will be understood.
- To design the algorithms for realtime problems.
- To solve the problems by using different types of algorithms techniques.

Course Outcomes

23CYC34.CO1 Design algorithms for various computing problems.

23CYC34.CO2 Analyze the time and space complexity of algorithms.

23CYC34.CO3 Critically analyze the different algorithm design techniques for a given problem.

23CYC34.CO4 Modify existing algorithms to improve efficiency

23CYC34.CO5 Solve the realtime problems by using back tracking and branch and bound techniques.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC34.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC34.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC34.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC34.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC34.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms.

UNIT-II: BRUTE FORCEANDDIVIDE-AND-CONQUER **9**

Brute Force - Closest-Pair and Convex-Hull Problems-Exhaustive Search - Traveling Salesman Problem - Knapsack Problem - Assignment problem. Divide and conquer methodology–Mergesort– Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication-Closest-Pair and Convex-Hull Problems.

UNIT-III: DYNAMIC PROGRAMMING AND GREEDYTECHNIQUE **9**

Computing a Binomial Coefficient – Warshall's and Floyd' algorithm – Optimal Binary Search Trees –Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm-Dijkstra's Algorithm-Huffman Trees.

UNIT-IV: ITERATIVE IMPROVEMENT AND LIMITATION OF ALGORITHM **9**

The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- the Stable marriage Problem. Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP Complete Problems.

UNIT-V: BACKTRACKING, BRANCH AND BOUND AND APPROXIMATION ALGORITHM 9

Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem- Approximation Algorithms for NP – Hard Problems – Traveling Salesman problem – Knapsack problem.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	AnanyLevitin	Introduction to the Design and Analysis of Algorithms	Third Edition, PearsonEducation,.	2012
2.	BogdanCiubotaru& Gabriel-MiroMuntean	Advanced Network Programming Principles & Techniques, NetworkApplication Programming with Java	Springer Verlag	2013

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman	Data Structures And Algorithms	Pearson Education, Reprint	2006
2.	Donald E. Knuth,	The Art of Computer Programming	Volumes 1& 3 Pearson Education,	2009
3.	A I. Chandra Mohan	Design and Analysis of Algorithms	PHI Learning Pvt. Ltd, 2nd Edition	2012
4.	Steven S. Skiena	The Algorithm Design Manual	Second Edition , Springer	2008
5.	ManasRanjanKabat	Design And Analysis Of Algorithms	PHI Learning Pvt. Ltd, 2nd Edition	2013

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23CYC35	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY	L	T	P	C
		0	0	2	1

Course Objective:

- To write programs in java to solve problems using divide and conquer strategy.
- To write programs in java to solve problems using backtracking strategy.
- To write programs in java to solve problems using greedy
- To write programs in java to solve problems using dynamic programming techniques strategy.
- To write programs in java to solve problems using approximation algorithm design.

Course Outcomes:

23CYC35.CO1	Ability to write programs in java to solve problems using Divide and Conquer algorithm design techniques.
23CYC35.CO2	Write program in java to solve problems using Greedy algorithm design technique
23CYC35.CO3	Write program in java to solve problems using Dynamic programming algorithm design technique
23CYC35.CO4	Write program in java to solve problems using Backtracking algorithm design technique
23CYC35.CO5	Write program in java to solve problems using approximation algorithm design technique

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC35.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC35.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC35.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC35.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC35.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No	List of Experiments
1.	Write a java program to implement Quick sort algorithm for sorting a list of integers in ascending order
2.	Write a java program to implement Merge sort algorithm for sorting a list of integers in ascending order
3.	Write a java program to implement the backtracking algorithm for the sum of subsets problem.
4.	Write a java program to implement the backtracking algorithm for the Hamiltonian Circuits problem.
5.	Write a java program to implement greedy algorithm for job sequencing with deadlines.
6.	Write a java program to implement Dijkstra's algorithm for the Single source shortest path problem.
7.	Write a java program that implements Prim's algorithm to generate minimum cost spanning tree.
8.	Write a java program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
9.	Write a java program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.

Total Periods: 30

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		L	T	P	C
23CYC36	**BLOCKCHAIN TECHNOLOGY**	**3**	**0**	**0**	**3**

Course Objectives

- To study Basic cryptographic primitives and Blockchain Technology.
- To study about Distributed computing basics and the issues related to it.
- To know about Bitcoin and ethereum crypto- currencies.
- Tolearn about Hyperledger and other advancement in Block chain.
- To learn about privacy and security issues in Block chain.

Course Outcomes

23CYC36.CO1 Explore Blockchain Technology and cryptographic primitives.

23CYC36.CO2 Tell about Distributed Computing and various Cryptographic Techniques.

23CYC36.CO3 Solve Bitcoin and Ethereum puzzles to include blocks into Block chain.

23CYC36.CO4 Tell about Hyper ledger and its uses.

23CYC36.CO5 Address the privacy and security issues In Blockchain Technology.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC36.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC36.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC36.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC36.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC36.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Introduction- Distributed systems- Architecture- Need for Distributed Record Keeping- Modeling faults and adversaries- Byzantine Generals problem-Consensus algorithms and their scalability problems- Cryptcurrency-Technologies Borrowed in Blockchain – hash pointers, consensus, byzantine fault-tolerant distributed computing and digital cash.

UNIT-II: DISTRIBUTED COMPUTING AND CRYPTOGRAPHY BASICS **9**

Introduction- Distributed Computing- issues in Distributed Computing- Atomic Broadcast, Consensus, Byzantine Models of fault tolerance- Hash functions, Puzzle friendly Hash, Collision resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge system.

UNIT-III: BITCOIN AND ETHEREUM **9**

Bitcoin- blockchain, the challenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use- Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges.

UNIT-IV: HYPERLEDGER **9**

Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts-Hyperledger fabric, the plug and play platform and mechanisms in permissioned blockchain

UNIT-V: PRIVACY AND SECURITY ISSUES IN BLOCKCHAIN **9**

Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - -advent of algorand, and Sharding based consensus algorithms to prevent these.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S.Shukla, M. Dhawan, S.Sharma, S. Venkatesan	Blockchain Technology: Cryptocurrency and Applications	Oxford University Press	2019
2.	Josh Thompson	Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming	Create Space Independent Publishing Platform	2017

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Tiana Laurence	Block chain For Dummies	Wiley	2019
2.	Don Tapscott	Blockchain Revolution: How the Technology BehindBitcoin and Other Cryptocurrencies is Changing the World	Penguin	2018
3.	Daniel Drescher	Blockchain Basics: A Non-Technical Introduction in 25 Steps	Apress	2017

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23CYC37 **MOBILE COMMUNICATION**

L	T	P	C
3	0	0	3

Course Objectives

- Understand the fundamentals of mobile communication
- Apply the typical mobile networking infrastructure through a popular GSM protocol
- Summarize the basics of mobile telecommunication system.
- Identify the Mobile Network Layer Functionalities of Mobile communication.
- Define the functions of Transport and Application layers

Course Outcomes

23CYC37.CO1 State the basics of mobile telecommunication system

23CYC37.CO2 Illustrate the generations of telecommunication systems in wireless network

23CYC37.CO3 Understand the architectures, the challenges and the Solutions of Wireless Communication

23CYC37.CO4 Identify solution for each functionality at each layer

23CYC37.CO5 Analyze the functionality of Transport and Application layer

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC37.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC37.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC37.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC37.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC37.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: WIRELESS COMMUNICATION FUNDAMENTALS **9**

Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks.

UNIT-II: TELECOMMUNICATION NETWORKS **9**

Telecommunication systems – GSM – GPRS – DECT – Satellite Networks - Basics – Parameters and Configurations – Capacity Allocation – FAMA and DAMA – Broadcast Systems – DAB - DVB.

UNIT-III: WIRELESS LAN **9**

Wireless LAN – IEEE 802.11 - Architecture – services – MAC – Physical layer – IEEE 802.11a - HIPERLAN – Blue Tooth.

UNIT-IV: MOBILE NETWORK LAYER **9**

Mobile IP – Dynamic Host Configuration Protocol - Routing – DSDV DSR Alternative Metrics.

UNIT-V: TRANSPORT AND APPLICATION LAYERS **9**

Traditional TCP – Classical TCP improvements – WAP- Introduction to 4G mobile networks- Case study – Mobile multimedia networks.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jochen Schiller	Mobile Communications	PHI/Pearson Education.Second Edition	2003
2.	William Stallings	Wireless Communications and Networks	PHI/Pearson Education	2002

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	KavehPahlavan, PrasanthKrishnamoorthy	Principles of Wireless Networks	PHI/Pearson Education	2003
2.	UweHansmann, LotharMerk, Martin S, Nicklons and Thomas Stober	Principles of Mobile Computing	Springer,New York	2003
3.	HazysztofWesolowshi	Mobile Communication Systems	John Wiley and Sons Ltd	2002

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23CYC38 **INTERNET OF THINGS**

L	T	P	C
3	0	0	3

Course Objectives

- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To be exposed to web, cloud in the context of IoT
- To develop different models for network dynamics
- To analyze applications of IoT in realtime scenario

Course Outcomes

23CYC38.CO1 Explain the underlying architectures and models in IoT.

23CYC38.CO2 Analyze various protocols for IoT at the different layers for IoT

23CYC38.CO3 Apply the web of things and cloud of things Models

23CYC38.CO4 Develop different models for network dynamics

23CYC38.CO5 Study the needs and suggest appropriate solutions for Industrial applications

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC38.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC38.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC38.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC38.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC38.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Definitions and Functional Requirements –Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security.

UNIT-II: IOT PROTOCOLS **9**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security

UNIT-III: WEB OF THINGS **9**

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing–Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture

UNIT-IV: IOT BUSINESS MODELS **9**

ntegrated Billing Solutions in the Internet of Things Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects – Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small-World Phenomenon

UNIT-V: APPLICATIONS **9**

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronization and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David Hanes,GonzaloSalgueiro,Patrick,Grossetete, Rob Barton and Jerome Henry	Fundamentals:Networking Technologies, Protocols and Use Cases for Internet of Things	Cisco Press	2017
2.	ArshdeepBahga,VijayMadisetti	Internet of Things	A hands-on approach, Universities press	2015

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David Easley and Jon Kleinberg	Networks, Crowds, and Markets: Reasoning About a Highly Connected World	Cambridge University Press	2010
2.	Olivier Hersent, David Boswarthick, Omar Elloumi	The Internet of Things	A John Wiley & Sons, Ltd	2012
3.	Honbo Zhou	The Internet of Things in the Cloud: A Middleware Perspective	CRC Press	2012
4.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds)	Architecting the Internet of Things	Springer	2011
5.	Olivier Hersent, Omar Elloumi and David Boswarthick	The Internet of Things: Applications to the Smart Grid and Building Automation	Wiley	2012

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23CYC39 **INTERNET OF THINGS LABORATORY**

L	T	P	C
0	0	2	1

Course Objectives

- To study the assembly language using simulator and kit.
- To perform ALU operations.
- To generate waveforms and test timers.
- To develop applications using Embedded C.
- To develop IoT applications using Aurdino, Raspberry Pi, and Bluemix.

Course Outcomes

23CYC39.CO1 Execute Assembly Language experiments using simulator.

23CYC39.CO2 Implement ALU operations.

23CYC39.CO3 Design waveforms and test timers

23CYC39.CO4 Develop real time applications and explore ARM/PIC using Embedded C.

23CYC39.CO5 Demonstrate real time applications using Aurdino, Raspberry Pi, and Bluemix.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC39.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC39.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC39.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC39.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC39.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. Write 8051 Assembly Language experiments using simulator.
2. Test data transfer between registers and memory.
3. Perform ALU operations.
4. Using interrupts generate waveforms and test Timers.
5. Write assembly language experiments using Kit to test interfaces and interrupts using Traffic Generator, DAC, ADC,
6. Stepper Motor (2).
7. Write Basic and arithmetic Programs Using Embedded C.
8. Write Embedded C program to test interrupt and timers.

9. Develop Real time applications – clock generation, wave form generation, counter using embedded C.

10. Explore ARM/PIC based controllers using Embedded C.

11. Explore different communication methods with IoT devices

12. Develop simple application – testing infrared sensor – IoT Applications – using Aurdino.

13. Develop simple application – testing temperature, light sensor – IOT Application using open platform/Raspberry Pi.

14. Deploy IOT applications using platforms such as Bluemix.

15. Develop Real time applications – clock generation, wave form generation, counter using embedded C.

16. Explore ARM/PIC based controllers using Embedded C.

Total : 30

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		L	T	P	C
23CYC40	**ARTIFICIAL INTELLIGENCE**	**3**	**0**	**0**	**3**

Course Objectives

- To learn the concepts of computational intelligence for solving problems
- To Understand about knowledge representation and decisions making
- To introduce the concepts of machine learning and Neural Networks
- To Initiate the Perception of Genetic Algorithms.
- To understand the knowledge about Expert Systems

Course Outcomes

23CYC40.CO1	Apply different searching strategies for problem solving
23CYC40.CO2	Represent planning problems and find the sequence of actions to achieve goals by using knowledge representation.
23CYC40.CO3	Comprehends the various machine learning techniques.
23CYC40.CO4	Demonstrate different techniques to represent Genetic Algorithms
23CYC40.CO5	Develop the expert system for the real time problems.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC40.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC40.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC40.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC40.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC40.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION TO AL AND PRODUCTION SYSTEMS **9**

Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms

UNIT-II: REPRESENTATION OF KNOWLEDGE **9**

Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic- Structured representation of knowledge.

UNIT-III: MACHINE LEARNING **9**

Machine Learning-Supervised learning-un Supervised learning-Reinforcement Learning-Learning by Inductive Logic Programming-Computational Learning Theory-Neural Nets-Artificial Neural Nets-Topology of AI- Learning using Neural Nets-Back Propagation Training Algorithm- Multi-Layered ADALINE Models- Hopfield Neural Net-Associative Memory-Fuzzy Neural Nets- Self Organizing Neural Net-Adaptive Resonance Theory.

UNIT-IV: GENETIC ALGORITHMS **9**

Genetic Algorithms-Hollands Observation-Fundamental Theorem of Genetic Algorithms-Markov Model for Convergence Analysis-Applications of Optimization problem, Intelligent Systems-Genetic Programming- Fuzzy Neural Nets-Cognitive Maps-Stability Analysis-Control Command by Cognitive Map-Visual perception- Case Study

UNIT-V: EXPERT SYSTEMS **9**

Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Elaine Rich, Kevin Knight, Shivashankar.B.Nair	Artificial Intelligence	Tata McGraw Hill	2011
2.	AmitKonar	Artificial Intelligence	CRC,Press	2009

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Russell, Peter Norvig	ArtificialIntelligence–A ModernApproach	Prentice Hall of India	2009
2.	Dan W. Patterson	Introduction to AI and ES	Pearson Education	2007
3.	AndriesP.Engelbrecht,	Computational Intelligence: An Introduction	John Wiley & Sons	2007
4.	Eugene Charniak, Drew McDermott	Introduction to Artificial Intelligence	Pearson Education	2006.
5.	Nils.J.Nilsson	Artificial Intelligence: A new synthesis	Elsevier	2003

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23CYC41 **PRINCIPLES OF COMPILER DESIGN**

L	T	P	C
3	0	0	3

Course Objectives

- To learn the basic concepts of Automatatheory.
- To know the basic concepts of compilers.
- To learn the functions of Lexical Analyzer and SyntaxAnalyzer.
- To understand the process of Intermediate Code Generation.
- To underst and the concepts of Code Generation and Code Optimization

Course Outcomes

23CYC41.CO1 Design a lexical analyzer for compiler.

23CYC41.CO2 Implement a parser such as a bottom– up SLR parser without usingYACC.

23CYC41.CO3 Implement semantic rules into aparser.

23CYC41.CO4 Implement intermediate code generator for compiler design.

23CYC41.CO5 Implement code generator and codeoptimizer.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC41.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC41.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC41.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC41.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC41.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION TO AUTOMATA AND COMPILER **9**

Basic Machines Finite Automata (FA) - Deterministic Finite Automata (DFA) – Nondeterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions-Finite State Automata and Regular Expressions. Compilers – Phases of a compiler – Cousins of the Compiler– Compiler construction tools – Lexical Analysis – Role of LexiAnalyzer– Input Buffering – Tokens Specification.

UNIT-II: LEXICAL ANALYSIS **9**

Recognition machine - A typical lexical analyzer generator - Parsing - Top Down parsing – Recursive Descent Parsing – Predictive Parsing. Syntax

UNIT-III: ANALYSIS **9**

Analysis: Role of the parser – Context-Free Grammars –– Bottom-up parsing – Shift Reduce Parsing – Operator Precedent Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser.

UNIT-IV: INTERMEDIATE CODE GENERATION **9**

Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Procedure calls. Code Optimization and Code generation

UNIT-V: CODE OPTIMIZATION **9**

Introduction to code optimization - Principal Sources of Optimization – Optimization of basic Blocks – DAG representation of Basic Blocks – Peephole Optimization - code generation- Issues in design of code generator – The target machine - A simple Code generator.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Alfred Aho Jeffrey D Ullman	Compilers Principles Techniques and Tools	Pearson Education	2014
2.	J.E.Hopcroft, R.Motwani and J.D Ullman	Introduction to Automata Theory, Languages and Computations	Pearson Education	2003

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Fischer C N LeBlanc R J	Crafting a compiler with C	Benjamin Cummings	2003
2.	Bennet J P	Introduction to Compiler Techniques	Tata McGraw Hill	2003
3.	Kenneth C Louden	Compiler Construction Principles and Practice	Thompson Learning	2003
4.	Henk Alblas and Albert Nymeyer	Practice and Principles of Compiler Building with C	PH.	2001
5.	Alfred V. Ahoet. Al	Compilers Principles, Techniques and Tools	Pearson Education	2007

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23CYC42 **COMPILER DESIGN LABORATORY**

L	T	P	C
0	0	2	1

Course Objectives

- To learn the basic concepts of Automatatheory.
- To know the basic concepts of compilers.
- To learn the functions of Lexical Analyzer and SyntaxAnalyzer.
- To understand the process of Intermediate Code Generation.
- To underst and the concepts of Code Generation and Code Optimization

Course Outcomes

23CYC42.CO1 Ability to design and implement lexical analyzer using C and LEX tool.

23CYC42.CO2 Ability to design and implement parsers using C, YACC and LEX tools.

23CYC42.CO3 Ability to design and implement compilers.

23CYC42.CO4 Implement intermediate code generator for compiler design.

23CYC42.CO5 Implement code generator and code optimizer.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC42.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC42.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC42.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC42.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC42.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. Implementation of lexical analyzer inC.
2. Implementation of lexical analyzer using LEXtool.
3. Implementation ofthe recursive descent parser for an expression grammar that generates arithmetic expressions with digits, + and*.
4. Implementation of a parser for the same grammar as given in problem using YACC andLEX.
5. WritesemanticrulestotheYACCprograminproblemandimplementacalculatorthattakesanexpression with digits, + and * and computes and prints itsvalue.
6. Implementation of the front end of a compiler that generates the three address code for a simple language with: one data type integer, arithmetic operators, relational operators, variable declaration statement, one conditional construct, one iterative construct and assignmentstatement.
7. Implementation of back end of a compiler usingC.
8. Stack implementation of LR parser usingC.
9. Implementation of lexical analyzer inC.

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Total : 30

23CYC43 **DATA WAREHOUSING AND DATA MINING**

L	T	P	C
3	0	0	3

Course Objectives

- To study the concepts of data warehousing architecture
- To understand data mining principles and techniques
- To learn to use association rule mining for handling large data
- To study classification and clustering for better organization and retrieval of data
- To expose business applications and recent trends of Data mining

Course Outcomes

23CYC43.CO1 Identify the components of data ware housing architecture

23CYC43.CO2 Implement data preprocessing for mining applications

23CYC43.CO3 Apply the association rules for mining the data

23CYC43.CO4 Deploy a ppropriate classification techniques

23CYC43.CO5 Analyze clustering techniques

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC43.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC43.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC43.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC43.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC43.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: DATA WAREHOUSING **9**

Introduction to Data warehousing - Data warehousing Components - Building a Data Warehouse–Mapping the Data Warehouse to Multiprocessor Architecture - DBMS Schemas for Decision Support - Data Extraction, Cleanup, and Transformation Tools - Multidimensional Data Model-On Line Analytical Processing and tools - Need for OLAP-OLAP Operations – Types ofOLAP servers.

UNIT-II: DATA MINING **9**

Data Mining-Motivation and Importance of Data mining – Evolution of Database systems – Data mining functionalities – Steps in KDD process- Architecture of a typical data mining system - Classification of data mining systems – Data mining task primitives - Major issues in data mining

UNIT-III: ASSOCIATION RULE MINING **9**

Introduction - Association rule mining - Mining frequent item sets with and without candidate generation – Pattern evaluation methods - Mining various kinds of association rules: Pattern mining - Mining multilevel association - Mining multidimensional association - Constraint based mining.

UNIT-IV: CLASSIFICATION **9**

Basic concepts - Decision tree induction - Bayesian classification - Rule based classification - Classification by back propagation - Model Evaluation and Selection - Techniques to improve classification – Case study

UNIT-V: CLUSTER **9**

Cluster analysis - Clustering techniques: Partitioning methods - Hierarchical methods - Evaluation of clustering Outlier detection: Outliers and Outlier analysis - Outlier detection methods- Case study

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jiawei Han and Micheline Kamber,	Data Mining: Concepts and Techniques	Morgan Kaufmann Publishers	2011.
2.	Alex Berson and Stephen J. Smith	Data Warehousing, Data Mining & OLAP	Tata McGraw Hill Edition	2011

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	G. K. Gupta	Introduction to Data Mining with Case Studies	Prentice Hall of India	2014
2.	Ian Witten, Eibe Frank	Data Mining: Practical Machine Learning Tools and Techniques	Morgan Kaufmann	2011
3.	Alex Berson and Stephen J. Smith	Data Warehousing, Data Mining & OLAP	Tata McGraw – Hill Edition	2007
4.	K.P. Soman, ShyamDiwakarand V. Ajay	Insight into Data mining Theory and Practice	Prentice Hall of India	2006
5.	George M Marakas	ModernDataWarehousing, Miningand Visualization	Prentice Hall	2003

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		L	T	P	C
23CYC44	**MACHINE LEARNING**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the basics of Machine Learning (ML)
- To understand the methods of Machine Learning
- To know about the implementation aspects of machine learning
- To understand the concepts of Data Analytics and Machine Learning
- To understand and implement use cases of ML

Course Outcomes

23CYC44.CO1 Understand the basics of ML

23CYC44.CO2 Explain various Machine Learning methods

23CYC44.CO3 Demonstrate various ML techniques using standard packages.

23CYC44.CO4 Explore knowledge on Machine learning and DataAnalytics

23CYC44.CO5 Apply MLto various realtimeexamples

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC44.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC44.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC44.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC44.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC44.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: MACHINE LEARNING BASICS **9**

Introduction to Machine Learning (ML) - Essential concepts of ML – Types of learning – Machinelearning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends inMachinelearning–Data Understanding Representation and visualization..

UNIT-II: MACHINE LEARNING METHODS **9**

Linearmethods–Regression-Classification–PerceptronandNeuralnetworks–Decisiontrees–Support vectormachines–Probabilisticmodels ––Unsupervisedlearning –Featurization

UNIT-III: MACHINE LEARNING IN PRACTICE **9**

Ranking–RecommendationSystem-DesigningandTuningmodelpipelines-Performancemeasurement – Azure Machine Learning – Open-source Machine Learning libraries – Amazon'sMachineLearningTool Kit:Sagemaker

UNIT-IV: MACHINE LEARNING AND DATA ANALYTICS **9**

Machine Learning for Predictive Data Analytics – Data to Insights to Decisions – Data Exploration –Information based Learning – Similarity based learning – Probability based learning – Error basedlearning–Evaluation – TheartofMachine learningtoPredictive DataAnalytics.

UNIT-V: APPLICATIONS OF MACHINE LEARNING **9**

Image Recognition–Speech Recognition–Email spam and Malware Filtering–Online fraud detection–Medical Diagnosis.

Total : 45

TextBooks:				
S.No.	**Author(s)**	**TitleoftheBook**	**Publisher**	**Year of Publication**
1	AmeetVJoshi	Machine Learning and Artificial Intelligence	Springer Publications	2020
2	JohnD. Kelleher, Brain Mac Namee, AoifeD'Arcy	Fundamentals of Machine learning for Predictive Data Analytics, Algorithms, Worked Examplesandcasestudies	MITpress	2015

ReferenceBooks:				
S.No.	**Author(s)**	**TitleoftheBook**	**Publisher**	**Year of Publication**
1	ChristopherM.Bishop	Pattern Recognition and Machine Learning	Springer Publications	2011
2	Stuart Jonathan Russell, Peter Norvig, JohnCanny	Artificial Intelligence: A Modern Approach	Prentice Hall	2020
3	John Paul Muller, Luca Massaron	MachineLearningDummies	WileyPublications	2021

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		L	T	P	C
23CYC45	**SOFTWARE ENGINEERING AND ITS METHODOLOGY**	**3**	**0**	**0**	**3**

Course Objectives

- To Understand the software life cycle models
- Learn Requirement analysis and fundamental concepts
- Understand the various software design methodologies
- Acquire knowledge on Software testing and risk management
- Apply different techniques to measure software performance

Course Outcomes

23CYC45.CO1 Apply the concepts of lifecycle models to choose the appropriate model.

23CYC45.CO2 Analysis the requirements and design the software.

23CYC45.CO3 Construct a design for a real-world problem.

23CYC45.CO4 Design and develop test cases.

23CYC45.CO5 Work with version control and work on configuration and release management plans

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYC45.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYC45.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYC45.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYC45.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYC45.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: SOFTWARE PROCESS AND AGILE DEVELOPMENT **9**

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models–IntroductiontoAgility-Agileprocess-Extremeprogramming-XPProcess.

UNIT-II: REQUIREMENTS ANALYSIS AND SPECIFICATION **9**

Software Requirements: Functional and Non-Functional, User requirements, System requirements,Software Requirements Document – Requirement Engineering Process: Feasibility Studies,Requirementselicitationandanalysis,requirementsvalidation,requirementsmanagementClassicalanalysis:StructuredsystemAnalysis,PetriNets-DataDictionary

UNIT-III: SOFTWARE DESIGN **9**

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design –Architectural styles,Architectural Design,Architectural Mapping using Data Flow-User Interface Design: Interface analysis,InterfaceDesign–ComponentlevelDesign:DesigningClassbased components,traditionalComponents.

UNIT-IV: TESTING AND IMPLEMENTATION **9**

Software testing fundamentals-InternalandexternalviewsofTesting-whiteboxtesting -basispathtesting-control structure testing-black box testing- Regression Testing – Unit Testing – IntegrationTesting – Validation Testing – System Testing and Debugging – Software ImplementationTechniques:Coding practices-Refactoring

UNIT-V: PROJECT MANAGEMENT **9**

Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO Model I,II - Planning – ProjectPlan,PlanningProcess,RFPRiskManagement –Identification,Projection,RMMM-SchedulingandTracking – Relationship between people and effort, Task Set & Network, Scheduling, EVA - ProcessandProjectMetrics.

Total : 45

Text Books

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	RogerS.Pressman	SoftwareEngineering–APractitioner`sApproach	7thEdition McGraw-HillEducation	2010
2.	PankajJalote	SoftwareEngineering-APreciseApproach	WileyIndia	2010
3.	Sommerville	SoftwareEngineering	9th edition, Pearsoneducation	2001

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	K.K.Agarval, YogeshSingh	Software Engineering	3rd edition, New Age International Publishers	2007
2.	LamesF.Peters, Witold Pedrycz	Software Engineering an Engineering approach	JohnWiely&Sons	2000
3.	Shely Cashman Rosenblatt	Systems Analysis and Design	6th edition, Thomson, Publications	2006
4.	Ali Behforooz and Frederick Hudson	Software Engineering Fundamentals	Oxford University Press, New Delhi	1996
5.	Sheikh UmarFarooq, S. M. KQuadriandNesar Ahmad	Software Testing Techniques Evaluation – An Empirical Approach	Lambert Academic Publishing, Germany,	2012

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		L	T	P	C
21CYC46	**FOUNDATION OF DATA SCIENCE**	**3**	**0**	**0**	**3**

Course Objectives

- To Understand the key concepts of Data Science and its Applications
- To Analyze the results on Data Collection and Data Pre-Processing
- To Recall the mathematical concepts for descriptive and statistical analysis of the given dataset
- To Apply Model development and evaluation
- To Analyze the results on Model Evaluation metrics and validation

Course Outcome

21CYC46.CO1 Implement Data Science and its Applications

21CYC46.CO2 Apply results on Data Collection and Data Pre-Processing

21CYC46.CO3 Implement the Graph in Statistics.

21CYC46.CO4 Analyze Model development and evaluation

21CYC46.CO5 Analyze Model Evaluation metrics and validation

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21CYC46.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
21CYC46.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
21CYC46.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
21CYC46.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
21CYC46.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

IntroductiontoDataScience–EvolutionofDataScience–DataScienceRoles–StagesinaDataScience Project –Applications of Data Science in various fields – Data Security Issues

UNIT-II: DATA COLLECTION AND DATA PRE-PROCESSING **9**

DataCollectionStrategies–DataPre-ProcessingOverview–DataCleaning–DataIntegrationand Transformation–Data Reduction – Data Discretization.

UNIT-III: EXPLORATORY DATA ANALYTICS **9**

SimpleandMultipleRegression–ModelEvaluationusingVisualization–ResidualPlot–DistributionPlot– Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making

UNIT-IV: MODEL DEVELOPMENT **9**

DescriptiveStatistics–Mean,StandardDeviation,SkewnessandKurtosis–BoxPlots–PivotTable–HeatMap– Correlation Statistics – ANOVA

UNIT-V: MODEL EVALUATION **9**

GeneralizationError–Out-of-SampleEvaluationMetrics–CrossValidation–Overfitting–UnderFittingand Model Selection Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search

Total : 45

Text Books

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	RogerS.Pressman	Foundation Of Data Science	7thEdition McGraw-HillEducation	2010
2.	PankajJalote	Foundation Of Data Science -A Precise Approach	WileyIndia	2010
3.	Sommerville	Foundation Of Data Science	9thedition, Pearsoneducation	2001

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	K.K.Agarval,YogeshSingh	Foundation Of Data Science	3rdedition, NewAgeInternational Publishers	2007
2.	LamesF.Peters,WitoldPedrycz	Data Science approach	JohnWiely&Sons	2000
3.	ShelyCashmanRosenblatt	Foundation Of Data Science Analysis and Design	6thedition, Thomson, Publications	2006

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PROGRAMME ELECTIVE COURSES (PEC)

		L	T	P	C
23CYE01	**C# AND .NET FRAMEWORK**	**3**	**0**	**0**	**3**

Course Objectives

- To discuss the concepts of NET Framework and C# language
- To Design and develop real-time applications using object oriented concepts inC#
- To Design and develop real-time applications using .NET
- To Design and develop windows and web based applications using C#
- To Develop C# programs for Multithreading and database applications

Course Outcomes

23CYE01.CO1	Discuss the concepts of NET Framework and C# language
23CYE01.CO2	Design and develop real-time applications using object oriented concepts in C#
23CYE01.CO3	Design and develop real-time applications using .NET
23CYE01.CO4	Develop the web based applications using ADO.NET in C#
23CYE01.CO5	Implement the network application by using .Net framework.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE01.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE01.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE01.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE01.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE01.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION TO C# **9**

Introducing C#, Understanding .NET, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, and Enumerations.

UNIT-II: OBJECT ORIENTED ASPECTS OF C# **9**

Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.

UNIT-III: APPLICATION DEVELOPMENT ON .NET **9**

Windows Applications: Basic windows controls. Advanced controls, multi window applications, Accessing Data with ADO.NET: Connections, Data Adapters, Datasets, Data Application, Working with relational databases, multiple tables in a single dataset, Data views, Data Binding, Complex Binding, Navigating through datasets using bound controls.

UNIT-IV: WEB BASED APPLICATION DEVELOPMENT ON .NET **9**

Programming Web Applications with Web Forms, web server controls, Programming Web Services.

UNIT-V: THE CLR AND THE .NET FRAMEWORK **9**

Assemblies, Versioning, Attributes, Reflection, Viewing Metadata, Type Discovery, Reflecting on a Type, Marshaling, Remoting, Understanding Server Object Types, Specifying a Server with an Interface, Building a Server, Building the Client, Using Single Call, Threads.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	E. Balagurusamy	Programming in C#	Tata McGraw-Hill	2004
2.	J. Liberty	Programming C#	O'Reilly	2002

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Herbert Schildt	The Complete Reference: C#	Tata McGraw-Hill	2004
2.	Robinson et al	Professional C#	Wrox Press	2002
3.	Andrew Troelsen	C# and the .NET Platform	A1 Press	2003
4.	Thamarai Selvi, R. Murugesan	A Textbook on C#	Pearson Education	2003
5.	Karli Watson, Christian Nagel,Jacob Hammer Pedersen,Jon Reid, Morgan Skinner	Beginning Viual C# 2010	Wiley India Pvt.Ltd	2010

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		L	T	P	C
23CYE02	**SOFTWARE PROJECT MANAGEMENT**	**3**	**0**	**0**	**3**

Course Objectives

- To highlight different techniques for software cost estimation
- To plan and monitor projects for the risk management
- To explore the process of monitoring and controlling
- To manage people and organization of teams
- To estimate the cost associated with project

Course Outcomes

23CYE02.CO1	Able to practice the process of project management and its application in delivering successful projects
23CYE02.CO2	Evaluate the risks and hazards in the project management
23CYE02.CO3	Apply cost monitoring and control strategies for software projects
23CYE02.CO4	Identify desirable characteristics of effective project managers and manage the organizational behavior of people working in teams
23CYE02.CO5	Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE02.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE02.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE02.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE02.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE02.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION AND PROJECT EVALUATION **9**

Project Definition – Importance of Software Project Management – Contract Management – Activities covered by Software Project Management – Setting objectives – Stakeholders - Management Control – Overview of Project Planning – Stepwise Project Planning – Project evaluation - Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques.

UNIT-II: ACTIVITY PLANNING AND RISK MANAGEMENT **9**

Objectives – Project Schedule – Sequencing and Scheduling Activities – Network Planning Models – Forward Pass – Backward Pass – Critical path (CRM) method – Activity Float – Shortening the Project Duration– Activity on Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis.

UNIT-III: PROJECT MANAGEMENT AND CONTROL **9**

Introduction – Creating the Framework – Collecting the Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types of Contract – Stages in Contract Placement – Typical Terms of a Contract – Contract Management – Acceptance.

UNIT-IV: MANAGING PEOPLE AND ORGANIZING TEAMS **9**

Introduction – Understanding Behavior – Organizational Behavior – Selecting the Right Person for the Job–Instruction in the Best Methods – Motivation – The Oldham Hackman Job Characteristics Model – Working In Groups – Becoming A Team – Decision Making – Leadership – Organizational Structures – Stress – Health And Safety.

UNIT-V: SOFTWARE EFFORT ESTIMATION **9**

Introduction – The basics for software estimation – Software effort estimation techniques – Expert judgment– Estimating by analogy – Albrecht function point analysis –Function points Mark II – COSMIC Full function points - COCOMO: A Parametric Productivity Model.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bob Hughes, Mike Cotterell	Software Project Management	Tata McGraw Hill, Fifth Edition	2011
2.	Robert K. Wysocki	Effective Software Project Management	Wiley Publication	2011

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Adolfo Villafiorita	Introduction to Software Project Management	CRC Press	2014
2	Jalote	Software Project Management in Practice	Pearson Education	2010
3	Murali k. chemuturi, Thomas m cagly	Mastering software project management- best practices tools and Techniques	j ross Publication	2010

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		L	T	P	C
23CYE03	**SALESFORCE CRM AND PLATFORM**	**0**	**0**	**2**	**1**

Course Objectives

- To learn the basics of Salesforce as a CRM and a Platform
- To learn the administrative and configurable capabilities of Salesforce
- To write business logic customizations using Apex triggers and classes customized using SOQL and DML
- To describe how trigger code works within the basics of the Save Order of Execution and transactions
- To write Visualforce markup code to customize the user interface

Course Outcomes

23CYE03.CO1 Leverage configurable aspects of Salesforce for business process automation

23CYE03.CO2 Understand Apex Programming and Visualforce

23CYE03.CO3 Develop Apex program with SOQL & DML

23CYE03.CO4 Testing and Execution of triggers in Apex

23CYE03.CO5 Salesforce for business process automation

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE03.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE03.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE03.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE03.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE03.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION TO SALESFORCE **9**

Salesforce Overview - Architecture – Environment - Sales Cloud - Service Cloud - Navigating Setup Salesforce Objects - Standard Objects - Custom Objects & Fields - Field Types - Master Detail - Lookup Relationship - Schema Builder - Global Search.Standard UI Configuration - Page Layouts - Record Types - Record Type Based Picklist Values. Process Automation - Validation Rules, Workflow Rules and Actions - Process Builder - Approval Process. Salesforce Security Model - Role Hierarchy - Profiles and Permission Sets - Access Controls - Object and Field Level Security - Record Level Security - Org Wide Defaults - Record Ownership - Sharing Rules.

UNIT-II: SALESFORCE CRM FUNCTIONALITY **9**

CRM Basics : Introduction to CRM - Sales Objects - Service Objects. Sales Process: Lead - Web-to-Lead - Lead Conversion - Opportunities - Accounts & Contacts – Products. Service Process: Case, Email-to-Case, Web-to-Case. Automation Rules: Lead/Case Assignment Rules - Escalation Rules - Merge Records - DuplicationRules.

UNIT-III: APEX PROGRAMMING BASICS **9**

Programming with Apex: Introduction to Apex - Statements & Collections - Introduction to Apex Classes. SOQL: Syntax, SOQL in Apex, Dynamic SOQL. Query using relationships: Relationship name, child-to-parent relationship – parent-to- child relationship.DML essentials: DML operations with Apex - Transaction Controls - DML errors.

UNIT-IV: APEX PROGRAMMING DEVELOPMENT **9**

Apex Trigger Essentials: Introduction - Trigger Events - Syntax - Trigger context variables. Apex Class Implementation: Implement Business Logic in Apex class - Trigger Handlers and Controllers - Best Practices (Bulkification, No DML & queries inside loops) - Apex Test Classes. Advanced Apex: Asynchronous Apex - Apex Scheduler - Batch Apex - Future methods - Queueable Apex API Callouts - Apex Web Services - Standard APIs. Transactions: Lifecycle of a transaction – Memory life cycle for static variable - Salesforce order of Execution - Execution Governor Limits. Development Tools: Developer Console - Debug Logs - Eclipse & Force.com IDE - Visual Studio – Workbench

UNIT-V: VISUALFORCE DEVELOPMENT **9**

Visualforce: Introduction – Creating Visualforce pages – Important Visualforce Tags - Exploring the View and Controller layers of Visualforce – Standard Controller – Display data from a record in a Visualforce page – Display related data – Invoke standard controller actions– Using standard list controller in a Visualforce page – Using custom controllers and extensions – Security concerns.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Paul Goodey, - Fourth Edition,	Salesforce CRM - The Definitive Admin Handbook	4th Revised edition Edition, PACKT enterprises, Kindle edition	2016
2.	Matt Kaufmann and Michael Wicherski	Learning Apex Programming	PACKT enterprises, Kindle edition	2015

REFERENCE BOOK

SI.NO	Author(s)	Title of the Book	Publisher	Year of Publications
1.	David Taber	Salesforce.com Secrets of Success: Best Practices for Growth and Profitability	2nd Edition, Prentice Hall	2013
2.	Keir Bowden	Visualforce Development Cookbook	PACKT enterprises, Kindle edition	2016

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23CYE04 **SALESFORCE CRM AND PLATFORM LABORATORY**

L	T	P	C
0	0	2	1

Course Objectives

- To learn the basics of Salesforce as a CRM and a Platform
- To learn the administrative and configurable capabilities of Salesforce
- To write business logic customizations using Apex triggers and classes customized using SOQL and DML
- To describe how trigger code works within the basics of the Save Order of Execution and transactions
- To write Visualforce markup code to customize the user interface

Course Outcomes

23CYE04.CO1 Leverage configurable aspects of Salesforce for business process automation

23CYE04.CO2 Understand Apex Programming and Visual force

23CYE04.CO3 Develop Apex program with SOQL & DML

23CYE04.CO4 Testing and Execution of triggers in Apex

23CYE04.CO5 Customizing user interfaces using visual force markup code

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE04.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE04.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE04.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE04.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE04.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. Salesforce Basics

2. Salesforce Platform Basics

3. Platform Development Basics

4. Developer Console Basics

5. Apex Basics for Admin

6. Object Oriented Programming for Admin

7. Apex Triggers

8. SOQL Database .NetBasics

9. Visual force Basics

10. Build a Conference Management Application

11. Development an Account Geolocation Application

12. Transform SQL Queries to SOQL Queries

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Total : 30

		L	T	P	C
23CYE05	**BIOMETRIC SYSTEMS & BIOMETRIC IMAGE PROCESS**	**3**	**0**	**0**	**3**

Course Objectives

- Understand the basics of biometrics compared to traditional securing mechanisms.
- Design and develop a biometric security system
- Gain knowledge in building blocks of research fields like Pattern Recognition, Image Processing etc.
- Evaluate the fingerprint biometrics of several modalities from measures
- Analyze finger biometric technology

Course Outcomes

23CYE05.CO1 Understand the technological uplifts with biometrics

23CYE05.CO2 Evaluate security systems with biometrics.

23CYE05.CO3 Acquire the fundamental concepts of a digital image processing system

23CYE05.CO4 Demonstrate the features of fingerprint biometrics

23CYE05.CO5 Apply iris biometric for identification

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE05.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE05.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE05.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE05.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE05.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Biometric fundamentals – Biometric technologies – Biometrics Vs traditional techniques –Characteristics of a good biometric system – Benefits of biometrics – Key biometric processes: verification, identification and biometric matching – Performance measures in biometric systems, FAR,FRR, FTE rate, EER and ATV rate, Applications of Biometric Systems, Security and Privacy Issues. Physiological Biometrics : Leading technologies : Finger-scan – Facial-scan – Iris-scan – Voice-scan–components, working principles, competing technologies, strengths and weaknesses – Other physiological biometrics : Hand-scan, Retina-scan – components, working principles, competing technologies, strengths and weaknesses – Automated fingerprint identification systems.

UNIT-II: BEHAVIORAL BIOMETRICS **9**

Leading technologies: Signature-scan – Keystroke scan – components, working principles, strengths and weaknesses. Privacy and Standards in Biometrics: Assessing the Privacy Risks of Biometrics – Designing Privacy-Sympathetic Biometric Systems – Need for standards – different biometric standards.

UNIT-III: FUNDAMENTALS OF IMAGE PROCESSING **9**

Digital Image representation - Fundamental steps in Image Processing Image Enhancement: The Spatial Domain Methods, The Frequency Domain Methods – Image Segmentation: Pixel Classification by Thresholding, Histogram Techniques, Smoothing and Thresholding- Gradient Based Segmentation: Gradient Image, Boundary Tracking, Laplacian Edge Detection.

UNIT-IV: FINGERPRINT BIOMETRICS **9**

Fingerprint Patterns, Fingerprint Features, Fingerprint Image, width between two ridges -Fingerprint Image Processing - Minutiae Determination - Fingerprint Matching: Fingerprint Classification, Matching policies.

UNIT-V: IRIS BIOMETRICS **9**

Iris System Architecture, Definitions and Notations - Iris Recognition: Iris location, Doubly Dimensionless Projection, Iris code, Comparison - Coordinate System: Head Tilting Problem, Basic Eye Model, Searching Algorithm, Texture Energy Feature

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Paul Reid	Biometrics for Network Security	Pearson Education	2004
2.	Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins	Digital Image Processing	Pearson Education	2009

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David D. Zhang	Automated Biometrics: Technologies and Systems	Kluwer Academic Publishers	2000
2.	Anil K Jain, Arun A Ross, Karthik Nandakumar	Introduction to Biometrics	Springer	2011
3.	Samir Nanavati, Michael Thieme, Raj Nanavati	Biometrics – Identity Verification in a Networked World	Wiley-dreamtech India Pvt Ltd	2003

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		L	T	P	C
23CYE06	**AWS ACADEMY CLOUD DEVELOPING**	**3**	**0**	**0**	**3**

Course Objectives

- Recall cloud computing services and models.
- Configure AWS Identity and Access Management for programmatic access.
- To Develop containers with AWS Lambda
- Access solutions with Amazon API Gateway.
- Identify best practice for building secure applications and deploying applications.

Course Outcomes

23CYE06.CO1 Create onAWS.

23CYE06.CO2 Develop AWS Identity and Access Management for programmatic access.

23CYE06.CO3 Implement Container with AWS Lambda.

23CYE06.CO4 Organize solutions with Amazon API Gateway.

23CYE06.CO5 Build secure applications and deploying applications.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE06.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE06.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE06.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE06.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE06.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION TO DEVELOPING ON AWS **9**

Course Prerequisites, objectives and overview, AWS Training Portal, Lab Environment, AWS Free Tier, AWS Educate, Systems Development Lifecycle, Steps to Get Started Developing on AWS, Working with AWS SDKs, Errors and Exceptions, Introduction to AWS X-Ray, Introduction to Amazon CloudWatch and AWS CloudTrail, IAM - Shared Responsibility Model, Overview of IAM, Authentication with IAM, Authorization with IAM.

UNIT-II: DEVELOPING STORAGE SOLUTIONS WITH AMAZON S3 **9**

Introduction to Amazon S3, Creating Amazon S3 Buckets, Working with Amazon S3 Objects, Protecting Data and Managing Access to Amazon S3 Resources. Developing NoSQL Solutions with Amazon DynamoDB - Introduction to Amazon DynamoDB, Amazon DynamoDB Key Concepts, Partitions and Data Distribution, Secondary Indexes, Read/Write Throughput, Streams and Global Tables, Backup and Restore, Basic Operations for Amazon DynamoDB Tables. Caching Information for Scalability - Caching Overview, Caching with Amazon CloudFront, Caching with Amazon ElastiCache, Caching Strategies.

UNIT-III: INTRODUCTION TO CONTAINERS WITH AWS LAMBDA **9**

Introduction to Containers, Containers vs. Hardware Virtualization, Microservices – Use Case for Containers, Amazon Container Services. Developing Solutions with Amazon SQS and Amazon SNS - Introduction to Message Queues, Introduction to Amazon SQS, Amazon SQS Developer Concepts, Introduction to Amazon SNS, Amazon SNS Developer Concepts, Introduction to Amazon MQ. Developing Event – Driven solutions with AWS Lambda - Introduction to Serverless Computing with AWS Lambda, Overview of AWS Lambda, Execution Models for Invoking Lambda Functions, AWS Lambda Permissions, Overview of Authoring and Configuring

Lambda Functions, Overview of Deploying Lambda Functions.

UNIT-IV: DEVELOPING SOLUTIONS WITH AMAZON API GATEWAY **9**

Application Programming Interfaces, Amazon API Gateway, Creating a RESTful API, Controlling Access to a RESTful API, Testing a RESTful API, Deploying a RESTful API, Invoking a RESTful API, Monitoring a RESTful API. Developing solutions with AWS step functions - Workflow Coordination in Distributed Applications, Introduction to AWS Step Functions, State Types, AWS Step Functions Use Case, AWS Step Functions API. Developing secure application on AWS - Secure Network Connections, Manage Application Secrets, Authenticate with AWS Security Token Service, Authenticate with Amazon Cognito.

UNIT-V: DEPLOYING APPLICATIONS ON AWS **9**

Introducing DevOps Using AWScodeservicesforCI/CD, Introducing Deployment and Testing Strategies, Developing Applications with AWSElasticBeanstalk, Deploy applications AWSCloudFormation, Deploying Serverless applications AWSSAM.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Maverick Koston	AWS: Amazon Web Services, the Ultimate Guide for Beginners to Advanced	-	2020
2.	Mark Wilkins	Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud	-	2019
3.	Marcus Young	Implementing Cloud Design Patterns for AWS	-	2015

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Nathaniel Felsen	Effective DevOps with AWS	-	2018
2.	A.W.S. Smith	AWS: Amazon Web Services	-	2018
3.	Andreas Wittig and Michael Wittig	Amazon Web Services in Action	-	2015

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23CYE07 **AWS ACADEMY CLOUD DEVELOPING LABORATORY**

L	T	P	C
0	0	2	1

Course Objectives

- To Understand and study AWS Documentation and AWS Cloud9
- To create an IAM User and IAM Group
- To develop Amazon S3 and AWS Lambda and Amazon API Gateway
- To perform an activity RCUs and WCUs
- To demonstrate AWS Lambda with API Gateway.

Course Outcomes

23CYE07.CO1 Generate AWS Cloud9

23CYE07.CO2 Implement IAM user and Group

23CYE07.CO3 Developing Amazon S3 and AWS Lambda and Amazon API Gateway

23CYE07.CO4 Able to implement Docker Container.

23CYE07.CO5 Demonstrate AWS Lambda with API Gateway.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE07.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE07.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE07.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE07.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE07.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. Activity - AWS Documentation Scavenger Hunt
2. Introduction to AWS Cloud9
3. Educator Demo - AWS Cloud9
4. Educator Demo - Create an IAM User and IAM Group
5. Developing with Amazon S3 using the AWS SDK
6. Activity - Calculate Read Capacity Units (RCUs)
7. Activity - Calculate Write Capacity Units (WCUs)
8. Working with Docker Containers
9. Developing with AWS Lambda and Amazon API Gateway using the AWS SDK

Total : 30

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		L	T	P	C
23CYE08	**AWS ACADEMY CLOUD ARCHITECTING**	**3**	**0**	**0**	**3**

Course Objectives

- Illustrate how cloud adoption transforms the way IT systems work.
- Identify the benefits of Infrastructure as Code.
- Summarize database services for storing and deploying web-accessible applications.
- Describe how the AWS Well-Architected Framework improves cloud-based architectures.
- Evaluate the most important performance metrics for applications

Course Outcomes

23CYE08.CO1 Implement IT related work and access Amazon Web Services

23CYE08.CO2 Develop code

23CYE08.CO3 Construct real time database application using current techniques

23CYE08.CO4 Populate Cloud based architectures

23CYE08.CO5 Design real time application with performance metrics.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE08.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE08.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE08.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE08.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE08.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: WELCOME TO AWS ACADEMY CLOUD ARCHITECTING **9**

Course Prerequisites, Objectives, Overview, Creating AWS Training Portal Account, Accessing Course Materials. Designing Environment - Choosing a Region, Selecting Availability Zones, Virtual Private Cloud (VPC), Dividing VPCs and Subnets, Default VPCs and Default Subnets, Controlling VPC Traffic, Connecting Multiple VPCs, Integrating On-premises Components, VPC Best Practices. Designing for High Availabilty I - Load Balancing and Fault Tolerance, High Availability Across Regions, Connections Outside of Amazon VPC.

UNIT-II: DESIGNING FOR HIGH AVAILABILITY II AND INFRASTRUCTURE **9**

Designing for High Availabilty II - Best Practice – Scalability, Determining if Scaling is Needed, Automatic Scaling, Scaling Data Stores, AWS Lambda and Event Driven Scaling. Automating Infrastructure - Manual Environment Configuration, Infrastructure as code on AWS, Grouping resources in a template, Resources not supported by AWS CloudFormation. Decoupling Infrastructure - Loose Coupling, Loose Coupling Strategies, Communicating Easily and Reliably Among Components, Communicating with Loose Coupling and Amazon DynamoDB, Amazon API Gateway, Serverless Architectures, Decoupling Examples

UNIT-III: DESIGNING WEB-SCALE MEDIA AND ARCHITECTED FRAMEWORK **9**

Storing Web-Accessible Content with Amazon S3, Caching with Amazon Cloud Front, Managing NoSQL Databases, Storing Relational Data in Amazon RDS. Architected Framework - Introduction to the Well-Architected Framework, Pillars of the Well-Architected Framework, Well-Architected Design Principles. Operational Excellence - Principles of the Operational Excellence Pillar, Drive Operational Excellence, Operational Excellence Pillar Questions.

UNIT-IV: WELL-ARCHITECTED PILLARS : SECURITY, RELIABILITY, PERFORMANCEEFFICIENCY **9**

Security - Principles of the Security Pillar, Preventing Common Security Exploits, Securing Data in Cloud Front, Encrypting Data, Authentication. Reliability - Principles of the Reliability Pillar, Making Infrastructure More Reliable, Reliability Pillar Questions. Performance Efficiency - Principles of the Performance Efficiency Pillar, Infrastructure Efficiency Improvements, Performance Efficiency Pillar Questions and Best Practice.

UNIT-V: WELL-ARCHITECTED PILLARS : COST OPTIMIZATION, TROUBLESHOOTING, DESIGN PATTERNS AND SAMPLE ARCHITECTURES **9**

Cost Optimization - Principles of the Cost Optimization Pillar, Optimizing the Cost of Infrastructure, Dedicated Instances and Dedicated Hosts, Trusted Advisor, Optimizing Costs with Caching, AWS Cost Calculation Tools, Cost Optimization Questions. Troubleshooting - Troubleshooting Steps, AWS Support Options. Design Patterns - High-Availability Design Patterns, Stream Processing Example, Sensor Network Data Ingestion and Processing Example, Application Backend Example, Transcoding and Serving Video Files Example.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Joe Baron, Biff Gaut, Hisham Baz, Tim Bixler, Sean Senior, Kevin E. Kelly, John Stamper	AWS Certified Solutions Architect Official Study Guide: Associate Exam	-	2016

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ben Piper, David Clinton	AWS Certified Solutions Architect Study Guide: Associate SAA-C01 Exam	-	2019
2.	Julian Gramm	The Complete Guide From Beginners To Advanced For Amazon Web Services	-	2019
3.	Ben Piper, and David Clinton	AWS Certified Solutions Architect Study Guide: Associate SAA-C01 Exam 2nd Edition	-	2018

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23CYE09 AWS ACADEMY CLOUD ARCHITECTING LABORATORY

L	T	P	C
0	0	2	1

Course Objectives

- Formulate Auto scaling with AWS Lambda.
- To Summarize AWS Cloud formation.
- To decouple the infrastructure.
- To implement Serverless Architecture and Amazon CloudFront
- To Develop Amazon Route 53 and sandbox

Course Outcomes

23CYE09.CO1 Develop Auto scaling with AWS Lambda.

23CYE09.CO2 Deploy AWS Cloud formation.

23CYE09.CO3 Decoupling the infrastructure.

23CYE09.CO4 To implement Serverless Architecture and Amazon CloudFront

23CYE09.CO5 Construct Amazon Route 53 and sandbox

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE09.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE09.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE09.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE09.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE09.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No List of Experiments

1. Making Environment Highly Available
2. Using Auto Scaling with AWS Lambda
3. Automating Infrastructure Deployment with AWS Cloud Formation
4. Decoupling Infrastructure
5. Implementing a Serverless Architecture with AWS Managed Services
6. Introduction to Amazon CloudFront
7. Multi-Region Failover With Amazon Route 53
8. Sandbox
9. Making Environment Highly Available

Total : 30

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23CYE10 **AWS ACADEMY CLOUD FOUNDATION**

L	T	P	C
2	0	0	1

Course Objectives

- Describe three cloud deployment models, and Overview of AWS Global infrastructure.
- Understand the different AWS core services.
- Formulate virtual firewalls with security groups.
- Review the availability differences of alternative database solutions.
- Summarize the AWS Shared Responsibility Model, Examine IAM users, groups, and roles.

Course Outcomes

23CYE10.CO1 Construct three cloud deployment models, and Overview of AWS Global infrastructure.

23CYE10.CO2 Implement the different AWS compute services.

23CYE10.CO3 Create virtual firewalls with security groups.

23CYE10.CO4 Construct the availability of different alternative database solutions.

23CYE10.CO5 Implement AWS Shared Responsibility Model, Examine IAM users, groups, and roles.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE10.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE10.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE10.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE10.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE10.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: CLOUD CONCEPTS **9**

Cloud Concepts Overview - Introduction to Cloud Computing, Advantages of Cloud Computing, Introduction to Amazon Web Services (AWS), AWS Cloud Adoption Framework (CAF). Cloud Economics - Fundamentals of Pricing, Total Cost of Ownership, AWS Global Infrastructure Overview - AWS Global Infrastructure, AWS Service and Service Category Overview.

UNIT-II: AWS CORE SERVICES **9**

Compute - Compute Services Overview, Introduction to Amazon Elastic Compute Cloud (EC2), Amazon EC2 Cost Optimization, Introduction to AWS Lambda, Introduction to AWS Elastic Beanstalk. Storage - Amazon Elastic Block Store (EBS), Amazon Simple Storage Service (S3), Amazon Elastic File System (EFS), Amazon Glacier. VPC - Amazon Virtual Private Cloud (VPC), Amazon VPC Security Groups, Amazon CloudFront,. Database - Amazon Relational Database Service (RDS), Amazon DynamoDB, Amazon Redshift, Amazon Aurora. Balancing, Scaling, Monitoring - Elastic Load Balancing (ELB), Amazon CloudWatch, Auto Scaling.

UNIT-III: CLOUD SECURITY **9**

AWS Shared Responsibility Model, AWS Identity and Access Management (IAM), AWS Trusted Advisor, AWS CloudTrail, AWS Config, AWS Day One Best Practice Review, AWS Security and Compliance Programs, AWS Security Resources.

UNIT-IV: CLOUD ARCHITECTING **9**

Introduction to the Well-Architected Framework, Well-Architected Design Principles, Understanding Reliability and High Availability.

UNIT-V: CLOUD SUPPORT **9**

Introduction to AWS Organizations, AWS Cost Explorer, Overview of AWS Technical Support Plans and Costs.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Cloud Experts	The AWS Handbook	-	2018
2.	Dan Sullivan	Official Google Cloud Certified Associate Cloud Engineer Study Guide	-	2019

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ben Piper, David Clinton	AWS Certified Cloud Practitioner Study Guide: CLF-C01 Exam	Addison-Wesley Professional	June 2019
2.	Mark Wilkins	Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud	Addison-Wesley Professional	July 2019
3.	Ben Piper, David Clinton	AWS Certified Cloud Practitioner Study Guide	Sybex	July 2019

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23CYE11 AWS ACADEMY CLOUD FOUNDATION LABORATORY

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Course Objectives

- To understand and study Amazon EC2
- To work with EBS.
- To build VPC, web server and DB server
- To build the DB Server.
- To construct scale and load balance of cloud architecture.

Course Outcomes

23CYE11.CO1 Construct Amazon EC2

23CYE11.CO2 Working with EBS

23CYE11.CO3 Develop VPC, web server and DB server

23CYE11.CO4 Build the DB Server.

23CYE11.CO5 Implement scale and load balance of cloud architecture.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE11.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE11.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE11.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE11.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE11.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No List of Experiments

1. Introduction to Amazon EC2
2. Working with EBS
3. Build VPC and Launch a Web Server
4. Build DB Server and Interact with DB Using an App
5. Scale and Load Balance Architecture
6. Introduction to AWS IAM
7. Sandbox

Total : 30

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		L	T	P	C
23CYE12	**ETHICAL HACKING AND CYBER FORENSICS**	**3**	**0**	**0**	**3**

Course Objectives

- To render all the techniques used for penetration testing for performing security auditing
- To transform the internet security industry by infusing professionalism and efficiency
- To discover Remote Control Insecurities
- To Understand the Digital Investigation and its technology.
- To Learn Methods of storing data and forensic artifacts

Course Outcomes

23CYE12.CO1 Perform system vulnerability exploit attacks

23CYE12.CO2 Learn various hacking methods

23CYE12.CO3 Examine Advanced HijackingTechniques and cryptography method

23CYE12.CO4 Apply the process in taking digital investigation

23CYE12.CO5 Explain different methods of storing data and file formats

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE12.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE12.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE12.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE12.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE12.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: CASING THE ESTABLISHMENT **9**

What is footprinting- Internet Footprinting - Scanning-Enumeration - basic banner grabbing, Enumerating Common Network services. Securing permission - Securing file and folder permission. Using the encrypting file system. Securing registry permissions. Securing service- Managing service permission. Default services in windows 2000 and windows XP. Unix - The Quest for Root. Remote Access vs Local access. Remote access. Local access. After hacking root.

UNIT-II: NETWORK HACKING **9**

Dial-up ,PBX, Voicemail, and VPN hacking - Preparing to dial up. War- Dialing. Brude-Force Scripting PBX hacking. Voice mail hacking, VPN hacking. Network Devices – Discovery, Autonomous System Lookup. Public Newsgroups, Service Detection. Network Vulnerability, Detecting Layer 2 Media.

UNIT-III: REMOTE CONTROL INSECURITIES **9**

Connection. Weakness. VNC . Microsoft Terminal Server and Citrix ICA . Advanced Techniques Session Hijacking. Back Doors. Trojans. Cryptography . Subverting the systems Environment. Social Engineering. Web Hacking. Web server hacking web application hacking. Hacking the internet User - Malicious Mobile code, SSL fraud, E-mail Hacking, IRC

hacking, Global Counter measures to Internet User Hacking.

UNIT-IV: DIGITAL INVESTIGATION **9**

Digital Investigation - Digital Evidence and Computer Crime - History and Terminology of Computer Crime Investigation - Technology and Law - The Investigative Process -Investigative Reconstruction - Modus Operandi, Motive and Technology -Digital Evidence in the Courtroom.

UNIT-V: UNDERSTANDING INFORMATION **9**

Methods of storing data: number systems, character codes, record structures, file formats and file signatures - Word processing and graphic file formats - Structure and Analysis of Optical Media Disk Formats - Recognition of file formats and internal buffers - Extraction of forensic artifacts– understanding the dimensions of other latest storage devices – SSD Devices.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Stuart McClure, Joel Scambray and Goerge Kurtz,	"Hacking Exposed Network Security Secrets & Solutions"	Tata Mcgrawhill Publishers	2010
2.	Bensmith, and Brian Komer	"Microsoft Windows Security Resource Kit"	Prentice Hall of India	2010

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hein, Hilary Morrison	Ethical Hacking	Create Space Independent Publishing Platform	2018
2.	Patrick Engebretson ·	The Basics of Hacking and Penetration Testing	Elsevier Science	2013
3.	Rafay Baloch	Ethical Hacking and Penetration Testing Guide	CRC Press	2017

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23CYE13 **ETHICAL HACKING LABORATORY**

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Course Objectives

- Install, configure, use and manage hacking software on a closed network environment
- Evaluate best practices in security concepts to maintain confidentiality, integrity and availability of computer systems
- Execute a penetration test using standard hacking tools in an ethical manner.
- Plan a vulnerability assessment and penetration test for a network.
- Determine the type of attack used and pinpoint exploit code in network traffic

Course Outcomes

23CYE13.CO1 Analyze and resolve Cyber security through the application of systematic approaches

23CYE13.CO2 Explore wireless network hacking

23CYE13.CO3 Demonstrate the ability to attack and defend a network.

23CYE13.CO4 Investigate trojans and other attacks

23CYE13.CO5 Explore hacking through the network: Sniffers and evasion

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE13.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE13.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE13.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE13.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE13.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. Scanning Options
2. Analyze Browser-Based Heap Spray Attack
3. Analyze SQL Injection Attack
4. Analyze Various Data Sources to Confirm Suspected Infection
5. Automated Vulnerability Assessments
6. Core Impact Vulnerability Scan
7. Core Impact Web Application Penetration Testing

Total : 30

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23CYE14 **COMPUTER FORENSICS ANALYSIS & INVESTIGATION**

L	T	P	C
3	0	0	3

Course Objectives

- To correctly define and cite appropriate instances for the application of computer forensics Correctly collect and analyze computer forensic evidence
- Identify the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Computer Forensics
- Explain how to conduct a digital forensics investigation, including the concept of the chain of evidence.
- Report findings from digital forensic investigations.
- Perform recovery of digital evidence from various digital devices using a variety of software utilities.

Course Outcomes

23CYE14.CO1	Students discuss the use of different computer forensic tools.
23CYE14.CO2	Identify the process in taking digital evidence.
23CYE14.CO3	Describe how to conduct an investigation using methods of memory, operating system, network and email forensics.
23CYE14.CO4	Assess the different forensics tools.
23CYE14.CO5	Differentiate among different types of security attacks.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE14.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE14.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE14.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE14.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE14.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: COMPUTER FORENSICS ANALYSIS **9**

Determining what data to collect and analyze. Addressing data hiding techniques, Hiding partitions, Marking bad cluster, Bit –shifting, using steganography to hide data, Examining encrypted files, Recovering Passwords, Performing Remote Acquisitions, Remote Acquisitions with Runtime Software.

UNIT-II: RECOVERING GRAPHICS FILES **9**

Understanding vector Graphics, Understanding graphics file formats .Lossless and lossy compression. Identifying graphics file fragments, Repairing Damaged Headers, Searching for and carving data from unallocated space. Understanding steganography in graphics files. Using steganalusis tools. Understanding copyright issues with graphics.

UNIT-III: VIRTUAL MACHINES, NETWORK FORENSICS, AND LIVE ACQUIT IONS **9**

Performing live acquit ions, Performing a live acquit ion in windows, Developing standard procedures for network forensics, Reviewing network logs. Using network tools, using Unix/Linux tools. Using packet sniffers, examining the honey net projects.

UNIT-IV: E-MAIL INVESTIGATION **9**

Exploring the role of email investigation, Exploring the role of client and server in email, Investigating E-mail crimes and violations, Examining E-mail Messages, Viewing E-mail headers, Examing E-mail headers, Examining additional E-mail files. Tracing an e-mail message, Using network E-mail logs, Understanding E-mail servers, Examining Unix e-mail server logs, Examining Microsoft email server logs.

UNIT-V: CELL PHONE AND MOBILE DEVICE FORENSICS **9**

Understanding mobile device forensics, Mobile phone basics, inside mobile devices, inside PDAs, Understanding acquisition procedures for cell phones and mobile devices, Mobile forensics equipment.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Bill Nelson,Amelia Phillips,Christopher Steuart	Guide to Computer Forensics and Investigations	Fourth Edition,Course Technology	
2.	Angus M.Marshall	Digital forensics: Digital evidence in criminal investigation	John – Wiley and Sons	2008

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Eoghan Casey	Handbook of Digital Forensics and Investigation	Elsevier	2009
2.	John Sammons	The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics	Elsevier	2011
3.	Amelia Phillips, Bill Nelson, and Christopher Steuart	Guide to Computer Forensics and Investigations	Booktopia	2003

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23CYE15 **COMPUTER FORENSICS LABORATORY**

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0	0	2	1

Course Objectives

- Conduct digital investigations that conform to accepted professional standards
- Identify and document potential security breaches of computer data
- Apply a solid foundational grounding in computer networks, operating systems, file systems
- Explain and perform forensic analysis in various operating system environments.
- Select and apply current computer forensics tools.

Course Outcomes

23CYE15.CO1 Demonstrate the recovery of image files.

23CYE15.CO2 Perform e-mail investigations.

23CYE15.CO3 Act as expert witness and report results of investigations.

23CYE15.CO4 Identify and apply current practices for data discovery recovery and acquisition.

23CYE15.CO5 Conduct basic network forensic analysis.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE15.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE15.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE15.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE15.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE15.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

S.No **List of Experiments**

1. Recovering Graphics Files
2. Digital Forensics Analysis and Validation
3. Virtual Machine Forensics
4. Live Acquisitions, and Network Forensics
5. Email/Social Media Investigations
6. Mobile Device Forensics
7. Disk Forensics and Data Recovery
8. Steganography
9. Key loggers
10. Network monitors

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Total : 30

		L	T	P	C
23CYE16	**SEMANTIC WEB**	**3**	**0**	**0**	**3**

Course Objectives

- To learn Web Intelligence
- To learn Knowledge Representation for the Semantic Web
- To learn Ontology Engineering
- To learn Semantic Web Applications, Services and Technology
- To learn Social Network Analysis and semantic web

Course Outcomes

23CYE16.CO1	Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web.
23CYE16.CO2	Understand the concepts of Web Science, semantics of knowledge and resource, ontology.
23CYE16.CO3	Describe logic semantics and inference with OWL.
23CYE16.CO4	Use ontology engineering approaches in semantic applications
23CYE16.CO5	To perform social network k analysis for different applications

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE16.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE16.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE16.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE16.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE16.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: WEB INTELLIGENCE **9**

Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

UNIT-II: KNOWLEDGE REPRESENTATION FOR THE SEMANTIC WEB **9**

Ontologies and their role in the semantic web,Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

UNIT-III: ONTOLOGY ENGINEERING **9**

Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

UNIT-IV: SEMANTIC WEB APPLICATIONS, SERVICES AND TECHNOLOGY **9**

Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods.

UNIT-V: SEMANTIC PATTERNS AND TOOLS, CHALLENGES AND OPPORTUNITIES **9**

Patterns in Software Design, Pattern Frame, Semantic Patterns, Semantic Tools, Semantic Web Services Tools, Semantic Doubts, Semantic Opportunities and Challenges.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Berners Lee, Godel and Turing	Thinking on the Web	Wiley inter science	2008

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	J. Davies, R. Studer, P. Warren, John Wiley & Sons	Semantic Web Technologies, Trends and Research in Ontology Based Systems	Wiley inter science	2006
2	Liyang Lu Chapman	Information sharing on the semantic Web	CRC Publishers, (Taylor & Francis Group)	2006

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23CYE17 **NETWORK PROGRAMMING AND MANAGEMENT**

L	T	P	C
3	0	0	3

Course Objectives

- To Explain socket programming to design client server environment
- To understand the basics of socket programming using TCP and UDP Sockets
- To analyze the socket options and Internet protocol interoperability
- To develop macros for including objects in MIB structure.
- T o Understand SNMP v1, v2 and v3 protocols & practical issues

Course Outcomes

23CYE17.CO1 Apply socket structure and functions to client serverapplications

23CYE17.CO2 Design applications using TCP and UDP sockets

23CYE17.CO3 Implement socket options and advanced sockets to applications

23CYE17.CO4 Compare number of variations of the net work management architecture

23CYE17.CO5 Configure and manage network services and network architecture

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE17.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE17.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE17.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE17.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE17.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: SOCKET STRUCTURE AND FUNCTIONS **9**

Introduction to Socket Programming - OSI Layer and Services - Overview of TCP/IP Protocols - Socket Introduction - Socket address Structures - Value - Result Arguments - Byte Ordering Functions Byte Manipulation Functions - Elementary TCP sockets - Socket, connect, bind, listen, accept, fork and exec functions, concurrent servers - Close function

UNIT-II: TCP AND UDP SOCKETS **9**

TCP Echo Server - TCP Echo Client - Posix Signal handling - TCP Echo server functions Normal startup-terminate and signal handling server process termination - Crashing and Rebooting of server host - shutdown of server host - I/O multiplexing - I/O Models - select function - shutdown function - pselect function - poll function- Multiplexing TCP Sockets - TCP socket options - Elementary UDP sockets - UDP echo Server - UDP echo Client - Multiplexing UDP sockets

UNIT-III: SOCKET OPTIONS AND ADVANCED SOCKETS **9**

Socket options - getsocket and setsocket functions - generic socket options - IP socket options - ICMP socket options - Domain name system - gethostbyname function - gethostbyadr function -getservbyname and getservbyport functions Ipv4 and Ipv6 interoperability - threaded servers - thread creation and termination- Mutex - condition variables - raw sockets - raw socket creation - raw socket output - raw socket input - ping program - trace route program

UNIT-IV: SIMPLE NETWORK MANAGEMENT **9**

SNMP network management concepts - SNMPv1 - Management information - MIB Structure - Object syntax - Standard MIBs - MIB-II Groups - SNMPv1 protocol and Practical issues

UNIT-V: SNMP ENHANCED FEATURES AND RMON **9**

Introduction to SNMPv2 - SMI for SNMPV2 - Protocol - SNMPv3 - Architecture and Applications - Security and access control model - Overview of RMON

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	W. Richard Stevens, Bill Fenner Andrew M. Rudoff	Unix Network Programming Vol-I	Pearson Education	2015
2.	Mani Subramaniam	Network Management: Principles and Practice	PHI	2012

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Iresh A. Dhotre, V.S.Bagad	Network Programming & Management	Technical Publications	2009
2.	William Stallings	SNMP, SNMPV2, SNMPV3 and RMON 1 and 2	Addison Wesley	1999
3.	D. E. Comer	Internetworking with TCP/IP Vol - III‖, (BSD Sockets Version), 2nd Edition	Prentice Hall of India	2003

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		L	T	P	C
23CYE18	**BUSINESS INTELLIGENCE**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the business intelligence architectures.
- To develop a foundation in Business Intelligence (BI) for Business Analysis through knowledge delivery.
- To understand the different aspects of the BI environment, and data envelopment analysis.
- To implementation methodology and project life cycle business intelligence
- To understand the management and future of business intelligence

Course Outcomes

23CYE18.CO1 Explain about business intelligence architectures.

23CYE18.CO2 Summarize various knowledge delivery methods

23CYE18.CO3 Summarize data envelopment analysis

23CYE18.CO4 Implement the business intelligent system for realtime application.

23CYE18.CO5 Explain the management and future of business intelligent system.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE18.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE18.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE18.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE18.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE18.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: BUSINESS INTELLIGENCE **9**

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

UNIT-II: KNOWLEDGE DELIVERY **9**

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

UNIT-III: DATA ENVELOPMENT ANALYSIS **9**

Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficien cy analysis – virtual inputs and outputs – Other models.

UNIT-IV: BUSINESS INTELLIGENCE IMPLEMENTATION: INTEGRATION AND EMERGING TRENDS **9**

Implementing BI – Overview – BI and Integration Implementation – Connecting BI System to Database and other Enterprise Systems – On-Demand BI – Issues of Legality, Privacy, and Ethics –Emerging Topics in BI – The Rise of Collaborative Decision Making

UNIT-V: MANAGEMENT AND FUTURE OF BUSINESS INTELLIGENCE **9**

Development of BI - Business Intelligence System - Reporting system - Data Warehouse - Data Mart- Knowledge Management Systems - Discussion and Case Study – The Future of Business Intelligence.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David Loshin Morgan, Kaufman	Business Intelligence: TheSavy Managers Guide	Wiley Publications	2012
2.	Efraim Turban, Ramesh Sharda, Jay E.Aronson, David King	Business Intelligence: A Managerial Approach	Pearson Education	2011

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Efraim Turban, Ramesh Sharda, Dursun Delen,	Decision Support and Business Intelligence Systems	Pearson	2013
2.	Rajiv Sabherwal, Irma Becerra-Fernandez	Business Intelligence Practices, Technologies, and Management	Wiley	2011
3.	Carlo Vercellis	Business Intelligence: Data Mining and Optimization for Decision Making	Wiley Publications	2009

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		L	T	P	C
23CYE19	**WIRELESS SENSOR NETWORKS**	**3**	**0**	**0**	**3**

Course Objectives

- To understand basic sensor network concepts
- To know physical layer issues, medium Access control Protocols
- To comprehend network layer characteristics and protocols and transport layer issues and protocols
- To understand the network management in Wireless sensor network.
- To understand the Middleware services

Course Outcomes

23CYE19.CO1	To understand basic sensornetwork concepts
23CYE19.CO2	To know physical layer issues, medium Access control Protocols
23CYE19.CO3	To comprehend network layer characteristics and protocols and transport layer issues and protocols
23CYE19.CO4	To understand the network management in Wireless sensor network.
23CYE19.CO5	To understand the Middleware services

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE19.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE19.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE19.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE19.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE19.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Introduction to wireless sensor networks - Challenges and Constraints - Application of sensor networks ode architecture - Operating System - Fundamental aspects.

UNIT-II: PHYSICAL LAYER ANDMEDIUM ACCESS LAYER **9**

Basic architectural framework – Physical layer – source encoding –channel encoding – modulation – medium access control- Wireless MAC protocols – Characteristics of MAC protocols in sensor networks – Contention free MAC protocols - traffic adaptive medium access - Low-Energy Adaptive Clustering Hierarchy –Contention based protocols - Power Aware Multi-Access with Signaling - Data-Gathering MAC - Receiver-Initiated MAC.

UNIT-III: NETWORK LAYER AND TRANSPORT LAYER **9**

Routing metrics – Data centric Routing - Proactive routing – OLSR – Reactive Routing – AODV – Location Based Routing - Traditional Transport Control Protocols - TCP (RFC 793) - UDP (RFC 768) - Mobile IP - Feasibility of Using TCP or UDP for WSNs - Transport Protocol Design Issues – Examples of Existing Transport Control Protocols- CODA (Congestion Detection and Avoidance).

UNIT-IV: NETWORK MANAGEMENT **9**

Power Management **-** Local Power Management Aspects - Processor Subsystem - Communication Subsystem - Active Memory - Power Subsystem- Dynamic Power Management - Dynamic Operation Modes - Time Synchronization – Clocks and the Synchronization Problem - Time Synchronization in Wireless Sensor Networks - Reasons for Time

Synchronization - Challenges for Time Synchronization - Basics of Time Synchronization - Synchronization Messages Non determinism of Communication Latency -Time Synchronization Protocols Lightweight Tree-Based Synchronization - Timing-sync Protocol for Sensor Networks Localization -Ranging Techniques -Time of Arrival - Time Difference of Arrival - Angle of Arrival - Received Signal Strength - Range- Based Localization - Triangulation - Range-Free Localization - Ad Hoc Positioning System (APS) .

UNIT-V: MIDDLEWARE FOR WIRELESS SENSOR NETWORKS **9**

Introduction -WSN Middleware Principles - Middleware Architecture – Data Related Functions, Architectures – Case study - MiLAN (Middleware Linking Applications and Networks) - IrisNet (Internet-Scale Resource- Intensive Sensor Networks Services).

Total : 45

TEXT BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.Xerenium, Shen, Dr. Yi Pan	Fundamentals of Wireless Sensor Networks, Theory and Practice	Wiley Series	2010
2.	H. Karl and A. Willig	Protocols and Architectures for Wireless Sensor Networks	John Wiley & Sons	2005

REFERENCE BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Kazem Sohraby, Daniel Manoli	Wireless Sensor networks- Technology, Protocols and Applications	Wiley Inter Science Publications	2007
2	Bhaskar Krishnamachari	Networking Wireless Sensors	Cambridge university press	2005.
3	C. S. Raghavendra,K. M. Sivalingam, andT.	Wireless Sensor Networks	John Wiley & Sons	2007
4	N.P. Mahalik	Sensor Networks and Configuration: Fundamentals, Standards, Platforms	Springer	2006

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23CYE20 **INFORMATION RETRIEVAL TECHNIQUES**

L	T	P	C
3	0	0	3

Course Objectives

- To know about Information retrieval system strategies.
- To learn Web Search Engine and Compare various types of retrieval utilities.
- To know about Information Retrieval modeling techniques
- To Identify various web based information retrieval techniques using modern tools.
- To understand information retrieval techniques in XML retrieval and multimedia

Course Outcomes

23CYE20.CO1	Explain the factors which optimize the information retrieval process
23CYE20.CO2	Understand web based information retrieval techniques
23CYE20.CO3	Identify the techniques of Information Retrieval modeling
23CYE20.CO4	Apply parallel information retrieval models and distributed information retrieval models in realtime problem.
23CYE20.CO5	Summarize various steps involved in XML and multimedia information retrieval techniques

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE20.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE20.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE20.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE20.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE20.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Introduction - History of IR- The IR problem – Software Architectures of the IR system – The retrieval and ranking processes – Open source Search engine Frameworks - The impact of the web on IR - The role of artificial intelligence (AI) in IR – IR Versus Web Search - Components of a Search engine- Characterizing the web.

UNIT-II: WEB RETRIEVAL AND WEB CRAWLING **9**

Web retrieval – Introduction – The web – search engine architectures – search engine ranking – managing web data – search engine user interaction – browsing – Web crawling – Introduction – Applications of web crawler – Architecture and implementation

UNIT-III: INFORMATION RETRIEVAL MODELING **9**

IR Models-Modeling and Ranking - A Taxonomy of IR Models - Classic Information Retrieval -The Boolean Model – TF - IDF Weights - Document Length Normalization - The Vector Model- The Probabilistic Model - Alternative Set Theoretic Models - Set-Based Model - Extended Boolean Model-Fuzzy Set Model - Alternative Algebraic Models - Generalized Vector Space Model - Latent Semantic Indexing Model - Neural Network Model - Alternative

Probabilistic Models - BM25 - Language Models - Divergence from Randomness – Bayesian NetworkModels

UNIT-IV: PARALLEL AND DISTRIBUTED INFORMATION RETRIEVAL **9**

Distributed Information Retrieval – Introduction – A taxonomy of Distributed IR systems – Theoretical Model – Data partitioning – Parallel IR – Introduction – Parallel Indexing – Clustering and Classification – Parallel Systems – Parallel IR on MIMD architectures – parallel IR on SIMD architectures – Cluster based IR – Retrieval in peer to peernetworks.

UNIT-V: XML RETRIEVAL AND MULTIMEDIA INFORMATION RETRIEVAL **9**

XML Retrieval – Introduction – XML retrieval evaluation – Query Languages – Multimedia Information Retrieval –The challenges – Content based image retrieval – Audio and Music retrieval – Retrieving and browsingvideo.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ricardo Baeza - Yates and Berthier Ribeiro - Neto	Modern Information Retrieval: The Concepts and Technology behind search	2nd Edition, ACM Press Books	2011
2.	Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack	Information Retrieval: Implementing and Evaluating Search Engines	The MIT Press	2010
3.	Ricardo Baeza - Yates and Berthier Ribeiro - Neto	Modern Information Retrieval: The Concepts and Technology behind search	2nd Edition, ACM Press Books	2011

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	G.G. Chowdhury	Introduction to Modern Information Retrieval	Neal- Schuman Publishers, Third Edition	2010
2.	Mark Levene	An Introduction to Search Engines and Web Navigation	2nd Edition Wiley	2010
3.	Bruce Croft, Donald Metzler and Trevor Strohman	Search Engines: Information Retrieval in Practice	1st Edition Addison Wesley	2009

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		L	T	P	C
23CYE21	**SERVICE ORIENTED ARCHITECTURE**	**3**	**0**	**0**	**3**

Course Objectives

- To study the importance of Service Oriented Architecture.
- To provide an overview of XML Technology and modeling databases in XML
- To introduce Security solutions in XML and WebServices and to introduce Security standards for Web Services
- To learn to implement SOA in the J2EE and .Net environment
- To Implement the various advanced web services using J2EE

Course Outcomes

23CYE21.CO1 Explain the fundamental principles of SOA

23CYE21.CO2 Develop a simple XML services using SOA principles

23CYE21.CO3 Develop a simple web services using SOA principles

23CYE21.CO4 Model and analyze the JAVA web services and architecture.

23CYE21.CO5 Implement the various advanced web services using J2EE

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE21.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE21.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE21.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE21.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE21.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

The Evolution of SOA –Characteristics of SOA – Introducing SOA- Service oriented analysis – Business- centric SOA – Deriving business services- service modeling - Service Oriented Design- SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design– Task centric business service design

UNIT-II: XML SERVICES **9**

XML document structure – Well formed and valid documents – Namespaces – DTD – XML Schema – X- Files- Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML

UNIT-III: WEB SERVICES AND SOA **9**

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination-Atomic Transactions – Business activities – Orchestration – Choreography- Service layer abstraction –Application Service Layer – Business Service Layer – Orchestration Service Layer.

UNIT-IV: JAVA WEB SERVICES ARCHITECTURE **9**

Java Web Service Developer pack– JAXP- Architecture-SAX-DOM-XSLT-JDOM-JAX RI – JAX- RPC- Service Model - JAX RPC and J2EE - JAXM – JAXM Architecture –JAXR - Registries and Repositories – JAXR Architecture – JAXR Information Model - JAXB – Architecture – Developing with JAXB - XML to Java mapping – JAXB API - Validation with JAXB – Customizing JAXB.

UNIT-V: EXTENDED WEB SERVICES SPECIFICATION **9**

Metadata Management - Metadata Specification - Policy – Metadata exchange – Web Services Security–Core concepts – Challenges - Threads and Remedies – Message Level Security – Data Level Security – Advanced Messaging –

Reliable Messaging - Notification – Transaction Management - Protocols and Specification – TransactionSpecification

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Eric Newcomer, Greg Lomow	Understanding SOA with Web Services	Pearson Education	2005
2.	James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew	Java Web Services Architecture	Elsevier	2003
3.	Eric Newcomer, Greg Lomow	Understanding SOA with Web Services	Pearson Education	2005

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Thomas Erl	Service Oriented Architecture	Pearson Education	2005.
2.	Frank Cohen	Fast SOA	Elsevier	2007
3.	Scott Campbell, Vamsi Mohun,	Mastering Enterprise SOA	Wiley	2007

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23CYE22 **AGILE TECHNOLOGY**

L	T	P	C
3	0	0	3

Course Objectives

- To Identify core agile principles
- To Describe agile requirement over traditional methods of software development
- To Understand Extreme Programming Concepts.
- To develop theagile products.
- To Demonstrate the advanced techniques of Agile Methods

Course Outcomes

23CYE22.CO1 Apply agile principles and practices in an actual project.

23CYE22.CO2 Prepare the Document and assess an agile project.

23CYE22.CO3 Apply Extreme Programming in agile technology.

23CYE22.CO4 Explain the steps of releasing agile product.

23CYE22.CO5 Demonstrate the advanced techniques of Agile Methods

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE22.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE22.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE22.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE22.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE22.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION TO AGILE SOFTWARE DEVELOPMENT **9**

Agile Software Development-Cayman design- Organizational Culture Considerations with Agile - eam Members'Viewpoint- Manager's Viewpoint- Executive's Viewpoint- Different Types of Agile- Extreme Programming (XP)- Scrum- Feature-Driven Development- Dynamic Systems Development Method- Kanban Method- Crystal Family- Certification - Different Roles- Deep Dive into Scrum Roles- Roles in Other Methodologies

UNIT-II: AGILE REQUIREMENTS **9**

Agile Software Development-Cayman design- Organizational Culture Considerations with Agile - eam Members'Viewpoint- Manager's Viewpoint- Executive's Viewpoint- Different Types of Agile- Extreme Programming (XP)- Scrum- Feature-Driven Development- Dynamic Systems Development Method- Kanban Method- Crystal Family- Certification - Different Roles- Deep Dive into Scrum Roles- Roles in Other Methodologies

UNIT-III: EXTREME PROGRAMMING **9**

XP Life Cycle-XP Team-XP Concepts-Prerequisite of XP-Recommendation of XP-Pair Programming- Energized Work-Informative Workspace-Root-Cause Analysis-Retrospectives-Collaborating-Team Strategy- Organizational Strategy-Sit Together-Real Customer Involvement-Ubiquitous Language-Coding Standards- Iteration Demo-Reporting

UNIT-IV: RELEASING AGILE PRODUCTS **9**

Done Done-No Bugs-Version Control-Continuous Integration-Collective Code Ownership-documentation- Planning-Vision-Release Planning-Planning Game-Risk Management-Iteration Planning-Slack- Stories- Estimating-

UNIT-V: MASTERING AGILITY **9**

Developing-Incremental Requirements-Customer Tests-Test Driven Development-Refactoring-Simple Design-Incremental Design and Architecture-Spike Solutions-Performance Optimization-Exploratory Testing Values and Principles-Improve the Process-Rely on People-Eliminate Waste-Deliver Value-Seek Technical Excellence-CaseStudy

Total : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Sondra Ashmore, Kristin Runyan	Introduction to Agile Methods	Addison-Wesley Professional	2014
2.	James Shore, Shane Warden	The Art of Agile Development	O'REILLY	2008

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Woodward,E.Surdeck	A Practical guide to Distributed Scrum	Addison-wesley	2010
2.	Dean Leffingwell	Agile Software Requirements	Agile software Development Series	2010
3.	Kent ,Beck	Extreme Programming Explained	Pearson Education	2008
4.	Larman	Agile and iterative development: A Managers Guide	Addison-wesley	2004
5.	Anderson, David	Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results	Prentice Hall	2003

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23CYE23	**SOCIAL NETWORK ANALYSIS**	**3**	**0**	**0**	**3**

Course Objectives

- Understand the concept of semantic web and related applications.
- Learn knowledge representation using ontology.
- Understand human behaviour in social web and related communities
- Learn to handle privacy related issues
- Learn visualization of social networks

Course Outcomes

23CYE23.CO1 Develop semantic web related applications.

23CYE23.CO2 Represent knowledge using ontology.

23CYE23.CO3 Predict human behaviour in social web and related communities.

23CYE23.CO4 Handle privacy related issues

23CYE23.CO5 Visualize social networks.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE23.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE23.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE23.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE23.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE23.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: SOCIAL NETWORK ANALYSIS **9**

Social Network Analysis: History, Concepts and Research - Structure and Dynamics of Social Networks - Analysis of Social Networks - Analyzing the Dynamics of Communication in Online Social Networks - Qualitative Analysis of Commercial Social Network Profiles - Analysis of Social Networks Extracted from Log Files - Perspectives on Social Network Analysis for Observational Scientific Data - Modeling Temporal Variation in Social Network: An Evolutionary web graph approach - Churn in Social Networks.

UNIT-II: SOCIAL MEDIA MINING AND SEARCH **9**

Discovering Mobile Social Networks - Online Identities and Social Networking - Detecting Communities - Concept Discovery in Youtube.com - Mining Regional Representative Photos from Consumer- Generated Geo tagged Photos - Collaborative Filtering Based on Choosing a Different Number of Neighbors - Discovering Communities from Social Networks

UNIT-III: SOCIAL NETWORK INFRASTRUCTURES AND COMMUNITIES **9**

Decentralized Online Social Networks - Multi-Relational Characterization of Dynamic Social Network Communities- Accessibility Testing of Social Websites - Understanding and Predicting Human Behavior for Social Communities- Associating Human-Centered Concepts with Social Networks Using Fuzzy Sets

UNIT-IV: PRIVACY IN ONLINE SOCIAL NETWORKS **9**

Managing Trust in Online Social Networks - Security and Privacy in Online Social Networks - Investigation of Key-Player Problem in Terrorist Networks Using Bayes Conditional Probability - Optimizing Targeting of Intrusion Detection Systems in Social Networks - Security Requirements for Social Networks in Web 2.0

UNIT-V: VISUALISATION AND APPLICATIONS OF SOCIAL NETWORKS **9**

Visualization of Social Networks - Novel Visualizations and Interactions for Social Networks Exploration-Applications of Social Network Analysis - Online Advertising in Social Networks - Social Bookmarking on a Company's Intranet: A Study of Technology Adoption and Diffusion.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Furht, Borko	Handbook of Social NetworkTechnologies and Applications	Springer	2010
2.	Giles, Mark Smith, John Yen	Advances in Social Network Mining and Analysis	Springer	2010
3.	Furht, Borko	Handbook of Social NetworkTechnologies and Applications	Springer	2010

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Max Chevalier, Christine Julien and Chantal Soul- Dupuy	Collaborative and Social Information Retrieval and Access: Techniques for Improved User Modelling	IGI Global snippet	2010
2.	Charu C. Aggarwal	Social Network Data Analytics	Springer	2011
3.	Guandong Xu, Yanchun Zhang and Lin Li	Web Mining and SocialNetworking Techniques and applications	Springer	2011
4.	John Scott	Social Network Analysis	SAGE Publications Ltd	2013
5.	Toby Segaran	Programming Collective Intelligence	O□Reilly	2012

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23CYE24	**GAME PROGRAMMING**	**3**	**0**	**0**	**3**

Course Objectives

- Understand the concepts of Game design and development.
- Learn the processes, mechanics and issues in Game Design.
- Be exposed to the Core architectures of Game Programming.
- Know about Game programming platforms, frame works and engines.
- Learn to develop games

Course Outcomes

23CYE24.CO1 Understand the concepts of Game design and development.

23CYE24.CO2 Learn the processes, mechanics and issues in Game Design.

23CYE24.CO3 Be exposed to the Core architectures of Game Programming.

23CYE24.CO4 Know about Game programming platforms, frame works and engines.

23CYE24.CO5 Learn to develop games.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE24.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE24.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE24.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE24.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE24.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: 3D GRAPHICS FOR GAME PROGRAMMING **9**

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation

UNIT-II: GAME DESIGN PRINCIPLES **9**

Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding

UNIT-III: GAMING ENGINE DESIGN **9**

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics

UNIT-IV: GAMING PLATFORMS AND FRAMEWORKS **9**

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DXStudio, Unity

UNIT-V: GAME DEVELOPMENT **9**

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	David H. Eberly	Game Engine Design, Second Edition: A Practical Approach to Real Time Computer Graphics	"3D" Morgan Kaufmann, 2 Edition	2006

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ernest Adams and Andrew Rollings	Fundamentals of Game Design	Prentice Hall 1st edition	2006
2.	Roger E. Pedersen	Game Design Foundations	Edition 2, Jones & Bartlett Learning	2006

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23CYE25	**NATURAL LANGUAGE PROCESSING**	**3**	**0**	**0**	**3**

Course Objectives

- To tag a given text with basic language processing features,
- To Design An innovative application using NLP components,
- To implement a rule based system to tackle morphology/syntax of a language,
- To Design a tag set to be used for statistical processing keeping an application in mind,
- To Compare and contrast use of different statistical approaches for different types of applications.

Course Outcomes

23CYE25.CO1 Understand the basic concepts of Natural Language Processing.

23CYE25.CO2 Describe the tag a given text with basic language processing eatures,

23CYE25.CO3 Implement a rule based system to tackle morphology/syntax of a language

23CYE25.CO4 Design a tag set to be used for statistical processing keeping an application in mind

23CYE25.CO5 To Compare and contrast use of different statistical approaches for different types of applications.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE25.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE25.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE25.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE25.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE25.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Natural Language Processing tasks in syntax, semantics, and pragmatics – Issues - Applications - The role of machine learning - Probability Basics –Information theory – Collocations -N-gram Language Models - Estimating parameters and smoothing - Evaluating language models.

UNIT-II: MORPHOLOGY AND PART OFSPEECH TAGGING **9**

Linguistic essentials - Lexical syntax- Morphology and Finite State Transducers - Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models – Transformation based Models - Maximum Entropy Models. Conditional Random Fields.

UNIT-III: SYNTAX PARSING **9**

Syntax Parsing - Grammar formalisms and treebanks - Parsing with Context Free Grammars - Features and Unification -Statistical parsing and probabilistic CFGs (PCFGs)-Lexicalized PCFGs

UNIT-IV: SEMANTIC ANALYSIS **9**

Representing Meaning – Semantic Analysis - Lexical semantics –Word-sense disambiguation - Supervised – Dictionary based and Unsupervised Approaches - Compositional semantics Semantic Role Labeling and Semantic

Parsing – Discourse Analysis.

UNIT-V: APPLICATIONS **9**

Named entity recognition and relation extraction- IE using sequence labeling-Machine Translation (MT) – Basic issues in MT-Statistical translation-word alignment- phrase-based translation –Question AnsweringG.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Roland R. Hausser	Foundations of Computational Linguistics:	MIT Press	2011
2.	Daniel Jurafsky and James H. Martin	Martin Speech and Language Processing	McGraw Hill	2008

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Christopher D. Manning and Hinrich Schuetze	Foundations of Statistical Natural Language Processing	MIT Press	1999
2.	Steven Bird, Ewan Klein and Edward Loper	Natural Language Processing with Python	O'Reilly Media	2009
3.	Pierre M. Nugues	An Introduction to Language Processing with Perl and Prolog: An Outline of Theories, Implementation, and Application with Special	Soft cover reprint	2010
4.	James Allen,	Natural Language Understanding	Addison Wesley	1994
5.	Nitin Indurkhya, Fred J. Damerau	Handbook of Natural Language Processing	CRC Press	2010

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23CYE26	**BIG DATA ANALYTICS**	**3**	**0**	**0**	**3**

Course Objectives

- To Learn tips and tricks for BigData.
- To Learn to build and maintain reliable, scalable, distributed systems with Apache Hadoop
- To Learn the HadoopArchitecture
- To apply Hadoop ecosystemcomponents
- To Learn to build Hadoop Advanced Data baseSystems

Course Outcomes

23CYE26.CO1 Understand the basic concepts of BigData.

23CYE26.CO2 Explain the basics ofHadoop.

23CYE26.CO3 Describe the architecture ofHadoop.

23CYE26.CO4 Design Hadoop Ecosystem andyarn.

23CYE26.CO5 Explain the techniques of HIVE AND HIVEQL, HBASE

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE26.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE26.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE26.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE26.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE26.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION TO BIG DATA **9**

Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.

UNIT-II: INTRODUCTION HADOOP **9**

Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - DataSerialization.

UNIT-III: HADOOP ARCHITECTURE **9**

Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

UNIT-IV: HADOOP ECOSYSTEM AND YARN **9**

Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features- NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

UNIT-V: HIVE AND HIVEQL, HBASE **9**

Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase concepts- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications withZookeeper

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Boris lublinsky, Kevin t. Smith, Alexey Yakubovich	Professional Hadoop Solutions	Wiley	2015
2.	Chris Eaton, Dirk deroos	Understanding Big data	McGraw Hill	2012

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Tom White	HADOOP: The definitive Guide Everything	O Reilly	2012
2.	Vignesh Prajapati	Big Data Analytics with R and Haoop	Packet Publishing	2013
3.	Tom Plunkett, Brian Macdonald	Oracle Big Data Handbook	Oracle Press	2014
4.	Jy Liebowitz,	Jy Liebowitz,	CRC press	2013
5.	Seema Acharya and Subhashini C	Big Data and Analytics	Wiley India	2015

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23CYE27	**AD-HOC AND SENSOR NETWORKS**	**3**	**0**	**0**	**3**

Course Objectives

- To Understand the design issues in ad hoc and sensor networks
- To learn the different types of MAC protocols.
- Be familiar with different types of adhoc routing protocols.
- Be expose to the TCP issues in adhoc networks.
- To Learn the architecture and protocols of wireless sensor network

Course Outcomes

23CYE27.CO1	Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks.
23CYE27.CO2	Analyze the protocol design issues of ad hoc and sensor networks
23CYE27.CO3	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues
23CYE27.CO4	Evaluate the QoS related performance measurements of ad hoc and sensor networks.
23CYE27.CO5	Explain the techniques of protocols networks

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE27.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE27.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE27.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE27.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE27.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs): concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT-II: MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS **9**

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols-Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.1

UNIT-III: ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS **9**

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT-IV: WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS **9**

Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

UNIT-V: WSN ROUTING, LOCALIZATION & QOS **9**

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	C. Siva Ram Murthy, and B. S. Manoj	Ad Hoc Wireless Networks: Architectures and Protocols	Prentice Hall Professional Technical Reference	2008

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Carlos De Morais Cordeiro, Dharma Prakash Agrawa	Ad Hoc & Sensor Networks: Theory and Applications	World Scientific Publishing Company	2006.
2.	Feng Zhao and Leonides Guibas	Wireless Sensor Networks	Elsevier Publication	2002.
3.	Holger Karl and Andreas Willig	Protocols and Architectures for Wireless Sensor Networks	Wiley	2005

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23CYE28	**MANAGEMENT INFORMATION SYSTEM**	**3**	**0**	**0**	**3**

Course Objectives

- To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
- To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used.
- To enable students understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.
- To enable the students to use information to assess the impact of the Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulnerabilities of computer systems.
- To provide the theoretical models used in database management systems to answer business questions.

Course Outcomes

23CYE28.CO1	Relate the basic concepts and technologies used in the field of management information systems;
23CYE28.CO2	Compare the processes of developing and implementing information systems.
23CYE28.CO3	Outline the role of the ethical, social, and security issues of information systems.
23CYE28.CO4	Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
23CYE28.CO5	Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.

Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
23CYE28.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE28.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE28.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE28.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE28.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: MANAGEMENT INFORMATION SYSTEM IN A DIGITAL FIRM **9**

MIS concept - Definition –Role of the MIS - Impact of the MIS-MIS and the user - Management as a control system - MIS a support to management - Development process of theMIS

UNIT-II: SYSTEM ANALYSIS AND DESIGN **9**

System - Need for system analysis - System analysis of the existing system - System analysis of a new requirements - System Development Model - Structured System Analysis and Design - Object Oriented Analysis

UNIT-III: INFORMATION SYSTEM APPLICATIONS **9**

MIS applications, DSS – GDSS - DSS applications in E enterprise - Knowledge Management System and Knowledge Based ExpertSystem- Enterprise Model System and E-Business, E- Commerce, E-communication, Business ProcessReengineering.

UNIT-IV: TECHNOLOGY OF INFORMATION SYSTEM **9**

Data process- Transaction and application process- Information system process; Unified communication and network; Security challengesin E-enterprises; Security threats and vulnerability-Controlling security threat and vulnerability.

UNIT-V: DATA BASE MANAGEMENT SYSTEM **9**

Objectives of data base approach- Characters of databaseManagementsystems-Dataprocessingsystem-ComponentsofDBMSpackages- Data base administration- Data models - Datawarehouse.

Total : 45

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jawadekar, W.S	Management Information Systems	Tata McGrawHill Private Limited	2009
2.	Kenneth C. Laudon and Jane P. Laudon	Management Information Systems	Pearson Education	-
3.	Alex Leon and Mathew Leon	Data Base Management Systems	Vikas Publishing House	-
4.	Goyal, D.P	Management Information System	MACMILLAN India Limited	2008
5.	Panneerselvam R	Database Management System	PHI Private Limited	2008

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23CYE29	**SOFTWARE QUALITY ASSURANCE**	**3**	**0**	**0**	**3**

Course Objectives

- Understand the basic tenets of software quality and quality factors.
- Be exposed to the Software Quality Assurance (SQA) architecture and the details of SQA components.
- Understand of how the SQA components can be integrated into the project life cycle.
- Be familiar with the software quality infrastructure.
- Be exposed to the management components of software quality.

Course Outcomes

23CYE29.CO1 Utilize the concepts in software development life cycle.

23CYE29.CO2 Demonstrate their capability to adopt quality standards.

23CYE29.CO3 Assess the quality of software product.

23CYE29.CO4 Apply the concepts in preparing the quality plan & documents.

23CYE29.CO5 Demonstrate testing a software and apply management principles on decision making

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE29.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE29.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE29.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE29.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE29.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: SOFTWARE QUALITY **9**

Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, and Important Aspects of Quality Management.

UNIT-II: FUNDAMENTALS OF TESTING **9**

Introduction, Necessity of testing, what is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing.

UNIT-III: TESTING STRATEGIES: UNIT TESTING- BOUNDARY VALUE TESTING **9**

Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing-Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations- Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-

and-Effect Graphing, Guidelines and Observations- Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations- Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools.

UNIT-IV: SOFTWARE VERIFICATION AND VALIDATION **9**

Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis od Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities. V-test Model: Introduction, V-model for software, Testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities. Levels of Testing: Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing & Critical Path First.

UNIT-V: SPECIAL TESTS **9**

Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusiness eCommerce Testing, Agile Development Testing, Data Warehousing Testing.

Total : 45

REFRENCE BOOKS :

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	William E. Lewis	Software Testing and Continuous Quality Improvement	CRC Press	2016
2.	M. G. Limaye	Software Testing: Principles, Techniques and Tools	TCH	2017
3.	Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black	Foundations of Software Testing	Cengage Learning	-
4.	Paul C. Jorgenson	Software Testing: A Craftsman's Approach	CRC Press	2017

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		L	T	P	C
23CYE30	**BIO INFORMATICS**	**0**	**0**	**0**	**0**

Course Objectives

- To improve the programming skills of the student
- To let the students know the recent evolution in biological science.
- To learn about Phylogenetics and its applications
- To know about inference problems in biology and its applications
- To learn how to perform RNA modeling

Course Outcomes

23CYE30.CO1 Develop bioinformatics tools with programming skills.

23CYE30.CO2 Apply computational based solutions for biological perspectives.

23CYE30.CO3 To understand phylogenetics and its applications

23CYE30.CO4 To apply engineering techniques in the field of molecular biology

23CYE30.CO5 To create RNA models using various algorithms

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE30.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE30.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE30.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE30.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE30.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Introduction to Operating systems, Linux commands, File transfer protocols ftp and telnet, Introduction to Bioinformatics and Computational Biology, Biological sequences, Biological databases, Genome specific databases, Data file formats, Data life cycle, Database management system models, Basics of Structured Query Language (SQL).

UNIT-II: SEQUENCE ANALYSIS **9**

Sequence Analysis, Pair-wise alignment, Dynamic programming algorithms for computing edit distance, string similarity, shotgun DNA sequencing, end space free alignment. Multiple sequence alignment, Algorithms for Multiple sequence alignment, Generating motifs and profiles, Local and Global alignment, Needleman and Wunsch algorithm, Smith Waterman algorithm, BLAST, PSIBLAST and PHIBLAST algorithms.

UNIT-III: PHYLOGENETICS **9**

Introduction to phylogenetics, Distance based trees UPGMA trees, Molecular clock theory, Ultrametric trees, Parsimonious trees, Neighbour joining trees, trees based on morphological traits, Bootstrapping. Protein Secondary structure and tertiary structure prediction methods, Homology modeling, abinitio approaches, Threading, Critical Assessment of Structure Prediction, Structural genomics.

UNIT-IV: MOLECULAR BIOLOGY **9**

Inference problems and techniques for molecular biology- Overview of key inference problems in biology: Homology identification, Genomic sequence annotation (Genes and ORFs identification), Protein structure

prediction (Secondary and Tertiary structure prediction), Protein function prediction, Biological network identification, Next generation sequencing.

UNIT-V: RNA MODELING **9**

Basics of RNA Structure prediction and its limitations, Features of RNA Secondary Structure,RNA structure predictionmethods: Based on self-complementary regions in RNA sequence, Minimum free energy methods, Suboptimal structure prediction by MFOLD, Prediction based on finding most probable structure and Sequence co-variance method. Application of RNA structure modeling.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Lesk, A. K.	Introduction to Bioinformatics	Oxford University Press	2013
2.	Dan Gusfield	Algorithms on Strings, Trees and Sequences: Computer Science and Computational Biology	Cambridge University Press	1997

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Durbin, R., Eddy, S., Krogh, A., and Mitchison, G.	Biological Sequence Analysis Probabilistic Models of proteins and nucleic acids	Cold Spring Harbor Laboratory Press	2004
2.	Baldi, P. and Brunak, S	Bioinformatics: The Machine Learning Approach	Cambridge University Press	1998

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		L	T	P	C
23CYE31	**DOCKER AND KUBERNETES**	**3**	**0**	**0**	**3**

Course Objectives

- To Understand Kubernetes Architecture
- To Know the Principles of cluster And Image Management
- To Define Network And data Management using containers
- To Develop a Docker Essentials
- To deploy stateful and stateless apps on the cluster

Course Outcomes

23CYE31.CO1 Installing & creating an account with docker Hub

23CYE31.CO2 Develop interactive Scaling control and Networking Services using docker

23CYE31.CO3 Expose the Build Comprehensive Hands-on with Kubernetes Components

23CYE31.CO4 Kubernetes Cluster installation on Virtualbox, AWS & Google Cloud Platforms

23CYE31.CO5 Develop interactive app outside the cluster and to autoscale apps

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE31.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE31.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE31.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE31.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE31.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Introduction to Docker-requirements –Docker containers-listing-searching-pulling for an image-Starting containers-listing containers-stopping containers,deleting containers-setting and getting privileged access inside a container- run container images in Kubernetes-injecting new process to a running container-labelling filtering containers

UNIT-II: NETWORK AND DATA MANAGEMENT FOR CONTAINERS **9**

Introduction-Accessing containers from outside-Managing data in containers-linking two or more containers-LAMP-application by linking containers-networking of multihost containers with Flannel-Assigning IPv6 addresses to containers.

UNIT-III: DOCKER PERFORMANCE AND ORCHESTRATION **9**

Introduction-Benchmarking CPU performance, Benchmarking disk performance, Benchmarking network performance-Performance monitoring.Orchestration-Introduction-Applications with docker compose-cluster with docker Swarm-CoreOS for docker Orchestration-docker in project atomic.

UNIT-IV: INTRODUCTION TO KUBERNETES **9**

Introduction- Kubernetes Architecture- Components of kubernetes cluster -cluster management - Deploy Kubernetes- deploy Kubernetes on AWS and Google cloud platforms- Pods and Deployments -Kubernetes Master-master nodes.

UNIT-V: KUBERNETES USING DOCKER **9**

Kubernetes Management Design Patterns with Docker, CoreOS Linux- Kubernetes docker containers-Nodes-Cluster-Service-pod-Replication controller-label-selector-name-namespace-volume-Service proxy-listing service-listing nodes- Kubernetes Cluster-Scaling-Testing-wordpress with kubernetes cluster.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Deepak Vohra	Kubernetes Microservices with Docker	Apress	2016
2.	Baldi, P. and Brunak	Docker Cookbook	Packt Publishing	2015

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Deepak Vohra	Kubernetes Management Design Patterns	Apress	2017
2.	Baldi, P. and Brunak	Kubernetes on AWS	Packt Publishing	2018
3.	Karl Matthias, Sean P. Kane	Docker: Up and Running	O'Reilly Media	2015

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23CYE32	OPEN STACK ESSENTIALS	L	T	P	C
		3	0	0	3

Course Objectives

- To Understand Open Stack Architecture
- To Know The Principles Of Identity And Image Management
- To Define Network And Instance Management
- To Develop A Block And Object Storage
- To Design And Build Simple Nodes

Course Outcomes

23CYE32.CO1	Installing Pack stack and generating an answer file
23CYE32.CO2	Develop Glance as a Registry of images
23CYE32.CO3	Build Web Interface External Network Setup
23CYE32.CO4	Develop Object file management in the web interface
23CYE32.CO5	Develop interactive Scaling control and Networking Services

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE32.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE32.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE32.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE32.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE32.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: ARCHITECTURE AND COMPONENT OVERVIEW **9**

Open Stack Architecture- Dashboard- Keystone- Glance- Neutron- Nova- Cinder-Shift- Ceilometer- Heat.RDO Installation: Installing RDO using Packstack -Installing Packstack and generating an answer file.

UNIT-II: IDENTITY AND IMAGE MANAGEMENT **9**

Services and Endpoints: Hierarchy of users-roles-Creating an User-Creating an role-Interacting with Keystone in the dashboard-Endpoints in the Dashboard.Glance as a Registry of images -Using the Web Interface-Building an Image.

UNIT-III: NETWORK AND INSTANCE MANAGEMENT **9**

Networking And Neutron-Network Fabric-Open VSwitch Configuration-VLAN –GRE tunnels-VXLAN tunnels- Creating a Network- Web interface Management-External Network access – Preparing a network – Creating an External network-Web Interface External Network Setup.Managing flavors –Managing key pairs – Launching an Instance-Managing floating IP addresses-Managing Security Groups.

UNIT-IV: BLOCK AND OBJECT STORAGE **9**

Use case – Creating and using Block Storage – Attaching the block storage to an Instance - Backing Storage – Cinder types. Object Storage- Use case Architecture of Swift Cluster – Creating and using object storage – Object file management in the web interface – Ring Files.

UNIT-V: SCALING AND MONITORING **9**

Scaling Compute nodes – Control and Networking – Scaling control and Networking Services – Load – Balancing Key stone – Additional Key stone tuning – Glance Load Balancing.Monitoring – Methods – Commands – Non open stack Service checks – Monitoring control services – Network Services – Compute services – Trouble Shooting.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dan Radez	OpenStack Essentials Second Edition	Packt Publishing	2015
2.		Docker Cookbook	Packt Publishing	2013

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Omar Khedher	Learning Openstack Networking Third Edition	Packt Publishing	2014
2.	Cody Bumgardner	Open Stack in Action	Packt Publishing	2011
3.	Tom Fifield	Open stack Operations Guide	Packt Publishing	2000

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		L	T	P	C
23CYE33	**USER CENTRIC DESIGN**	**3**	**0**	**0**	**3**

Course Objectives

- Given a problem setting, critically discuss the appropriateness of potential design methods such as contextual design, prototyping, ideation, etc.
- Describe the issues and challenges to achieving a human-centered design process.
- Gather useful information about users and activities through observation or systematic in quiry.
- Use, adapt and extend design standards, guidelines, and patterns.
- Create a prototype for a small system and plan and perform a usability evaluation.

Course Outcomes

23CYE33.CO1	Develop an appreciation for the theory and sensibilities of user-centered design
23CYE33.CO2	Develop skills in the use and application of a variety of design methods, specifically Applicable to user- centered design
23CYE33.CO3	Improve individual and collaborative skills in design-based problem solving
23CYE33.CO4	Develop UCD is an Iterative process
23CYE33.CO5	Develop Multidisciplinary Design Teams for User Centered Design

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE33.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE33.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE33.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE33.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE33.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: USER CENTERED DESIGN OVERVIEW **9**

User centered Design- UCD Principle - Iterative Process-Phase of the design process—Investigative Methods and Tools- Example: Brainstorming- Apply User Centered Design – Understand context of use – Specify user Requirements – Design Solutions – Evaluate against requirements – Hardware UCD - Working with Users.

UNIT-II: MULTI DISCIPLINARY DESIGN TEAMS **9**

Multidisciplinary Design Teams for User Centered Design: Engineer-Designer-Researcher- Marketer – Stakeholder – Investment in UCD Pays off – Benefits of User centered Design – Approach of User centered Design – UX and Interactive Design. Design Principle : Hick's Law – Fitt's Law – Visibility – Visual Feedback – Gestalt Principle – Mobile UCD – UCD Terms.

UNIT-III: ESTABLISISHING A BASELINE ABOUT UCD **9**

Introduction to UCD – UCD and User Experience – User Experience versus User Interface – UX is more than a Buzz word – User Research – Interviews – Surveys – Focus Groups – Observational Usability Research – Scenarios - UCD Process –Storyboards - Creating a personal Manifesto – Balance and Filter Design Features – MVP .

UNIT-IV: USER CENTRIC TOOLS AND TECHNIQUES **9**

Introduction to UCD Tools and Techniques – Activity: Personas and Target Audience – UX One sheet – Journey Mapping – Wire framing – Ideation –Prototyping – Evaluation – Design specification - Sketching: Open ended vs Highly Constrained Sketching – Scribble Sketching – Stretch your imagination – Combining Sketching with images – Final Reflection – Pendo – Survey Monkey- Axure – POP - Silverback.

UNIT-V: TRENDS IN UCD **9**

Personalization - Material design - Designing for content - Designing for content - Animation and micro-interactions - Accessible design - AI for testing design options and making decisions - Data and design collaboration - Minimalistic Simple Designs - Stellar 3D Animation & Graphic – RIDE (Report – Iterate Deploy – Evaluate).

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Travis Lowdermilk	User-Centered Design: A Developer's Guide t Applications, First Edition	O'Reilly Media	2013
2.	Brian Still and Kate	Fundamentals of User-Centered Design: A Pr	CRC Press	2016

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Elizabeth F. Churchill,	Foundations for Designing User-Centered Systems: What System Designers Need to Know about People	Springer	2014
2.	Amir Shevat		O'Reilly Media	2017
3.	Westley Knight	UX for Developers: How to Integrate User-Centered Design Principles Into Your Day-to-Day Development Work	Apress	2018

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23CYE34 **SOFTWARE TESTING**

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3	0	0	3

Course Objectives

- To understand the basic software testing principles.
- To understand the working principles of various testing methodologies.
- To Understand knowledge of techniques for system testing and functional testing
- To understand the ways and means of controlling and monitoring testing activity.
- To understand the concept of modern software testing tools.

Course Outcomes

23CYE34.CO1 Explain the basic software testing principles.

23CYE34.CO2 Classify the types of testing

23CYE34.CO3 Differentiate operation of system testing & functional testing

23CYE34.CO4 Analyze the techniques in testing in planning, automation & execution management.

23CYE34.CO5 Implement the testing using modern software testing tools.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE34.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE34.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE34.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE34.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE34.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION **9**

Basic Concepts and preliminaries –Objectives of Testing-Testing Activities-Testing Levels-Role of Testing-Verification and Validation-Test Case-Theory of Program Testing- Theory of Good enough and Gerhart- Weyuker and Ostrand- Gourlay- Adequacy of Testing- Limitations of Testing.

UNIT-II: TYPES OF TESTING **9**

Unit Testing-Static and Dynamic Unit Testing-Defect Prevention-Mutation Testing and Debugging-Control Flow Testing- Control Flow Graph- Paths in a Control Flow Graph- Path Selection Criteria- Generating Test Input- Data Flow Testing- Data Flow Graph- Data Flow Terms- Data Flow Testing Criteria- Comparison of Data Flow Test Selection Criteria- Feasible Paths and Test Selection Criteria- Comparison of Testing Techniques-Domain Testing.

UNIT-III: SYSTEM TESTING & FUNCTIONAL TESTING **9**

System Testing- Different Types of Interfaces and Interface Errors- System Integration Techniques- Software and Hardware Integration- Test Plan for System Integration- Test Categories- Basic Tests- Functionality Tests- Robustness Tests- Functional Testing- Functional Testing Concepts of Howden- Pairwise Testing- Equivalence Class Partitioning- Boundary Value Analysis- Decision Tables- Random Testing- Error Guessing- CategoryPartition

UNIT-IV: PLANNING, AUTOMATION & EXECUTION **9**

Planning And Automation- Approach- Suite Structure- Environment- Execution Strategy- Effort Estimation- System Test Automation- Evaluation and Selection of Test Automation Tools- Characteristics of Automated Test Cases- Structure of an Automated Test Case- Test Execution- Modeling Defects- Metrics for Tracking System Test- Orthogonal Defect Classification- Defect Causal Analysis- Beta Testing- First Customer Shipment- System Test Report- Product Sustaining-Measuring TestEffectiveness

UNIT-V: MODERN SOFTWARE TESTING TOOLS **9**

. Evolution of Automated Testing Tools-Variable Capture/Replay Tools-Extreme Programming-Software Testing Trends-Taxonomyof Testing Tools-Methodologyto Evaluate Automated Testing Tools-Case Study

Total : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kshirsagar Naik, Priyadarshi Tripathy	Software Testing & Quality Assurance	A JOHN WILEY & SONS	2011
2.	William E.Lewis, Gunasekaran Veerapillai	Software Testing & Continuous Quality Improvement	AUERBACH PUBLICATIONS	2011

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Alan C Gillies	Software Quality Theory and Management	Cengage Learning	2011
2.	Srinivasan Desikan, Gopalaswamy Ramesh	Software Testing – Principles and Practices	Pearson Education	2009.
3.	Ron Patton	Software testing	Pearson Education	2007
4.	William E. Perry	Effective Methods for Software Testing	Wiley India	2006.
5.	Renu Rajani and Pradeep Oak	Software Testing – Effective Methods, Tools and Techniques	TataMcGraw Hill PublishingCompany Limited	2005

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23CYE35 **SOFT COMPUTING**

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Course Objectives

- To understand the basic concepts of soft computing
- To understand the fundamentals of artificial and neural networks
- To understand the fundamentals Unsupervised Learning Network
- To understand the fuzzy sets and fuzzy logic and genetic algorithms.
- To understand the fuzzy Fuzzy Arithmetic and Fuzzy Measures

Course Outcomes

23CYE35.CO1 Build intelligent machines using soft computing techniques.

23CYE35.CO2 Design a Neural Networks for the real time problems.

23CYE35.CO3 Implement various learningtechniques

23CYE35.CO4 Apply fuzzy logic and Develop fuzzy sets for realtime problems.

23CYE35.CO5 Develop genetic algorithms for various realtime applications

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE35.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE35.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE35.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE35.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE35.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: AI PROBLEMS AND SEARCH **9**

AI problems, Techniques, Problem Spaces and Search, Heuristic Search Techniques- Generate and Test, Hill Climbing, Best First Search Problem reduction, Constraint Satisfaction and Means End Analysis. Approaches to Knowledge Representation- Using Predicate Logic 2nd Rules.

UNIT-II: ARTIFICIAL NEURAL NETWORKS **9**

Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perception Networks, Adaptive Linear Neuron, Back propagation Network. Associative Memory Networks, Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-III: UNSUPERVISED LEARNING NETWORK **9**

Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various i networks.

UNIT-IV: FUZZY LOGIC **9**

Introduction to Classical Sets (crisp Sets)and Fuzzy Sets- operations and Fuzzy sets. Classical Relations -and Fuzzy Relations- Cardinality, Operations, Properties and composition. Tolerance and . Membership functions- Features, Fuzzification, membership value assignments, Defuzzification.

UNIT-V: APPLICATIONS **9**

Fuzzy Arithmetic and Fuzzy Measures, Fuzzy Rule Base and Approximate Reasoning Fuzzy Decision making Fuzzy Logic Control Systems. Genetic Algorithm- Introduction and basic operators andterminology. Applications: Optimization of TSP, Internet Search technique.

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S N Sivanandam, S N Deepa	Principles of Soft Computing	Wiley India	2007
2.	Fakhreddine 0 Karray, Clarence D Silva	Soft Computing and Intelligent System Design	Pearson Edition	2004

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Amit Konar	and Soft Computing- Behavioral and Cognitive Modeling of the Human Brain	CRC press	2000
2.	Elaine Rich and Kevin Knight	Artificial Intelligence	TMH	2008
3.	Stuart J. Russell and Peter Norvig	Artificial Intelligence A Modern Approach	Prentice Hall	2010
4.	Hung T. Nguyen, Elbert A. Walker	A first course in Fuzzy Logic	CRC. Press	2005
5.	N. P. Padhy	Artificial Intelligence and Intelligent Systems	Oxford University Press	2005

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		L	T	P	C
23CYE36	**REAL TIME SYSTEMS**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the basic concepts of real-time computing
- To understand the major issues real-time scheduling and real-time kernels. To write Real-time scheduling algorithms
- To understand timing analysis and resource control in real time system
- To design the real time database and fault tolerant techniques
- To implementation the real-timeoperating systems.

Course Outcomes

23CYE36.CO1	Apply the knowledge of operating system concepts to understand realtime system.
23CYE36.CO2	Implement the tasks scheduling of Realtime systems
23CYE36.CO3	Define various protocols for effective resource sharing
23CYE36.CO4	Find out the fault in realtime system by using various techniques
23CYE36.CO5	Design real time system for various realtime applications

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE36.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE36.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE36.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE36.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE36.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: INTRODUCTION TO REAL TIME SYSTEM **9**

Typical RT applications - Hard and soft Real Time constraints - Hard and soft RTS - Reference Modeling RTS- Issues in RTS - Structure of RTS

UNIT-II: REAL TIME SCHEDULING **9**

Task, processes, processors - Task allocation algorithm - Single processor and multi processor Scheduling - Clock driven and priority based scheduling algorithm

UNIT-III: TIMING ANALYSIS AND RESOURCE CONTROL **9**

Prediction of Execution Time - Worst Case Execution Time (WCET) analysis – Assumptions on Resources and Their Usage – Resource Contention and Resource Access Control – Priority Ceiling Protocol – Priority Inheritance Protocol – Stack Based Priority Ceiling Protocol – Preemption Ceiling Protocol.

UNIT-IV: REAL TIME DATABASE AND FAULT TOLERANT TECHNIQUES **9**

Transaction priority and concurrency control issues - Disk scheduling - Fault type and Detection Techniques - Redundancy management – Integration issues

UNIT-V: REAL TIME SYSTEM CASE STUDIES **9**

Examples of Hard, Soft and Firm real time systems like automatic chocolate vending machine, Smart Card and Adaptive Cruise Control System in a car or flight

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Jane .W. S. Liu	Real Time Systems	Pearson Education	2012
2.	Krishna .C.M	Real Time Systems	Mc-Graw Hill	2010

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Prasad K.V.K.K	Embedded/Real-Time Systems: Concepts, Design and Programming Cognitive Modeling of the Human Brain	Dream Tech Press	2014
2.	Sriram V Iyer , Pankaj Gupta	Embedded Real Time Systems Programming	McGraw Hill	2010
3.	Phillip A. Laplante	Real-Time Systems Design & Analysis	John Wiley & Sons	2006

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23CYE38 **HIGH SPEED NETWORKS**

L	T	P	C
3	0	0	3

Course Objectives

- To learn High speed networks and ATM Architecture
- To understand resource allocation and s congestion management approaches
- To understand resource allocation and s congestion management approaches
- To understand the integrated and differentiated services
- To learn protocols forQOS support

Course Outcomes

23CYE38.CO1 Summarize the mechanisms to provide highspeed networking through case studies of ATM and frame relay networks

23CYE38.CO2 Construct queuing system with different arrival andservice rates

23CYE38.CO3 Analyze the performance of various congestion controls inATM.

23CYE38.CO4 Design the integrated and differentiated services

23CYE38.CO5 Explain the protocols needed for QoS support.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYE38.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYE38.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYE38.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYE38.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYE38.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I: HIGH PERFORMANCE NETWORKS **9**

FrameRelayNetworks–Asynchronous Transfer Mode(ATM)–ATM Protocol Architecture- ATM logical connection - ATM cell – ATM service categories – ATM Adaptation Layer (AAL) - High Speed LANs: Fast ethernet - Gigabit ethernet - Fiberchannel.

UNIT-II: QUEUING MODELS AND CONGESTION MANAGEMENT **9**

Queuing analysis- Queuing models – Single server queues – Effects of congestion – Congestion control – Traffic management – Congestion control in packet switching networks

UNIT-III: ATM CONGESTION CONTROL **9**

Performance of TCP over ATM - Traffic and congestion control in ATM – Requirements – Attributes – Traffic management frame work - Traffic control – Available Bit Rate (ABR) Traffic management – ABR rate control - Resource Management (RM) Cell formats – ABR capacity allocations.

UNIT-IV: INTEGRATED AND DIFFERENTIATED SERVICES **9**

Integrated services architecture – Approach - Components - Services - Queuing discipline – Fair admission control - Traffic shaping - Resource reservation queuing (FQ) - Processor Sharing (PS) - Bit-Round Fair Queuing (BRFQ) - Generalized Processor Sharing (GPS) - Weighted Fair Queuing (WFQ) – Random early detection - Differentiated services DS code points – Per Hop Behavior

UNIT-V: PROTOCOLS FOR QOS SUPPORT **9**

Resource Reservation (RSVP) – Goals & characteristics - Data flow - RSVP operations - Protocol mechanisms – Multiprotocol label switching – Operations - Label stacking – Protocol details – Real Time Protocol (RTP) – Protocol architecture - Data transfer protocol - Real Time Control Protocol (RTCP)

Total : 45

Text Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	William Stallings	High Speed Networks and	Pearson Education	2002
2	Warland &PravinVaraiya	High Performance Communication Networks	Jean Harcourt Asia Pvt. Ltd	2001

Reference Books:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	IrvanPepelnjk, et al	MPLS and VPN architecture□	Cisco Press	2003
2.	Behrouz A. Forouzan, Sophia Chung Fegan	Data Communications and Networking	McGraw-Hill Higher Education	2003

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EMPLOYABILITY ENHANCEMENT COURSES (EEC)

		L	T	P	C
23CYP01	**PROJECT WORK PHASE I**	**0**	**0**	**10**	**5**

Course Objective:

- To practical implementation of theoretical knowledge gained during the study from First year to Third year.
- To implement their ideas/realtime industrial problem/current application of their engineering branch which they have studied in curriculum.
- To build confidence in the student what he has learnt theoretically.
- T o identify the appropriate problem solving methodology.
- T o Analyze and process the experimental information.

Course Outcomes:

23CYP01.CO1	Prepare literature survey in a specific domainas a team/individual to motivate life long learning.
23CYP01.CO2	Identify the problem which needs to be provided a sustainable solution using modern tools.
23CYP01.CO3	Analyze the problem definition and design its impact on the society and environment.
23CYP01.CO4	Document the literature and bindings.
23CYP01.CO5	Chose the domain of Information Technology and programming languages and apply to variety of real time problem scenarios.

Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
23CYP01.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYP01.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYP01.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYP01.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYP01.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

Content:

- Projec the students to gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal.
- B.E. Projects can be two types: Projects based on implementation of any application oriented problem, which will be more or less experimental in nature, and the others will be based on some innovative/ theoretica lwork.
- In Project Phase- I the student will undertake project over the academic year, which will involve the analysis, design of a system or sub system in the area identified earlier in the field of Information Technology.
- The topic must be formulated in consultation with the guide and project coordinator.
- The project will be undertaken preferably by a group of 1-3 students who will jointly work and implement the project.
- The group will select a project with approval from a committee formed by the department of senior faculty to check the feasibility and approve the topic.

Review Committee:

- The Head of the department/Project coordinator shall constitute a review committee for project work for project group.
- Project guide would be one member of that committee by default.
- The students or project group shall make presentation on the progress made by them before the committee.
- There cordof there marks/suggestions of there view committee should be properly maintained and should be made available at the time of examination.
- Each student/group is required to give presentation as part of review for 10 to15 minutes followed by a detailed discussion.

PROJECT WORK REVIEWS

- Projec twork phases will have a minimum of three internal reviews by an appointed committee of faculty.
- The final review will be done by an external faculty

Review 1: Finalization of scope – the objectives and scope of the project should be finalized in second week of their academic semester. Should finalize list of required hardware, software or other equipment for executing the project, test environment/tools.
Review 2: Finalization – High level design, planning. **Guide lines for Students and Faculty: Project Review Committee:**

1. This committee will be responsible for evaluating the timely progress of the projects and communicating the progress report to the students.
2. As far as possible Students should finalize the same project title taken for Project.
3. Review committee should conduct "Feasibility Review" in first week after commencement of the term. Review committee should finalize the scope of the project.
4. If change in project topic is unavoidable then the students should complete the process of project approval by submitting synopsis along with the review of important papers. This new project topic should be approved by review committee.

Term Work:

1. The term work will consist of are port prepared by the student on the project allotted to them.
2. They should use appropriate tools for the preparation of there port like project planning, UML diagram, testing tools, referencing tools etc.

Report Structure

- Contents
- List of Abbreviations
- List of Figures
- List of Graphs
- List of Tables

1. Introduction and aims/motivation and objectives
2. Literature Survey
3. Problem Statement
4. Project Requirements
5. System Analysis Proposed Architecture/high level design of the project
6. VerificationValidation
7. Project plan
8. Conclusion
9. References
10. Appendices

Evaluation Guidelines:

- A panel of examiner will evaluate the viability of project/project scope.
- The panel will also verify that all the suggestions/comments in the review document are taken care and accordingly allot the term work marks.
- Oral examination in the form of presentation will be based on the project work completedby the candidates. Preliminary report must also be presented during the oral examination.

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TOTAL HOURS: 150

		L	T	P	C
23CYP02	**PROJECT WORK -PHASE II**	**0**	**0**	**20**	**10**

Course Objective:

- To Plan an experimental design to solve Engineering problems.
- To develop an attitude of team work and independent working on realtime problems.
- To Analyze and process the experimental information.
- To evaluate, interpret and justify the experimental results.
- To develop a dissertation report.

Course Outcomes:

23CYP02.CO1	Explain the laws and theorems of electrical networks.
23CYP02.CO2	Outline the parameters of AC circuits.
23CYP02.CO3	Explain the constructional features of electric machines.
23CYP02.CO4	Illustrate the characteristics of semiconductor diodes.
23CYP02.CO5	Explain the Characteristics of transistors and opto-electronic devices.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYP02.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYP02.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYP02.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYP02.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYP02.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

PROJECT WORK REVIEWS

- Project work phases will have a minimum of three internal reviews by an appointed committee of faculty.
- The final review will be done by an external faculty

Review 3: Implementation Status and testing document.
Review 4: Final Project Demonstration, Project Report and proper Result analysis

The group will submit at the end of semester II.

a. The Workableproject.
b. Project report(Word Document)in the form of bound journal complete in all respect– 1 copy for the Institute, 1 copy for guide and1 copy of each student in the group for

certification. The project report contains the details.

1. Problem definition
2. Requirement specification
3. System design details (UML diagrams)
4. System implementation – code documentation – data flow diagrams/ algorithm, protocols used.
5. Test result and procedure
6. Conclusions.
7. Appendix a. Tools used b. References c. Basepapers.

TOTAL HOURS: 300

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		L	T	P	C
23CYP03	**COMPREHENSION**	**0**	**0**	**2**	**1**

Course Objective:

- To write effective and coherent paragraphs
- To comprehend the overall and internal organization of an academic essay.
- To write an effective the statement.
- To use pre-writing strategies to plan writing.
- To Produce coherent and unified paragraphs with adequate support and detail of the topic.

Course Outcomes:

23CYP03.CO1	Write a paragraph with a topic sentence, support, and concluding sentence.
23CYP03.CO2	Write an effective introduction the statement that addresses the writing prompt and conclusion.
23CYP03.CO3	Produce a well- organized academic essay and used variety of accurate sentence structures.
23CYP03.CO4	Produce appropriate vocabulary and correct word forms.
23CYP03.CO5	Produce accurate grammatical structures for the paragraph writing.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYP03.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYP03.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYP03.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYP03.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYP03.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

COMPREHENSION TOPICS:

1. Cloud Computing for Small Businesses
2. Role of Information Technology in Corporate Functions
3. Knowledge Management
4. The Impact of Cloud Computing
5. Cluster computing
6. Computer Forensics
7. The Internet of Things
8. Data Security
9. Green Computing
10. Issue on eGovernment Development and Applications
11. Big Data
12. Design of Reversible Computing Systems
13. Social Platforms

TOTAL HOURS: 30

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		L	T	P	C
23CYP04	**TECHNICAL SEMINAR**	**0**	**4**	**0**	**2**

Course Objective:

- To expose students to the 'real 'working environment and get acquainted with the organization structure, Business operations and administrative functions.
- To promote and develop presentation skills and import a knowledgeable society.
- Toset the stage for future recruitment by potential employers.
- To develop the presentation skill for employability.
- To Utilize available technical resources in efficient manner.

Course Outcomes:

23CYP04.CO1 Develop a skill for work in actual working environment.

23CYP04.CO2 Utilize available technical resources in efficient manner.

23CYP04.CO3 Write technical documents and give oral presentations related to the work completed.

23CYP04.CO4 Prepare a presentation in latest trends in InformationTechnology.

23CYP04.CO5 Implement the presentation in latest trends in Information Technology.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYP04.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYP04.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYP04.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYP04.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYP04.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

Seminar Topic:

Seminar topic should relate to the Information Technology, Some of the seminar topics are listed below:

1. Free Net
2. Linear Programming in Cloud
3. Blackberry Technology
4. Biometric Security Systems
5. Credit Card Fraud Detection
6. Vehicle Management System
7. Smartshader Technology
8. Digital Piracy
9. Google Glass
10. Data Recovery
11. Cyber and Social Terrorism
12. Space Mouse
13. Pill Camera
14. Ambient Intelligence
15. Mind ReadingComputer

16. Honeypots
17. Security through Obscurity

18. Electronic Banking
19. Gi-Fi

Scheme of Evaluation:

The Course is evaluated based on:

- Presentation
- Student'sreports
- PPTpresentation
- Presentation will take place in the weekly class. The presentation is evaluation by your class incharge.
- Report must be submitted during presentation. The report evaluation is done by your class incharge.
- A Viva voce comprising comprehensive questions basedon thepresentation

Total Hours: 60

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		L	T	P	C
23CYP05	**ENTREPRENEURSHIP DEVELOPMENT**	**3**	**0**	**0**	**3**

Course Objective:

- To promote strong entrepreneurship among Engineers, Managers and Science students.
- To promote entrepreneurship among relevant sectors in the state.
- To collaborate with other organizations and institutions.
- To organize entrepreneurship development and awareness programs.
- To undertake research studies to identify high technology are as having entrepreneurship opportunities.

Course Outcomes:

23CYP05.CO1	Identifying real problems and a solutions people want pitch in solutions, such as products and Services.
23CYP05.CO2	Achieve high degree of productivity in a small team via agile, high quality practices and team organization approaches.
23CYP05.CO3	Create a production software development environment.
23CYP05.CO4	Prepare landscape and approaches for attracting investors and securing funding Communicating with customer.
23CYP05.CO5	Achieve customer satisfaction in the development of IT products and services.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23CYP05.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23CYP05.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23CYP05.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23CYP05.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23CYP05.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT – I: CONCEPT OF ENTREPRENEURSHIP **9**

Meaning and characteristics of entrepreneurship, entrepreneurial culture, socio-economic origin of entrepreneurship, factors affecting entrepreneurship, conceptual model of entrepreneurship, traits of a good entrepreneur, entrepreneur, intra-preneur and manager ENTREPRENEURIAL MOTIVATION: motivating, compelling and facilitating factors, entrepreneurial ambition, achievement motivation theory and Kakinada experiment.

UNIT -II: ESTABLISHMENT OF ENTREPRENEURIAL SYSTEMS **9**

Search, processing and selection of idea, Input requirements SMALL SCALE INDUSTRY: meaning, importance, characteristics, advantages and problems of SSIs. Steps for starting a small industry, guidelines for project report, registration asSSI.

UNIT -III: ASSISTANCE TO SSI **9**

Need for incentives & subsidies, need for institutional support, role of government and other institutions.

UNIT -IV: FUNCTIONAL PLANS **9**

Marketingplan-marketingresearchforthenewventure, stepsinpreparingmarketing plan, contingency planning; Organizational plan- Forms of ownership, designing organizational structure, job design, manpower planning; Financial plan- cash budget, working capital, proforma income statement, Proforma cash flow, proforma balance sheet, break evenanalysis.

UNIT -V: SOURCES OF FINANCE **9**

Debt or Equity financing, commercial banks, venture capital; financial institutions supporting entrepreneurs; legal issues- intellectual property rights, patents, trademarks, copy rights, trade secrets, licensing, franchising.

TOTAL HOURS: 45

TEXT BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gupta C. B. and Srinivasan N. P	Entrepreneurial Development	Sultan Chand & Sons	2014
2.	Vasant Desai	Management of a Small Scale Industry	Himalaya Publishing House	2011

REFERENCE BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Sangeetha Sharma	Entrepreneurship Development	PHI Learning Pvt. Ltd	2016
2	K Ramachandran	Entrepreneurship Development	Tata McGraw-Hill	2009
3	Abhishek Nirjar	Entrepreneurship Development	CBS Publishers	2014
4	S. Anil Kumar	Entrepreneurship Development	New Age International	2008
5	Fang Zhao	Information Technology Entrepreneurship and Innovation	O'Reilly	2008

WEB URLs

1. https://www.tutorialspoint.com/entrepreneurship_development/index.htm
2. https://www.entrepreneur.com/article/244279
3. https://ocw.mit.edu/courses/entrepreneurship/
4. http://freevideolectures.com/Course/3645/Technology-Entrepreneurship
5. http://articles.bplans.com/11-excellent-free-online-courses-for-entrepreneurs

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		L	T	P	C
23CYP06	**PROFESSIONAL PRACTICES**	**0**	**0**	**6**	**3**

Course Objective:

- To examine important professional issues in contemporary practice and to help students become an effective participant in a team of IT professionals.
- To have gained a thorough understanding of the various issues/factors an IT professional faces and how one should respond
- To have learned what are considered professional behavior in the IT field
- To have learned about the current IT practices.
- To Develop professional attitude from the perspectives of experienced IT practitioners.

Course Outcomes:

23CYP05.CO1 Describe the various issues/factors an information technology professional

23CYP05.CO2 Describe professional behavior in the information technology

23CYP05.CO3 Recognize what are the current issues in IT and the emerging technology.

23CYP05.CO4 Write properly formatted and organized technical reports.

23CYP05.CO5 Acquire and integrate knowledge to appreciate industry practices.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23BSS24.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23BSS24.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23BSS24.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23BSS24.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23BSS24.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

CONTENT:

1. Discipline- specific knowledge and capabilities: appropriate to the level of study related to an Information Technology profession.
2. Communication: using oral, written and interpersonal communication to inform, motivate and effect change
3. Digitalliteracy: using technologies to find, use and disseminate information
4. Criticalthinking: evaluating information using critical and analytical thinking and judgment
5. Problemsolving: creating solutions to authentic(real world and ill-defined) problems
6. Self-management: working and learning independently, and taking responsibility for personalactions.
7. Teamwork: working and learning with others from different disciplines and backgrounds
8. Globalcitizenship: engaging ethically and productively in the professional context and with diverse communities and cultures in a global context

I. Information Technology Professionalism

A. Privacy and confidentiality
B. Computer ethics
C. Intellectual property issues
D. Computer crime and fraud
E. Professional bodies
F. Impact of information technology on society

II. Information Technology Practices

A. Effects of standardization
B. Effectiveness vs efficiency
C. Distributed systems issues
D. Emerging technologies
E. Quality issues
F. Current issues

TOTAL HOURS: 90

TEXT BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Schultz, Robert A	Contemporary Issues in Ethics and Information Technology	IRM Press	2006
2.	Baase S	A Gift of Fire, Social, Legal and Ethical Issues for Computers and the Internet	Prentice Hall	2003

REFERENCE BOOKS:

S.No.	Author(s)	Title of the Book	Publisher	Year of Publication
1	Johnson DG	Computer Ethics	Prentice Hall	2001
2	Spinello RA	CyberEthics: Morality and Law in Cyberspace	Jones and Bartlett	2000

WEB URLs

1. www.infosec.gov.hk
2. www.pcpd.org.hk
3. www.ipd.gov.hk
4. www.ogcio.gov.hk
5. www.hkcs.org.h

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OPEN ELECTIVE COURSES
(OEC)

23MEE07 **INDUSTRIAL AUTOMATION & ROBOTICS**

L	T	P	C
3	0	0	3

Course Objectives

- To learn the levels of automation
- To impart the knowledge on Material handling.
- To know the fundamentals of robotics.
- To impart clear knowledge about the principlesof sensors and end effectors.
- To understand robotic drives and fundamental programming

Course Outcomes

23MEE07.CO1 Recognize the levels of automation
23MEE07.CO1 Demonstrate the various Material handling systems.
23MEE07.CO1 Understand the fundamentals of robotics.
23MEE07.CO1 Select the sensors and end effectors.
23MEE07.CO1 Demonstratethe robotic drives and fundamental programming.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MEE07.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23MEE07.CO1	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23MEE07.CO1	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23MEE07.CO1	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23MEE07.CO1	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT-I : INTRODUCTION **7**

Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations.

UNIT-II : MATERIAL HANDLING **9**

The material handling function, Types of Material Handling Equipment, Analysis for Material Handling Systems, Design of the System, Conveyor Systems, Automated Guided Vehicle Systems. Automated Storage Systems: Automated Storage/Retrieval Systems

UNIT-III : FUNDAMENTALS OF ROBOT **9**

Robot - Definition - Robot Anatomy - Coordinate Systems, Work Envelope Types and Classification-specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT-IV : ROBOT SENSORSAND END EFFECTORS **9**

Sensors–Position Sensors (Piezoelectric,LVDT)–RangeSensors–ProximitySensors–TouchSensors
End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers.

UNIT-V : ROBOT DRIVES AND ROBOT PROGRAMMING **9**

PneumaticDrives–HydraulicDrives–MechanicalDrives–ElectricalDrives– DC servomotors, stepper motor, AC servomotor, Features and Applications. Introduction to Robot programming Languages- Motion Commands, Sensor Commands, End Effector commands and simple Programs.

CONTEMPORARY ISSUES: Industry Expert Lecture **2**

Total : 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	M.P.Grover	Automation, Production Systems and Computer IntegratedManufacturing	Pearson Education	2015
2	Krishna Kant	Computer Based Industrial Control	EEE-PHI	2017

REFERENCE BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Tiess Chiu Chang & Richard A. Wysk	An Introduction to Automated Process Planning Systems	PHI	1985
2	Amber G.H & P.S. Amber	Anatomy of Automation	Prentice Hall	2009
3	S.R. Deb	Robotics Technology and flexible automation	Tata McGraw-Hill Education	2009

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		L	T	P	C
23MEE18	**POWER PLANT ENGINEERING**	**3**	**0**	**0**	**3**

Course Objective:

- To provide an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.
- To understand about Thermal power plants and working
- To know about Diesel engine power plants and working
- To know the working of Nuclear power plants and other power plants
- To understand Environmental problems related to power plants

Course Outcomes:

23MEE18.CO1 Comprehend the working principles of coal based thermal powerplants

23MEE18.CO2 Illustrate the working principles of diesel, gas turbine and combined cycle powerplants

23MEE18.CO3 Illustrate and explain the working principle and components of nuclear powerplants

23MEE18.CO4 Explain the techniques to extract power from renewable energy sources

23MEE18.CO5 Understand the economic and environmental issues of powerplants.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MEE18.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23MEE18.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23MEE18.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23MEE18.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23MEE18.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: COAL BASED THERMAL POWER PLANTS **9**

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogenerationsystems.

UNIT II: DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS **9**

Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III: NUCLEAR POWER PLANTS **9**

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium-Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measuresfor Nuclear Power plants.

UNIT IV: POWER FROM RENEWABLE ENERGY **9**

Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), SolarThermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V: ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS **9**

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria,relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

Total: 45

TEXT BOOKS:

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Nag. P.K.,	Power Plant Engineering	Tata McGraw – Hill	2010
2	C. Elanchezhian, L. Saravanakumar,B. Vijaya Ramnath	Power Plant Engineering	I.K.International Publishing house pvt ltd	2007

REFERENCE BOOKS:

1.	El-Wakil. M.M	Power Plant Technology	Tata McGraw – Hill Publishing Company Ltd.,	2010
2.	Thomas C. Elliott	Power Plant Engineering	Standard Handbook of McGraw – Hill	2003
3.	Godfrey Boyle	Renewable energy	Oxford University Press	2004
4	R.K.Rajput	Power Plant Engineering	Laxmi Publications	2016
5	S. C. Arora and S. Domkundwar	A COURSE in Power Plant Engineering	Dhanpatrai & Sons,	2008

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5. www.youtube.com/watch?v=hrFeyue--g

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		L	T	P	C
23MEE26	**TOTAL QUALITY MANAGEMENT**	**3**	**0**	**0**	**3**

Course Objective:

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management
- To understand the application of statistical approach for quality control
- To create an awareness about the ISO and QS certification process and its need for the industries
- To apply the quality concepts in product design, manufacturing etc in order to maximize customer Satisfaction
- Human involvement to improve quality and the development and transformation

Course Outcomes:

23MEE26.CO1	Understand the concept of total quality management
23MEE26.CO2	Comprehend and illustrate the TQM principles
23MEE26.CO3	Solve quality related problems using statistical process control
23MEE26.CO4	Understand proven methodologies to enhance management processes
23MEE26.CO5	Illustrate the salient features of quality systems

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23MEE26.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23MEE26.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23MEE26.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23MEE26.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23MEE26.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: INTRODUCTION **9**

Definition of Quality – Dimensions of Quality – Quality Planning – Quality costs – Analysis Techniques for Quality Costs – Basic concepts of Total Quality Management – Historical Review – Quality Statements – Strategic Planning, Deming Philosophy – Crosby philosophy – Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen-Obstacles to TQMImplementation

UNIT II: TQM PRINCIPLES **9**

Principles of TQM, Leadership – Concepts – Role of Senior Management – Quality Council, Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits– Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure

UNIT III: STATISTICAL PROCESS CONTROL(SPC) **9**

The seven tools of quality – Statistical Fundamentals – Measures of central Tendency and Dispersion,Population and Sample, Normal Curve, Control Charts for variables X bar and R chart and attributes P, nP, C, and u charts, Industrial Examples, Process capability, Concept of six sigma – New seven Management tools

UNIT IV: TQM TOOLS **9**

Benchmarking – Reasons to Benchmark – Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, and Benefits – Taguchi Quality Loss Function – Total Productive Maintenance (TPM) – Concept, Improvement Needs, and FMEA – Stages of FMEA- Casestudies

UNIT V: QUALITY SYSTEMS **9**

Need for ISO 9000 and Other Quality Systems – ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 9000:2005 (definitions), ISO 9001:2008 (requirements) and ISO 9004:2009 (continuous improvement), TS 16949, ISO 14000, AS9100 – Concept, Requirements and Benefits- Case studies

Total: 45

TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dale H. Besterfiled	Total Quality Management	Pearson Education Inc, New Delhi	2003
2.	James R. Evans and William M. Lidsay,	The Management and Control of Quality	South-Western	2002

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	N. Gupta and B. Valarmathi,	Total Quality Management	Tata McGraw-Hill Publishing Company Pvt Ltd., New Delhi	2009
2	Dr S. Kumar	Total Quality Management,	Laxmi Publications Ltd., New Delhi	2006
3	P. N. Muherjee	Total Quality Management	Prentice Hall of India, New Delhi	2006
4	James R. Evans and William M. Lindsay	The Management and Control of Quality	8th Edition, First Indian Edition, Cengage Learning	2012
5	Suganthi.L and Anand Samuel	Total Quality Management	Prentice Hall (India) Pvt. Ltd	2006

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1. www.nptel.iitm.ac.in/COURSEs/WebCOURSE-contents/IIT-roorkee/industrialengineering/index.htm
2. www.statit.com/services/SPCOverview_mfg.pdf
3. www.3.ha.org.hk/qeh/wiser/doc/7bqt.pdf
4. www.directory.umm.ac.id/Data%20Elmu/pdf/TQMTools.pdf
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		L	T	P	C
23ECE06	**TELE COMMUNICATION SWITCHING NETWORKS**	**3**	**0**	**0**	**3**

Course Objective:

- To introduce fundamentals functions of a telecom switching Systems
- To provide statistical modeling of telephone traffic and characteristics of blocking and queuing system
- To learn the various switching networks
- To introduce the concepts of Digital Switching Systems
- To study signaling, packet switching and networks.

Course Outcomes:

23ECE06.CO1	Describe the Basic Switching concepts of telecommunication.
23ECE06.CO2	Analyze and evaluate fundamental telecommunication traffic models
23ECE06.CO3	Solve problems in switching networks
23ECE06.CO4	Understand the concepts of Digital switching
23ECE06.CO5	Understand the signaling and packet switching techniques

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23ECE06.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23ECE06.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23ECE06.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23ECE06.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23ECE06.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: SWITCHING SYSTEMS **9**

Evolution of Telecommunications; Basics of a Switching System; Functions of a Switching System; Crossbar Switching-Principle of Crossbar Switching; Crossbar Switch Configurations; Cross-Point Technology; Crossbar Exchange Organization; A General Trunking; Electronic Switching; Digital Switching Systems.

UNIT II: TRAFFIC ENGINEERING **9**

Congestion – Network traffic load and Parameters – Traffic measurement – Lost-call system – Grade of Service and Blocking probability – Modeling switching systems – Incoming traffic and service time characterization – Blocking models and loss estimates – Queuing systems – Simulationmodels.

UNIT III: SWITCHING NETWORKS **9**

Single Stage Networks; Gradings-Principle; Two Stage Networks; Three Stage Networks; Four Stage Networks - Gradings – Link systems – Grades of service of link systems – Application of graph theory to link systems – Use of expansion – Call packing – Rearrangeable networks – Strict-sense non-blocking networks –Sectionalized switching networks.

UNIT IV: DIGITAL SWITCHING SYSTEMS **9**

Space and time switching – Time-division switching networks – Grades of service of time-division switching networks-– hybrid time and space division multiplexes – Non-blocking networks – Synchronization – Call-processing functions – Common control – Reliability, availability and security – Stored program control.

UNIT V: SIGNALING AND PACKET SWITCHING **9**

Customer line signaling – FDM carrier systems – PCM signaling – Inter-register signaling – Common-channel signaling principles – CCITT signaling – Digital customer line signaling – Statistical multiplexing – Local area and wide area networks – Large scale and Broadbandnetworks.

Total: 45

TEXT BOOKS

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Thiagarajan Viswanathan	elecommunication Switching Systems and Networks	Prentice Hall of India Pvt.Ltd	2006
2.	William Stallings	ireless Communication and Networks	Pearson Education, New Delhi	Second edition 2004

REFERENCE BOOKS

Sl.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	J.E. . Flood	Telecommunications Switching, Traffic and Networks	Pearson Education Ltd	2006
2.	John C Bellamy	Digital Telephony	John Wiley	3rd Edition, 2000
3.	Behrouz Forouzan	Introduction to Data Communication and Networking	Tata Mc-Graw Hill New York	1996
4.	Tomasi	Introduction to Data Communication and Networking	Pearson Education	1st Edition, 2007
5.	R.A.Thomson	Telephone switching Systems	Artech House Publishers	2000

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2. wwwnptel.ac.in/courses/106105082/20
3. wwwnptel.ac.in/courses/117104104/
4. wwwnptel.ac.in/courses/117101050/25
5. wwwnptel.ac.in/courses/106105080/pdf/M4L1.pdf

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		L	T	P	C
23ECE08	**MOBILE AD-HOC NETWORKS**	**3**	**0**	**0**	**3**

Course Objective:

- To gain knowledge in wireless network protocol and standards.
- To study the MAC, Routing protocols for ad hoc networks.
- To gain knowledge about Network Simulator.
- To learn the concept of security mechanism for wireless networks.
- To study about Characteristics of security protocols

Course Outcomes:

23ECE08.CO1	Demonstratethecurrentad-hoc/sensortechnologiesbyresearchingkeyareassuchas algorithms, protocols and applications
23ECE08.CO2	Identify the major issues associated with ad-hoc/sensor networks and supporting software in ad hoc/sensor networks.
23ECE08.CO3	Create a wireless network scenario and analyze its performance using network simulator
23ECE08.CO4	Choose security component for five layers of networks
23ECE08.CO5	Analyze the characteristics of different security protocols

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23ECE08.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23ECE08.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23ECE08.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23ECE08.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23ECE08.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: INTRODUCTION **9**

Introduction to Ad-Hoc wireless networks- Packet radio networks-Key definitions of ad-hoc and sensor networks- Advantages of ad-hoc and sensor networks -Unique constraints and challenges and Vulnerabilities-Wireless Communications/Radio Characteristics. Applications of Ad-Hoc/Sensor Network and Future Directions: Driving Applications- Ultra wide band radio communication- Wireless fidelity systems-optical wireless networks - Simulation of Wi-Fi using QUALNET simulator.

UNIT II: MEDIA ACCESS CONTROL(MAC) PROTOCOLS **9**

Issues in designing MAC protocols-Bandwidth efficiency-Quality of service support-Synchronization hidden node-exposed node problems. Classifications of MAC protocols: Contention based protocols- MACAW- Media access protocol for wireless LAN-media access with reduced handshake- contention based with reservation mechanisms- Distributed priority-scheduling. Mac protocols using directional antenna. Simulation of 802.11using QUALNET

UNIT III: ROUTING PROTOCOLS **9**

Issues in designing routing protocols-Mobility-bandwidth constraint-Table driven routing protocols: DSDV,WRP, CHGSRP, - On demand routing protocol : AODV,DSR, TORA,LAR,ANODR- zone routing protocol-Fish eye state routing protocol-power aware routing protocol. Simulation of routing protocols using QUALNET simulator.

UNIT IV: WIRELESS SENSOR NETWORKS **9**

Introduction-sensor network architecture-Data dissemination-data gathering-self organizing, MAC Protocols for Sensor Networks - Location discovery- Quality of a Sensor Network - Evolving Standards - Energy efficient issues- Transport layer. Synchronizationissues.

UNIT V: SECURITY ISSUES IN AD HOC /SENSOR NETWORK **9**

Introduction -Need for Security- classification of attack-MAC layer attacks-Network layer attacks-Wired Equivalent Privacy(WEP)-Intrusion prevention scheme- Confidentiality : Symmetric Encryption- DES and Triple DES detection systems- Authentication :Digital Signatures, Certificates, User Authentication, Elliptic Curve Cryptosystems. Intrusion detection systems : behavior based detection knowledge based detection-watch dog-path rater. Reputation based system: CORE, CONFIDENT

Total: 45

TEXT BOOKS

Sl.N.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Siva Ram Murthy C. and Manoj B S,	Ad Hoc Wireless Networks: Architectures and Protocols	Prentice Hall,	2014.
2.	Toh C K,	Ad Hoc Mobile Wireless Networks: Protocols and Systems	Prentice Hall	2008

REFERENCE BOOKS

Sl.N.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Charles Perkins, Addision Wesley,	Ad hoc Networking	Pearson	2008
2.	Toh C.K,	Ad Hoc Mobile wireless Networks : protocol and Systems	Prentice Hall PTR,	2008
3.	Feng zhao, Leonidas Guibas	Wireless sensor network,	Morgan Kaufmann publishers,	2015
4.	Kazem sohraby, Daniel minoli and Taieb Znati,	Wireless sensor networks- Technology, Protocols and Applications	Wiley	2007
5.	T.L.Singhal	Wireless Communication	TMH,	2012

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2. www.nptel.ac.in/courses/106105160/3
3. www.nptel.ac.in/courses/106105080/pdf/M5L7.pdf
4. www.ece.rochester.edu/courses/ECE586/lectures/MANETS_MAC.pdf
5. www.onlinecourses.nptel.ac.in/noc17_cs07/announcements

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23PC-CED11	WATER SUPPLY ENGINEERING	L	T	P	C
		3	0	0	3

Course Objective:

- To make the students conversant with sources, demand and characteristics of water
- To expose the students to understand the concept of various water supply lines.
- To provide adequate knowledge about the water treatment processes.
- To prefer the suitable advanced treatment techniques.
- To provide knowledge on water distribution and plumbing system

Course Outcomes:

23PC- CED11.CO1 Identify the quantity and quality of water from various sources.

23PC- CED11.CO2 Explain the processes involved in the water conveyance systems

23PC- CED11.CO3 Infer the design principles of unit operations and unit processes for water treatment

23PC- CED11.CO4 Justify the suitable advanced treatment techniques for water treatment

23PC- CED11.CO5 Choose the appropriate water distribution network for a city and plumbing systems for a building

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23PC-CED11.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23PC-CED11.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23PC-CED11.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23PC-CED11.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23PC-CED11.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: PLANNING FOR WATER SUPPLY SYSTEM **9**

Public water supply system - Planning - Objectives -Design period - Population forecasting -Water demand - Sources of water and their characteristics - Surface and Groundwater- Impounding Reservoir -Development and selection of source-Water quality - Characterization andstandards.

UNIT II: CONVEYANCE SYSTEM **9**

Water supply -intake structures -Functions and drawings -Pipes and conduits for water- Pipe materials – Hydraulics of flow in pipes -Transmission main design -Laying, jointing and testing of pipes – Drawings appurtenances - Types and capacity of pumps -Selection of pumps and pipe materials.

UNIT III: WATER TREATMENT **9**

Objectives - Unit operations and processes - Principles, functions design and drawing of chemical feeding, Flash mixers, flocculators, sedimentation tanks and sand filters - Disinfection- Residue Management - Construction and Operation & Maintenance aspects of Water Treatment Plants.

UNIT IV: ADVANCED WATER TREATMENT **9**

Principles and functions of Aeration - Iron and manganese removal, Defluoridation and demineralization -Water softening - Desalination - Membrane Systems - Recent advances.

UNIT V: WATER DISTRIBUTION AND SUPPLY TO BUILDINGS **9**

Requirements of water distribution -Components -Service reservoirs - Functions and drawings - Network design - Analysis of distribution networks - Appurtenances -operation and maintenance -Leak detection, Methods. Principles of design of water supply in buildings -House service connection -Fixtures and fittings -Systems of plumbing and drawings of types of plumbing.

Total: 45

TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S.K. Garg	Water Supply Engineering	Khanna Publications Pvt.Ltd. New Delhi.	2010
2	Modi, P.N	Environmental Engineering I	Standard Book House, Delhi	2015

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1	Cpheeco Manual	Manual on Water supply and Treatment	Government of India, New Delhi	2016
2	Birdie.G	Water Supply and Sanitary Engineering	Dhanpat Rai and sons	2011
3	Syed R Qasim, Motley E M	Water Works Engineering – Planning, Design and Operation	Prentice- hall of India, New Delhi,	2013
4	Babbit. H. E., and Donald. J. J	Water Supply Engineering	McGraw Hill book Co	2012

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2. www.sswm.info/content/water-distribution-pipes
3. www.who.int/water_sanitation_health/dwq/S12.pdf
4. www.sswm.info/print/2820?tid=1257
5. www.sswm.info/content/water-distribution-pipes

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		L	T	P	C
23PE-CEE05	**HEALTH MONITORING OF STRUCTURES**	**3**	**0**	**0**	**3**

Course Objective:

- To Study about maintenance and repair of structure
- To impart the quality and durability of concrete
- To Study about special materials for repair of structures.
- To learn about repair and demolition technique.
- To gain the knowledge about rehabilitation and strengthening of structures.

Course Outcomes:

23PE- CEE05.CO1 Obtain the knowledge of maintenance and repair of structures.

23PE- CEE05.CO2 Obtain the knowledge serviceability and durability of concrete

23PE- CEE05.CO3 Select suitable material for repair

23PE- CEE05.CO4 Select appropriate techniques for repair and demolition

23PE- CEE05.CO5 Know about repair, rehabilitation and strengthening of structures.

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
23PE-CEE05.CO1	X	-	X	-	-	-	X	-	-	X	-	-	X	X	X
23PE-CEE05.CO2	X	-	X	-	-	X	X	-	X	-	X	X	-	-	-
23PE-CEE05.CO3	-	X	-	-	X	-	X	-	-	-	X	-	X	X	X
23PE-CEE05.CO4	X	-	-	X	-	X	-	X	-	X	-	X	-	X	-
23PE-CEE05.CO5	-	X	-	X	-	-	-	X	X	-	-	X	X	-	X

UNIT I: MAINTENANCE AND REPAIR STRATEGIES **9**

Maintenance, repair and rehabilitation - Facts of Maintenance - importance of Maintenance various aspects of Inspection-Assessment procedure for evaluating a damaged structure - causes of deterioration - Diagnosis of causesand preventivemeasures.

UNITII: SERVICE ABILITY AND DURABILITY OF CONCRETE **9**

Quality assurance for concrete construction concrete properties - strength, permeability, thermal properties and cracking

Effects due to climate, temperature, chemicals, corrosion - design and construction errors - Effects of cover thickness and cracking.

UNIT III: SPECIAL MATERIALS FOR REPAIR **9**

Special concretes and mortar - concrete chemicals - special elements for accelerated strength gain - Expansive cement - polymer concrete - sulphur infiltrated concrete - ferro cement - Fibre reinforced concrete.

UNITIV: TECHNIQUES FOR REPAIR AND DEMOLITION **9**

Rust eliminators and polymers coating for rebars during repair - foamed concrete - mortar and dry pack - vacuum concrete - Gunite and Shotcrete - Epoxy injection - Mortar repair for cracks - shoring and underpinning - Methods of corrosion protection - corrosion inhibitors - coating and cathodic protection - Engineered demolition techniques for Dilapildated structures - case studies.

UNIT V: REPAIRS, REHABILITATION & STRENGTHENING OF STRUCTURES **9**

Repairs to overcome low member strength - Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure - Strengthening of Super Structures - plating - Conversion tocomposite constructionpost stressing - Jacketing - Reinforcement addition, strengthening the substructures - Increasing the load capacity of footing.

Total: 45

TEXT BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Denison Campbell, Allen and Harold Roper	Concrete Structures, Materials, Maintenance and Repair	Longman Scientific and Technical UK	2006
2.	R.T.Allen and S.C.Edwards	Repair of Concrete structures	Blakie and Sons, UK	2007

REFERENCE BOOKS:

S.No	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr.B Vidivelli	Rehabilitation of Concrete Structures	Standard Publishers Distributors	2013
2.	M.S.Shetty	Concrete Technology - Theory and Practice	S.Chand and Company, New Delhi	2006
3.	M.L. Gambhir	Concrete Technology	Tata McGraw Hill Company, Noida	2011

WEB URLs

1. www.youtube.com/watch?v=fikRPFpbgVo
2. www.brainkart.com/.../Important-Questions-and-Answers--Serviceability-and-Durabil...
3. www.iitk.ac.in/nicee/wcee/article/11_2089.PDF
4. www.brainkart.com/.../Important-Questions-and-Answers--Techniques-for-Repair-an...
5. www.ijiert.org/download-file?file=1490447458_Volume%204%20Issue%203...

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