S.A ENGINEERING COLLEGE, CHENNAI – 77
(An Autonomous Institution Affiliated to Anna University)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
REGULATION-2020
CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABUS

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

1. Graduates shall have professional competency in the field of Computer Science and Engineering for pursuing higher education, research or as entrepreneurs.
2. Graduates shall work in a business environment with ethical standards, leadership qualities and communication necessary for engineering principles.
3. Graduates shall adapt to emerging technologies and respond to the challenges of the environment and society forever.

PROGRAM OUTCOMES (POs):

Engineering Graduates will be able to:

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

2. **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.

3. **Design/development of 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.

4. **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.

5. **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.

6. **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.

7. **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.

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

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

10. **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.

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

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

Apply mathematical foundations, management principles and computational concepts to design and develop efficient solutions for complex technical challenges, adhering to ethical standards and sustainable practices.

Analyze and design computer programs in domains such as algorithms, networking, web development, cloud computing, IoT, machine learning etc., for the development of computer-based systems with varying levels of complexity providing practical, industry-relevant solutions to meet societal and organizational needs.

Mapping of POs/PSOs to PEOs

Contribution 1: Reasonable 2: Significant 3: Strong

	PEOs		
POs	Graduates shall have professional competency in the field of Computer Science and Engineering for pursuing higher education, research or as entrepreneurs.	Graduates shall work in a business environment with ethical standards, leadership qualities and communication necessary for engineering principles.	Graduates shall adapt to emerging technologies and respond to the challenges of the environment and society forever.
1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	2	3
2. **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.	3	2	3
3. **Design/development of 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.	3	2	3
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of	3	3	3

experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
5. **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.	3	2	3
6. **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.	2	2	1

7. **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.	2	1	3
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	3	3	1
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	3	3	2

10. 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.	3	3	3
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	2	3	2
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	3	2	3

PSOs		
1. Apply mathematical foundations, management principles and computational concepts to design and develop efficient solutions for complex technical challenges, adhering to ethical standards and sustainable practices.	3	1
2. Analyze and design computer programs in domains such as algorithms, networking, web development, cloud computing, IoT, machine learning etc., for the development of computer-based systems with varying levels of complexity providing practical, industry-relevant solutions to meet societal and organizational needs.	2	1

MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the Course Outcomes and Programme Outcomes is given in the following table

		Course Title	PROGRAMME OUTCOME(PO)											
			1	2	3	4	5	6	7	8	9	10	11	12
YEAR-I	SEMESTER-I	Technical English								√	√	√		√
		Calculus and its applications	√	√	√						√			
		Applied Physics	√	√	√									
		Engineering Chemistry	√	√	√									
		Problem Solving and Python Programming	√	√	√									
		Engineering Graphics	√	√	√		√			√	√	√		√
		Physics and Chemistry Laboratory	√	√	√					√	√	√		√
		Problem Solving and Python Programming Laboratory	√	√	√		√			√	√	√		√
	SEMESTER-II	English for Communication								√	√	√		√
		Complex Variables and Transforms	√	√	√						√			
		Material Science	√	√	√									
		Basic Electrical, Electronics and Measurement Engineering	√	√	√									
		Programming in C	√	√	√					√	√	√		√
		Fundamentals of Computing	√	√	√					√	√	√		√
		Programming in C Laboratory	√	√	√					√	√	√		√
		Engineering Practice Laboratory	√	√	√	√	√	√		√	√	√		√
		Fundamentals of Computing Laboratory	√	√	√					√	√	√	√	√
		Environmental Science and Engineering	√	√	√				√	√	√	√		√

		PROGRAMME OUTCOME(PO)												
		COURSE TITLE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
YEAR-III	**SEMESTER-III**	Discrete Mathematics	√	√	√						√			
		Object Oriented Programming	√	√	√	√	√				√	√	√	√
		Data Structures	√	√	√	√	√				√	√	√	√
		Digital Principles and System Design	√	√	√									
		Software Engineering	√	√	√		√	√		√	√	√		√
		Object Oriented Programming Laboratory	√	√	√					√	√	√		√
		Data Structures Laboratory	√	√	√					√	√	√		√
		Interpersonal Skills Laboratory								√	√	√		√
	SEMESTER-IV	Probability and Statistics	√	√	√						√			√
		Computer Architecture	√	√	√									
		Database Management Systems	√	√	√	√	√				√	√	√	√
		Design and Analysis of Algorithms	√	√	√						√	√		√
		Universal Human Values						√	√	√				√
		Object Oriented Analysis and Design	√	√	√			√						
		Database Management Systems Laboratory	√	√	√					√	√	√		√
		Design and Analysis of Algorithms Laboratory	√	√	√					√	√	√		√
		Employability And Soft Skills Laboratory	√	√	√					√	√	√		√

		PROGRAMME OUTCOME(PO)												
		COURSE TITLE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
YEAR-III	**SEMESTER-V**	Algebra and Number Theory	√	√	√						√			
		Computer Networks		√			√					√		
		Operating Systems	√	√	√	√	√				√	√	√	√
		Theory of Computation	√	√	√	√	√				√	√	√	√
		Embedded System	√	√	√	√	√				√	√	√	√
		Open Elective I												
		Networks Laboratory	√	√	√					√	√	√		√
		Operating Systems Laboratory	√	√	√					√	√	√		√
	SEMESTER-VI	Internet Programming	√	√	√					√	√	√		√
		Compiler Design	√	√	√	√	√				√	√	√	√
		Artificial Intelligence	√	√	√	√	√				√	√	√	√
		Cryptography and Network Security	√	√	√	√	√				√	√	√	√
		Professional Elective I												
		Internet Programming Laboratory	√	√	√		√			√	√	√		√
		Professional Readiness for Innovation, Employability and Entrepreneurship	√	√	√	√	√	√	√	√	√	√	√	√
		Security Laboratory	√	√	√		√	√		√	√	√		√
		Professional Communication Laboratory						√				√		√

		PROGRAMME OUTCOME(PO)											
YEAR-IV	**SEMESTER-VIII**	**COURSE TITLE**	1	2	3	4	5	6	7	8	9	**10**	**11**	**12**
		Distributed Systems and cloud computing	√	√	√	√	√				√	√	√	√
		Machine Learning	√	√	√	√	√				√	√	√	√
		Principles of Management	√	√	√	√	√	√	√	√	√	√	√	√
		Open Elective II												
		Professional Elective II												
		Professional Readiness for Innovation, Employability and Entrepreneurship	√	√	√	√	√	√	√	√	√	√	√	√
		Cloud Computing Laboratory	√	√	√	√	√				√	√	√	√
		Summer internship	√	√	√	√	√	√	√	√	√	√	√	√
		Machine Learning Laboratory	√	√	√	√	√	√	√	√	√	√	√	√
	SEMESTER–VIII	Professional Elective III												
		ethics Elective IV												
		Project Work-II	√	√	√	√	√	√	√	√	√	√	√	√

PROFESSIONAL ELECTIVES

SEM	COURSE TITLE	PROGRAMME OUTCOME(PO)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
VI	**Cyber Security**	√	√	√	√	√	√		√			√	
	Software Testing	√	√	√		√				√	√		
	Agile Methodologies	√	√	√									

	Graph Theory and Applications	√	√	√									
	Data warehousing and Data mining	√	√	√									
VII	**Service Oriented Architecture**	√	√	√									
	Total Quality Management	√	√	√								√	
	Multi-core Architectures and Programming	√	√	√									
	Human Computer Interaction	√	√	√									
	C# and .Net Programming	√	√	√		√				√	√		
	Wireless Adhoc and Sensor Networks	√	√	√									
	Advanced Topics on Databases	√	√	√									
	Full Stack Web Development	√	√	√	√	√				√	√	√	√
	Human Rights	√	√	√									
	Blockchain Technologies	√	√	√	√	√				√			√
VIII	**Neural Networks and Deep Learning**	√	√	√	√	√	√			√	√	√	√
	Professional Ethics in Engineering						√	√	√	√	√		√
	Big Data Analytics	√	√	√		√				√	√		
	Principles of Programming Languages	√	√	√	√	√	√	√	√	√	√	√	√
	Security and Privacy in Cloud	√	√	√	√	√				√	√	√	√
	Game Development	√	√	√	√	√	√						
	Multimedia and Animation	√	√	√	√	√	√			√	√	√	√
VIII	**UI and UX Design**	√	√	√	√	√				√	√	√	√
	Green Computing	√	√	√									
	Mobile and Pervasive Computing	√	√	√									
	Software Defined Networks	√	√	√	√	√	√	√	√	√	√	√	√
	Digital marketing	√	√	√	√	√				√	√	√	√
	Knowledge Engineering	√	√	√	√	√	√			√	√	√	√
	Ethical Hacking	√	√	√	√	√				√	√	√	√

SEMESTER- I

SL.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	HS1101	Technical English	HS	3	3	0	0	3
2.	MA1101	Calculus and its applications	BS	4	3	1	0	4
3.	PH1101	Applied Physics	BS	3	3	0	0	3
4.	CY1101	Engineering Chemistry	BS	3	3	0	0	3
5.	CS1101	Problem Solving and Python Programming	ES	3	3	0	0	3
6.	ME1101	Engineering Graphics	ES	4	2	0	2	3
7.	TA1101	TamilarMarubu	HSMC	1	0	0	1	1
PRACTICALS:								
8.	BS1101	Physics and Chemistry Laboratory	BS	4	0	0	4	2
9.	CS1102	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
MANDATORY COURSE								
10	CI1101	Indian Constitution	MC	2	2	0	0	0
			TOTAL	31	19	1	11	24

SEMESTER-II

SL.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	HS1201	English for Communication	HS	3	3	0	0	3
2.	MA1201	Complex Variables and Transforms	BS	4	3	1	0	4
3.	PH1201	Materials Science	BS	3	3	0	0	3
4.	EE1202	Basic Electrical, Electronics and Measurement Engineering	ES	3	3	0	0	3
5.	CS1201	Programming in C	PC	3	3	0	0	3
6.	CS1202	Fundamentals of Computing	PC	3	3	0	0	3
7.	TA1201	Tamilar Thozhil Nutpam	HSMC	1	0	0	1	1
PRACTICALS:								
8.	CS1203	Programming in C Laboratory	PC	4	0	0	4	2
9.	GE1201	Engineering Practices Laboratory	ES	4	0	0	4	2
10.	CS1204	Fundamentals of Computing Laboratory	PC	2	0	0	2	1
MANDATORY COURSE								
11.	CY1201	Environmental Science and Engineering	MC	2	2	0	0	0
			TOTAL	32	20	1	11	25

SEMESTER -III

SL.NO	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	MA1303	Discrete Mathematics	BS	4	3	1	0	4
2.	IT1301	Object Oriented Programming	PC	3	3	0	0	3
3.	CS1301	Data Structures	PC	3	3	0	0	3
4.	EC1306	Digital Principles and System Design	ES	3	3	0	0	3
5.	CS1302	Software Engineering	PC	3	3	0	0	3
PRACTICALS:								
6.	IT1302	Object Oriented Programming Laboratory	PC	4	0	0	4	2
7.	CS1303	Data Structures Laboratory	PC	4	0	0	4	2
8.	HS1301	Interpersonal Skills Laboratory	EEC	2	0	0	2	1
			TOTAL	26	15	1	10	21

SEMESTER-IV

SL.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	MA1403	Probability and Statistics	BS	4	3	1	0	4
2.	CS1401	Computer Architecture	PC	3	3	0	0	3
3.	IT1401	Database Management Systems	PC	3	3	0	0	3
4.	CS1402	Design and Analysis of Algorithms	PC	3	3	0	0	3
5.	HV1401	Universal Human Values	ES	3	2	1	0	3
6.	CS1403	Object Oriented Analysis and Design	PC	4	3	0	2	4
PRACTICALS :								
7.	IT1402	Database Management Systems Laboratory	PC	4	0	0	4	2
8.	CS1404	Design and Analysis of Algorithms Laboratory	PC	4	0	0	4	2
9.	HS1401	Employability And Soft Skills Laboratory	EEC	2	0	0	2	1
			TOTAL	30	17	2	12	25

SEMESTER-V

SL.NO	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	MA1501	Algebra and Number Theory	BS	4	3	1	0	4
2.	IT1501	Computer Networks	PC	3	3	0	0	3
3.	CS1501	Operating Systems	PC	3	3	0	0	3
4.	CS1502	Theory of Computation	PC	3	3	0	0	3
5.	EC1515	Embedded System	PC	3	3	0	0	3
6.		Open Elective-I	OE	3	3	0	0	3
PRACTICALS:								
7.	IT1503	Networks Laboratory	PC	4	0	0	4	2
8.	CS1503	Operating Systems Laboratory	PC	4	0	0	4	2
			TOTAL	27	18	1	8	23

SEMESTER -VI

SL.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	CS1601	Internet Programming	PC	3	3	0	0	3
2.	CS1602	Compiler Design	PC	3	3	0	2	4
3.	CS1603	Artificial Intelligence	PC	3	3	0	0	3
4.	CS1604	Cryptography and Network Security	PC	3	3	0	0	3
5.		Professional Elective-I	PE	3	3	0	0	3
PRACTICALS:								
6.	CS1605	Internet Programming Laboratory	PC	4	0	0	4	2
7.	ECS1601	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	4	0	0	6	0
8.	CS1606	Security Laboratory	PC	4	0	0	4	2
9.	HS1601	Professional Communication Laboratory	EEC	2	0	0	2	1
			TOTAL	29	15	0	18	21

SEMESTER-VII

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	IT1701	Distributed Systems and Cloud Computing	PC	3	3	0	0	3
2.	CS1701	Machine Learning	PC	3	3	0	0	3
3.	MG1701	Principles of Management	HS	3	3	0	0	3
4.		Open Elective-II	OE	3	3	0	0	3
5.		Professional Elective-II	PE	3	3	0	0	3
PRACTICALS:								
6.	CS1702	Machine Learning Laboratory	PC	0	0	0	4	2
7.	CS1703	Summer Internship	EEC	0	0	0	0	2
8.	IT1702	Cloud Computing Laboratory	PC	4	0	0	4	2
8.	ECS1601	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	1	0	0	1	3
			TOTAL	20	15	0	5	24

SEMESTER-VIII

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.		Professional Elective-III	PE	3	3	0	0	3
2.		Professional Elective-IV	PE	3	3	0	0	3
PRACTICALS:								
3.	CS1801	Project Work	PC	6	0	0	6	10
			TOTAL	12	6	0	6	16

TOTAL NO. OF CREDITS: 179

HUMANITIES AND SOCIAL SCIENCES (HS)

	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS1101	Technical English	HS	3	3	0	0	3
3.	HS1201	English for Communication	HS	3	3	0	0	3
4.	MG1701	Principles of Management	HS	3	3	0	0	3

BASIC SCIENCES (BS)

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA1101	Calculus and its applications	BS	4	3	1	0	4
2.	PH1101	Applied Physics	BS	3	3	0	0	3
3.	CY1101	Engineering Chemistry	BS	3	3	0	0	3
4.	BS1101	Physics and Chemistry Laboratory	BS	4	0	0	4	2
5.	MA1201	Complex Variables and Transforms	BS	4	3	1	0	4
6.	PH1201	Material Science	BS	3	3	0	0	3
7.	MA1303	Discrete Mathematics	BS	4	3	1	0	4
8.	MA1403	Probability and Statistics	BS	4	3	1	0	4
9.	MA1501	Algebra and Number Theory	BS	4	3	1	0	4

ENGINEERING SCIENCES (ES)

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CS1101	Problem Solving and Python Programming	ES	3	3	0	0	3
2.	ME1101	Engineering Graphics	ES	4	2	0	2	3
3.	EE1202	Basic Electrical, Electronics and Measurement Engineering	ES	3	3	0	0	3
4.	CS1102	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
5.	GE1201	Engineering Practices Laboratory	ES	4	0	0	4	2
6.	EC1306	Digital Principles and System Design	ES	3	3	0	0	3
7.	HV1401	Universal Human Values	ES	3	2	1	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS1301	Interpersonal Skills Laboratory	EEC	2	0	0	2	1
2.	HS1401	Employability And Soft Skills Laboratory	EEC	2	0	0	2	1
3.	HS1601	Professional Communication Laboratory	EEC	2	0	0	2	1
4.	CS1703	Summer Internship	EEC	0	0	0	0	2
5.	ECS1601	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	4	0	0	1	3

PROFESSIONAL CORE (PC)

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CS1201	Programming in C	PC	3	3	0	0	3
2.	CS1202	Fundamentals of Computing	PC	3	3	0	0	3
3.	CS1203	Programming in C Laboratory	PC	4	0	0	4	2
4.	CS1204	Fundamentals of Computing Laboratory	PC	2	0	0	2	1
5.	IT1301	Object Oriented Programming	PC	3	3	0	0	3
6.	CS1301	Data Structures	PC	3	3	0	0	3
7.	CS1302	Software Engineering	PC	3	3	0	0	3
8.	IT1302	Object Oriented Programming Laboratory	PC	4	0	0	4	2
9.	CS1303	Data Structure Laboratory	PC	4	0	0	4	2
10.	CS1401	Computer Architecture	PC	3	3	0	0	3
11.	IT1401	Database Management Systems	PC	3	3	0	0	3
12.	CS1402	Design and Analysis of Algorithms	PC	3	3	0	0	3
13.	CS1403	Object Oriented Analysis and Design	PC	4	3	0	2	4
14.	IT1402	Database Management Systems Laboratory	PC	4	0	0	4	2
15.	CS1404	Design and Analysis of Algorithms Laboratory	PC	4	0	0	4	2
16.	IT1501	Computer Networks	PC	3	3	0	0	3

17.	CS1501	Operating Systems	PC	3	3	0	0	3
18.	CS1502	Theory of Computation	PC	3	3	0	0	3
19.	EC1515	Embedded System	PC	3	3	0	0	3
20.	IT1503	Networks Laboratory	PC	4	0	0	4	2
21.	CS1503	Operating Systems Laboratory	PC	4	0	0	4	2
22.	CS1601	Internet Programming	PC	3	3	0	0	3
23.	CS1602	Compiler Design	PC	3	3	0	2	4
24.	CS1603	Artificial Intelligence	PC	3	3	0	0	3
25.	CS1604	Cryptography and Network Security	PC	3	3	0	0	3
26.	CS1605	Internet Programming Laboratory	PC	4	0	0	4	2
27.	CS1606	Security Laboratory	PC	4	0	0	4	2
28.	IT1701	Distributed Systems and Cloud Computing	PC	3	3	0	0	3
29.	CS1701	Machine Learning	PC	3	3	0	0	3
30.	IT1702	Cloud Computing Laboratory	PC	4	0	0	4	2
31.	CS1702	Machine Learning Laboratory	PC	0	0	0	4	2
32.	CS1801	Project Work	PC	6	0	0	6	10

PROFESSIONAL ELECTIVES
ELECTIVE-I

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	CS1607	Cyber Security	PE	3	3	0	0	3
2.	CS1608	Software Testing	PE	3	3	0	0	3
3.	CS1609	Agile Methodologies	PE	3	3	0	0	3
4.	CS1610	Graph Theory and Applications	PE	3	3	0	0	3
5.	CS1611	Data warehousing and Data mining	PE	3	3	0	0	3

ELECTIVE-II

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	CS1704	Service Oriented Architecture	PE	3	3	0	0	3
2.	CS1705	Total Quality Management	PE	3	3	0	0	3
3.	CS1706	Multi-core Architectures and Programming	PE	3	3	0	0	3
4.	CS1707	Human Computer Interaction	PE	3	3	0	0	3
5.	CS1708	C# and .Net Programming	PE	3	3	0	0	3
6.	CS1709	Wireless Adhoc and Sensor Networks	PE	3	3	0	0	3
7.	CS1710	Advanced Topics on Databases	PE	3	3	0	0	3
8.	CS1711	Full Stack Web Development	PE	3	3	0	0	3
9.	CS1712	Human Rights	PE	3	3	0	0	3
10.	CS1713	Blockchain Technologies	PE	3	3	0	0	3

ELECTIVE-III

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	GE1801	Professional Ethics in Engineering	PE	3	3	0	0	3
2.	CS1802	Neural Networks and Deep Learning	PE	3	3	0	0	3
3.	CS1803	Big Data Analytics	PE	3	3	0	0	3
4.	CS1804	Principles of Programming Languages	PE	3	3	0	0	3
5.	CS1805	Security and Privacy in Cloud	PE	3	3	0	0	3
6.	CS1806	Game Development	PE	3	3	0	0	3
7.	CS1807	Multimedia and Animation	PE	3	3	0	0	3

ELECTIVE-IV

Sl.NO.	SUBJECT CODE	SUBJECT	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY:								
1.	**CS1808**	**UI and UX Design**	**PE**	**3**	**3**	**0**	**0**	**3**
2.	**CS1809**	**Green Computing**	**PE**	**3**	**3**	**0**	**0**	**3**
3.	**CS1810**	**Mobile and Pervasive Computing**	**PE**	**3**	**3**	**0**	**0**	**3**
4.	**CS1811**	**Software Defined Networks**	**PE**	**3**	**3**	**0**	**0**	**3**
5.	**CS1812**	**Digital Marketing**	**PE**	**3**	**3**	**0**	**0**	**3**
6.	**CS1813**	**Knowledge Engineering**	**PE**	**3**	**3**	**0**	**0**	**3**
7.	**CS1814**	**Ethical Hacking**	**PE**	**3**	**3**	**0**	**0**	**3**

SUMMARY

SL.NO	Subject Area	Credits per semester								Credits total	Percentage
		I	II	III	IV	V	VI	VII	VIII		
1.	**HS**	**3**	**3**					**3**		**9**	**5.02**
2.	**BS**	**12**	**7**	**4**	**4**	**4**				**31**	**17.3**
3.	**ES**	**8**	**5**	**3**	**3**					**19**	**10.6**
4.	**PC**		**9**	**13**	**17**	**16**	**17**	**10**	**10**	**92**	**51.39**
5.	**PE**						**3**	**3**	**6**	**12**	**6.70**
6.	**OE**					**3**		**3**		**6**	**3.351**
7.	**EEC**			**1**	**1**		**1**	**5**		**8**	**4.469**
8.	**MC**										
9.	**HS MC**	**1**	**1**							**2**	**1.11**
TOTAL		**24**	**25**	**21**	**25**	**23**	**21**	**24**	**16**	**179**	

HS1101	TECHNICAL ENGLISH	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Nurture their ability in technical writing like to prepare professional job applications and effective reports.
- Develop their speaking skills by participating in various speaking activities.
- Strengthen their listening skill to comprehend lectures and talks in their areas of specialization.
- Improve their ability to explicit their excellence in all modes of technical communication.

UNIT I		9

Reading- Reading short texts Listening- Listening to different formal / informal conversations Writing- Instructions, Jumbled sentences Speaking- Self introduction Language development- Parts of speech, Prepositions Vocabulary development- Word formation- root words from foreign language and their use in English.

UNIT II		9

Reading-Skimming and Scanning to find specific information Listening- Listening to INK talks Writing- Job Application – cover letter, resume writing Speaking- Asking and Giving directions Language development- Conjunctions, Types of Nouns Vocabulary development- Prefixes and Suffixes.

UNIT III		9

Reading- Reading for predicting the content Listening- Listening to situational short talks Writing- Types of paragraphs- Descriptive/Analytical/ compare and contrast Speaking- Mini presentations, Expressing greeting and thanks Language development- Adjectives, Numerical Adjectives, Conditional Clauses Vocabulary development- Homophones, Homonyms.

UNIT IV		9

Reading- Practice in speed reading Listening- Listening to short texts and fill the data Writing- Interpretation of Graphics / Information, Note making Speaking-Contributing for Group Discussion Language development- Active, Passive, Impersonal passive voice Vocabulary development- Definitions, Nominal Compounds.

UNIT V		9

Reading- Reading short stories Listening- Listening for note taking Writing- Report writing, E-mail Writing Speaking- Picture descriptions, Speaking in familiar situations Language development- Tenses Vocabulary development- British and American Vocabulary.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Exhibit the memory of the previously learnt grammatical concepts and apply them in technical contexts.
- Indicate the professional proficiency by preparing the formal correspondence with global standards.
- Infer information and interrelate the technical and general texts.
- Relate verbal and technical information concisely with coherence and cohesion.
- Identify and construct appropriate statements representing the global situations.

TEXT BOOKS:

1. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.
2. Board of editors. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2016.

REFERENCES:

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
3. Darlene Smith-Worthington, Sue Jefferson, Technical writing for Success, South-Western Cengage Learning,USA-2011
4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007
5. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014
6. Swan Michael, Practical English Usage. Oxford University Press, Eighth impression 2002.

MA1101	CALCULUS AND ITS APPLICATIONS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To understand the concepts of limits, continuity, differentiation and use it to find maxima and minima of functions of one variable.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations of first and second order that model in various engineering problems.
- To familiarize the student with functions of several variables that is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I	DIFFERENTIAL CALCULUS	12

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules Maxima and Minima of functions of one variable.

UNIT II	ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER WITH APPLICATIONS	12

Basic concepts- Separable differential equations - Exact differential equations - Integrating factors - Linear differential equations - Bernoulli's equation - Geometric Applications- Orthogonal trajectories - Physical Applications - Simple electronic circuits-Newton law of cooling-Heat flow-Rate of decay of radioactive materials-Chemical reaction and solutions.

UNIT III	DIFFERENTIAL EQUATIONS	12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

UNIT IV	FUNCTIONS OF SEVERAL VARIABLES	12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maximum and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V	MULTIPLE INTEGRALS	12

Double integrals – Change of order of integration – Double integrals in polar co-ordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Acquire the basic concepts of differentiation rules to find the maxima and minima for function of one variable.
- Attain the knowledge of basic application problems involved in first order differential equation.
- Compute the solution of second order linear differential equations with constant coefficients.
- Explore the concept of ordinary derivatives into partial derivatives and apply them to find extreme values of the functions of two variables and series approximation of the function of two variables.
- Identify the double and Triple integration techniques over a region in two dimensional and three-dimensional geometry.

TEXTBOOKS:

1. Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 2016.

REFERENCES:

1. Bali,N.P., Goyal,M.,Watkins,C.,Advanced Engineering Mathematics, Laxmi Publications Pvt. Limited, 2007.
2. Boyce,W.E.,andDiPrima,R.C., Elementary Differential Equations and Boundary Value Problems, Wiley India, 2012.
3. O'Neil. P. V., "Advanced Engineering Mathematics", 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2011.
4. T.Veerarajan, Engineering Mathematics, Mc Grawhill Publications, New Delhi 2017.

PH1101	APPLIED PHYSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I	PROPERTIES OF MATTER	9

Elasticity- plasticity – Different Types of Stress and Strain- concept of stress-strain diagram and its application - three types of modulus of elasticity- Poisson's Ratio – Bending of beams- Expression for bending moment –- young's modulus uniform and Non uniform bending : Theory and Experiment – I Shape girders – Torsional oscillation Theory and Experiment- Application of Elastic Materials.

UNIT II	**APPLIED OPTICS**	**9**

Laser : characteristics of laser - Principle of spontaneous emission and stimulated emission – Laser action – Einstein A & B coefficients - Population inversion - Pumping – Basic requirement of laser – Types of laser : Nd-YAG and CO_2 – Applications : Welding , Drilling & Cutting – Medical field Fiber optics: Introduction- Principle and propagation of light – Numerical aperture and acceptance angle – classification of optical fibers – Losses in optical fibers(Qualitative) – Fiber optics communication system (Block Diagram) – Advantages with fiber optic communication system.

UNIT III	**THERMAL PHYSICS**	**9**

Modes of heat transfer- thermal conduction, convection and radiation – Specific heat capacity- thermal conductivity- Newton's law of cooling - Searle's and Lee's disc methods: theory and experiment - conduction through compound media (series and parallel) – thermal expansion of solids, liquids and gases - Applications: heat exchangers, refrigerators and solar water heaters.

UNIT IV	**WAVE AND PARTICLE PHYSICS**	**9**

Inadequacy of Classical Mechanics - Development of quantum theory- Planck's Black body radiation and Distribution Laws(Qualitative) – Compton Effect (Derivation) - De Broglie wavelength – properties of matter waves – Experimental Verification (G.P Thomson experiment) – Heisenberg's uncertainty principle - Schrodinger's wave equation – time dependent – time independent wave equations – physical significance of Wave function – applications: particle in a one dimensional potential box**.**

UNIT V	**CRYSTALOGRAPHY**	**9**

Single crystalline, polycrystalline and amorphous materials Lattice - unit cell- Crystal systems- Bravais lattices- Lattice planes- Miller indices- Interplanar- d- Spacing in cubic Lattice- calculation of number of atoms per unit cell – atomic radius – packing factor for SC, BCC, FCC and HCP structures- Crystal Defects – types.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- The students will gain knowledge on the basics of properties of matter and its applications
- Use the concepts of waves and optical devices and their applications in Laser and fiber optics
- The students will understand the properties of thermal materials and its applications
- The students will get knowledge on advanced physics concepts of quantum theory and its application in one dimensional box
- The students will understand the different types of crystals structures and different crystal growth techniques.

TEXT BOOKS:

1. Gupta S.L. and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai Publishers, 2015.

2. R. K. Gaur and S.C. Gupta, Engineering Physics, Dhanpat Rai Publication (P) Ltd, New Delhi, 2014.
3. Bhattacharya, D.K. and Poonam, T. Engineering Physics, Oxford University Press, 2015.

REFERENCES:

1. C. Kittel , Introduction to Solid State Physics 8th Edition , Wiley Eastern Ltd,2004.
2. Halliday, D., Resnick, R. and Walker, J. Principles of Physics. Wiley, 2015.
3. Tipler, P.A. and Mosca, G. Physics for Scientists and Engineers with Modern Physics, W.H.Freeman, 2007.
4. Einstein coefficient calculation,https://youtu.be/TvfiZHXUtXg(Video lecture)
5. Lattice structures, https://youtu.be/Rm-i1c7zr6Q(Video lecture)

CY1101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and Two component systems and appreciate the purpose and significance of alloys.
- It enables the students to gain information about Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells
- It deals with the information about the types of fuels, calorific value calculations and manufacture of solid, liquid and gaseous fuels.
- To impart knowledge about the nano materials synthesis, properties and applications

UNIT I	WATER TREATMENT AND TECHNOLOGY	9

Introduction – characteristics, Water quality parameters -hardness– types, Determination-EDTA method, Alkalinity ,boiler feed water requirements-boiler troubles – scale & sludge -Caustic Embrittlement, boiler explosion -softening of hard water - external treatment process - demineralization and zeolite, internal treatment - boiler compounds (phosphate, calgon, carbonate and colloidal conditioning methods) – desalination of brackish water –reverse osmosis.

UNIT II	PHASE RULE AND ALLOYS	9

Phase rule: Introduction, definition of terms with examples, One Component System- water system,Sulphur,CO2 system, Thermal Analysis and cooling curves, Reduced phase rule - Two Component Systems- classification – lead-silver system-problems. Alloys: Introduction- Definition- Properties of alloys- Significance of alloying, Functions and effect of alloying elements- Ferrous alloys- Nichrome and Stainless steel – heat treatment of steel.

UNIT III	ENERGY SOURCES AND STORAGE DEVICES	9

Energy – Types – Non-renewable energy - Nuclear energy -renewable energy - solar energy conversion - solar cells. Introduction to Electrochemistry, Nernst Equation-Electrochemical cells – reversible and irreversible cells –Cell construction and representation - Batteries -types of batteries – characteristics – construction and working of primary battery (dry cell) - secondary battery(lithium-ion-battery) - fuel cells (H2-O2).

UNIT IV	FUELS AND COMBUSTION	9

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal- analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) – petroleum- manufacture of synthetic petrol (Bergius process)- knocking- octane number – diesel oil- cetane number – natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG) producer of fuels: introduction- theoretical calculation of calorific value- ignition temperature- explosive range – flue gas analysis (ORSAT Method).

UNIT V	**NANOCHEMISTRY**	**9**

Basics - distinction between nanoparticles and bulk materials; size- dependent properties, Nano cluster, Nano rod, nanotube(CNT)-Types of CNT and nanowire. Synthesis: precipitation, thermolysis, chemical vapour deposition, Properties, Characterization and applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Explain the hardness of water, related problems and its treatment.
- Apply phase rule to construct phase diagram and predict the low melting alloys.
- Illustrate conventional and non-conventional energy sources and basics of electrochemistry, Types of batteries, their reactions and the importance.
- Explain various fuels and its applications based on its calorific value.
- Comprehend the basics, types, preparation methods and recent trends in nanomaterial.

TEXT BOOKS:

1. Jain P.C. and Monica Jain, "Engineering Chemistry", DhanpatRai Publishing Company (P) Ltd., New Delhi, 2010.

REFERENCES:

1. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
3. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.

CS1101	**PROBLEM SOLVING AND PYTHON PROGRAMMING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I	**ALGORITHMIC PROBLEM SOLVING**	**9**

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards and guess an integer number in a range, Towers of Hanoi.

UNIT II	**DATA EXPRESSIONS, STATEMENTS**	**9**

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III	**CONTROL FLOW, FUNCTIONS**	**9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV	**LISTS, TUPLES, DICTIONARIES**	**9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

UNIT V	**FILES, MODULES, PACKAGES &TURTLE**	**9**

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file- Case study: Simple Graphics using Turtle: Draw a Random Pattern of Circle, Square and Rectangle; Draw a Pattern of Straight Lines, Plotting Graphs in Python: Menu Driven Program to Create Mathematical 3D Objects.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Understand the basic of algorithmic problem solving.
- Illustrate Python programs with data expressions and statements.
- Apply Python control flow and python functions
- Apply Python data structures like list, tuples and dictionaries.
- Implement file concepts to read and write data from/to files.

TEXT BOOKS:

1. Allen B. Downey, `Think Python: How to Think Like a Computer Scientist', 2nd edition, Updated for Python Shr off/ O'Reilly Publishers, 2016(http://greenteapress.com/wp/thinkpython/)
2. Reema Thareja, Problem Solving and Programming with python, 2nd edition, Oxford University press, 2019.
3. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press, 2013.

3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.

ME1101	ENGINEERING GRAPHICS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications –Use of drafting instruments – BIS conventions and specifications – Size and layout of drawing sheets – Lettering and dimensioning.

UNIT I	PLANE CURVES AND ORTHOGRAPHIC PROJECTIONS	12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization principles – Layout of views- Orthographic projection of multiple views(Free Hand Sketching) from pictorial views of objects-Principal planes-Projection of points-Demo using CAD software for above topics.

UNIT II	PROJECTION OF POINTS STRAIGHT LINES AND PLANE SURFACES	12

Orthographic projections-principles-Principal planes-First angle projection-Projection of points-Projection of straight lines (only First angle projections) inclined to one of the principal planes - Determination of true lengths and true inclinations - Projection of planes (polygonal and circular surfaces) inclined to one of the principal planes - Demo using CAD software for above topics.

UNIT III	PROJECTION OF SOLIDS	12

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method-Demo using CAD software for above topics.

UNIT IV	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	12

Sectioning of above solids in simple vertical position - the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones-Demo using CAD software for above topics.

UNIT V	ISOMETRIC AND PERSPECTIVE PROJECTIONS	12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple

vertical positions –Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method-Demo using CAD software for above topics.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of this course, the student will be able to

- Understand existing national standards of engineering drawing and visualization concepts.
- Understand the projection of Points, Lines and Plane surfaces.
- Understand the projection of Solids.
- Understand the section of solids.
- Understand the development of surfaces.

TEXT BOOKS:

1. NatrajanK.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers,Chennai,2009.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

REFERENCES:

1. Bhatt N.D. and PanchalV.M., "Engineering Drawing", Charotar Publishing House, 50th Edition,2010.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores,Bangalore, 2007.
4. Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi,2005.
5. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, NewDelhi, 2015.
6. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2ndEdition, 2009.

TA1101	**HERITAGE OF TAMILS**	L	T	P	C
		1	**0**	**0**	**1**

UNIT I	**LANGUAGE AND LITERATURE**	**3**

Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II	**HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	**3**

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III	FOLK AND MARTIAL ARTS	3
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils		
UNIT IV	**THINAI CONCEPT OF TAMILS**	**3**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas		
UNIT V	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	**3**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		
TOTAL : 15 PERIODS		

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலொறு – மக்களும் பண் பொடும் – கக.கக. பிள்ளள (தவளியீடு:
2. தமிழ் நொடு பொடநூல் மற்றும் கல் வியியல் பணிகள் கழகம்).
3. கணினித் தமிழ் – முளனவர் இல. சுந்தரம் . (விகடன் பிரசுரம்).
4. கீழடி – ளவளக நதிக்களரயில் சங் ககொல நகர நொகரிகம் (ததொல் லியல் Fளற தவளியீடு)
5. தபொருளந – ஆற்றங் களர நொகரிகம் . (ததொல் லியல் Fளற தவளியீடு)
6. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
7. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
8. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
9. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
10. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation,
11. Tamil Nadu)
12. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
13. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
14. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

BS1101	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

PHYSICS LABORATORY

COURSE OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. Determination of wavelength, and particle size using Laser
4. Determination of acceptance angle in an optical fiber.
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
7. Determination of wavelength of mercury spectrum – spectrometer grating
8. Determination of band gap of a semiconductor
9. Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS

CHEMISTRY LABORATORY

COURSE OBJECTIVES:

- Understand and apply fundamental concepts of mechanical properties analysis.
- Understand the fundamental principles of acoustic properties, and learn about semiconductor properties.
- Understand and learn about the fundamental principles of optical properties analysis.

LIST OF EXPERIMENTS (Any seven experiments to be conducted)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of TDS of water sample.
5. Determination of strength of acids in a mixture of acids using conductivity meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Conductometric titration of strong acid vs strong base.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

- Understand and apply fundamental concepts of mechanical properties analysis.
- Understand the fundamental principles of acoustic properties, and learn about semiconductor properties.
- Understand and learn about the fundamental principles of optical properties analysis.
- Apply hands-on knowledge in the quantitative chemical analysis of water.
- Carry out the basics of instrumental analysis-conductivity meter, and potentiometer.

CS1102	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To study python programs with conditionals and loops
- To use functions for python structured programs.
- Use strings for structuring Python programs.
- Represent compound data using Python lists, tuples and dictionaries.
- To read and write data from and to files in python.

LIST OF EXPERIMENTS:

1. Write a program to display the largest number among three numbers.
2. Write a program to display the Fibonacci series by using looping constructs.
3. Write a function to compute the GCD of two numbers.
4. Explore String Functions
5. With the help of strings, array or list, display a simple calendar in python program without using the calendar module.
6. With the help of list perform linear search and Binary search.
7. Write a program to perform Selection sort, Insertion sort, Merge sort
8. Create a text file using python file I/O. Read the content of the file and change them from lower to upper case characters.
9. Programs that take command line arguments (word count)
10. Find the most frequent words in a text read from a file
11. Simulate bouncing ball using Pygame

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 terminals

SOFTWARE: Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the student should be able to

- Design simple programs using conditionals and loops.
- Implement functions to solve mathematical problems.
- Use strings for structuring Python programs.
- Summarize compound data using Python lists, tuples, and dictionaries.
- Implement file concepts to write programs to read and write datas.

CI1101	INDIAN CONSTITUTION	L	T	P	C
		2	0	0	0

Prerequisites: Basic law.

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this

power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India have played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

HS1201	ENGLISH FOR COMMUNICATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Improve their language ability to improve the four basic skills of communication (LSRW).
- Enhance the skills and methods to enrich their reading and comprehending ability.
- Strengthen their skills to listen to the lectures and talks related to their fields of studies.
- Foster their ability to write effectively in all contexts.

- Cultivate their oral presentation skills through technical presentations and contribution in group discussions.

UNIT I		**9**

Reading- Reading for detailed comparison Listening- Listening to interviews Writing- Developing hints, summarizing Speaking- Talk about future plans, arrangements intensions Language development- Sentence structures Vocabulary development- Synonyms, Antonyms, Adverbs

UNIT II		**9**

Reading-Extended reading Listening- Listening to telephonic conversations Writing- Formal Letter Writing - Letters for bona fide certificate - to the principal for permission for in plant training, industrial visit, paper presentations, inter college events, Letter to the Editor, Recommendations Speaking- Formal conversation Language development-Use of Punctuation, Modal verbs Vocabulary development- One word substitutes, Common Phrasal verbs

UNIT III		**9**

Reading- Identify topic sentences by reading a short story Listening- Listening to TED talks Writing- Process/product description Speaking- Formal Conversations Language development-Relative Clauses, Concord, Error correction Vocabulary development- Idioms & Phrases, Minimal pair.

UNIT IV		**9**

Reading- Reading newspaper articles Listening- Listening to inspirational speeches Writing- Essays, Checklist Speaking- Technical Presentations Language development- Degrees of Comparison Vocabulary development- Articles, Cause and Effect Expressions

UNIT V		**9**

Reading- Close reading Listening- Listening for summarizing Writing- Dialogue conversations Speaking- Movie/ Book Review Language development- Wh Questions, Yes/ no Questions Vocabulary development- Foreign Expressions and its applications, Reference words

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Sketch brief technical and general texts using appropriate diction.
- Express various styles of drafts in formal and informal contents.
- Inter relate the verbal and technical skills in the given technical contexts.
- Construct meaningful utterances to present intense technical knowledge.
- Interpret key ideas by reviewing lexicon across the language in syntactical contexts.

REFERENCES:

1. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014
2. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
4. Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013
5. Means,L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning
   USA: 2007.

RECCOMENDED WEBSITES:

TED.com
learningenglish.voanews.com
islcollective.com
examenglish.com
englishclass101.com

MA1201	COMPLEX VARIABLES AND TRANSFORMS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- Understand the concept of Divergence and curl and use it in evaluating Line, Surface and Volume integrals.
- Understand C-R equations and use it in the construction of Analytic Functions.
- Understand the methods of Complex Integration using Cauchy's Integral Formula and Cauchy Residue theorem, finding Taylor's and Laurent's Series expansions.
- Find the Laplace Transforms of standard Functions and to find the Inverse Laplace Transform of a function and use it in solving Differential Equations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems

UNIT I	VECTOR CALCULUS	12

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral – Area of a curved surface – Volume integral – Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals-simple applications involving cubes and rectangular parallelopipeds.

UNIT II	ANALYTIC FUNCTIONS	12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions (w 1 z , wz^2, we^z, w sinhz, w coshz) – Bilinear transformation.

UNIT III	COMPLEX INTEGRATION.	12

Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT IV	LAPLACE TRANSFORMS	12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem –Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

UNIT V	Z - TRANSFORMS AND DIFFERENCE EQUATIONS	12

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of this course, the student will be able to

- "Understanding the concept of divergence and curl to calculate the line, surface and volume integrals using vector integration."
- Solve the problems under analytic functions and construction of analytic function using C-R equation.

- Classify the singularities and pole, find residues and evaluate complex integrals using residue theorem.
- Understand the concepts of Laplace Transforms and its properties and to solve the differential equations.
- Using the properties of Z-transform and solve the difference equation.

TEXTBOOKS:

1. Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 2016.

REFERENCES:

1. Bali,N.P.,Goyal,M.,Watkins,C.,AdvancedEngineeringMathematics,Laxmi Publications Pvt. Limited, 2007.
2. Boyce,W.E.,and DiPrima, R.C.,Elementary Differential Equation sand Boundary Value Problems, Wiley India, 2012.
3. O'Neil. P. V."Advanced Engineering Mathematics", 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2011.
4. 4.T. Veerarajan, Engineering Mathematics, Tata Mcgraw Hill publications co. ltd, New Delhi.2017.

PH1201	MATERIAL SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To enrich the understanding of various types of materials and their applications in engineering and technology.

UNIT I	CONDUCTING MATERIALS	9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity –Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states –carrier concentration in metals.

UNIT II	SEMICONDUCTING MATERIALS	9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination –Elemental and Compound Semiconductors – N-type and P-type semiconductor (Qualitative) – Hall effect –Determination of Hall coefficient – Applications.

UNIT III	MAGNETIC AND SUPERCONDUCTING MATERIALS	9

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism –Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials –Ferrites and its applications. Electro static Discharge (ESD)-Superconductivity: properties – Type I and Type II superconductors–BCS theory of superconductivity (Qualitative) - High Tc superconductors – Electrical, medical, magnetic and computer application of superconductors.

UNIT IV	DIELECTRIC MATERIALS	9

Electrical susceptibility – dielectric constant – electronic, ionic, orientation and space charge polarization – frequency and temperature dependence of polarisation – Clausius mosotti relation - dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer).

UNIT V	ADVANCED ENGINEERING MATERIALS	9

Metallic glasses - melt spinning process, applications - shape memory alloys: Ni-Ti alloy, applications – nano materials: preparation (bottom up and top down approaches), properties and applications- Bio materials – introduction- properties of bio materials-examples- medical applications- Ophthalmology- bio sensors- characteristics.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Understand the fundamental principles of conducting materials and analyze their behavior under varying temperature conditions.
- Gain knowledge on semiconductor physics, including carrier concentration, and apply it to the design and analysis of semiconductor devices.
- Understand the properties of magnetic and superconducting materials, and apply their concepts in practical engineering systems
- Gain knowledge on polarization mechanisms in dielectric materials and its applications
- Understand the properties and applications of advanced nano materials and biomaterials for various engineering applications.

TEXT BOOKS:

1. S.Mohan, Principles of Materials Science, MJP Publishers, 2018.
2. Jasprit Singh, Semiconductor Devices, Basic Principles, Wiley 2012.
3. Umesh K Mishra and Jasprit Singh, Semiconductor Device Physics and Design‖, Springer, 2008.

REFERENCES:

1. Wahab, M.A. Solid State Physics: Structure and Properties of Materials‖, Narosa Publishing House, 2009.
2. William D.Callister Jr, David G. Rethwisch, Materials Science and Engineering, An Introduction, Wiley India (P) Ltd., 8th Edition, 2009.
3. Pillai S.O., Solid State Physics, New Age International (P) Ltd., Publishers, 2009.
4. Semiconductor Introduction, https://youtu.be/k6ZxP9Yr02E(Video lecture)
5. Superconductivity, https://youtu.be/D-9M3GWOBrw(Video lecture)

EE1202	BASIC ELECTRICAL, ELECTRONICS & MEASUREMENT ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamental laws, theorems of electrical circuits and also to analyze them
- To study the basic principles of electrical machines and their performance
- To study the different energy sources, protective devices and their field applications
- To understand the fundamentals of electronic circuit constructions
- To understand the principles and operation of measuring instruments and transducers

UNIT I	ELECTRICAL CIRCUITS ANALYSIS	9

Ohms Law, Kirchhoff‘s Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems –Thevenin’s theorem, Norton theorem and superposition theorem, three phase supply-Instantaneous, Reactive and apparent power-star delta conversion.

UNIT II	ELECTRICAL MACHINES	9

DC and AC rotating machines: Types, Construction, principle, Emf and torque equation, application - Speed Control- Basics of Stepper Motor – Brushless DC motors- Transformers-Introduction- types and construction, working principle of Ideal transformer-Emf equation

UNIT III	UTILIZATION OF ELECTRICAL POWER	9

Overview of "Renewable Energy Sources". (Wind and Solar). Illumination by lamps- Energy Saving lamps (Compact Fluorescent Lamp, Cold Cathode Tube, LED bulbs). Domestic refrigerator and air conditioner-Electric circuit, construction and working principle. Li-Ion Battery's Operation & Maintenance. Protection-need for earthing, fuses and circuit breakers – MCB, RCB and ELCB. Energy Tariff calculation for domestic loads.

UNIT IV	ELECTRONIC CIRCUITS	9

Introduction to Electron Devices – PN Junction diode, Zener Diode, Transistor)-. Op-amps- Amplifiers, differentiator, integrator, ADC, DAC. Multi vibrator using 555 Timer IC. Voltage regulator IC using LM 723, LM 317.

UNIT V	ELECTRICAL MEASUREMENT	9

Characteristics of measurement-errors in measurement, torque in indicating instruments- moving coil and moving iron meters, Energy meter and watt meter. Transducers- classification- RTD, Strain gauge, LVDT, LDR and piezoelectric. Functional Block diagram of DSO

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Understand and analyse the fundamental laws & electrical network theorems
- Gain knowledge on DC & AC static and rotating machines
- Gain knowledge on renewable energy sources, various electrical protective devices
- To understand the fundamentals of electronic circuits
- To gain knowledge on the working principle & operation of measuring instruments and transducers

TEXT BOOKS:

1. D.P. Kothari and I.J Nagrath, Basic Electrical and Electronics Engineering, McGraw Hill, 2016, Third Edition.
2. M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronic Engineering, Oxford, 2016.

REFERENCES:

1. S.B. LalSeksena and Kaustuv Dasgupta, fundaments of Electrical Engineering, Cambridge,2016.
2. B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, Chand & Co, 2008.
3. S.K.Sahdev, Basic of Electrical Engineering, Pearson 2015.
4. John Bird,-Electrical and electronic principles and Technology, Fourth Edition, Elsevier, 2010.
5. Mittle, Mittal, Basic Electrical Engineering, 2nd edition, Tata McGraw-Hill Edition, 2016.
6. C.L.Wadhwa, "Generation, Distribution and utilization of Electrical Energy", New Age international pvt ltd .2003.

CS1201	PROGRAMMING IN C	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To develop C Programs using basic programming constructs.
- To develop C programs using arrays and strings.
- To develop applications in C using functions and pointers.

- To develop applications in C using structures.
- To do input/output and file handling in C.

UNIT I	BASICS OF C PROGRAMMING	9

Introduction to programming paradigms - Structure of C program - C programming: Identifiers-Keywords-Data Types - Variables - Constants. Operators: Precedence and Associativity - Expressions-Input/ Output statements - Decision making statements - Switch statement - Looping statements - Pre-processor directives - Compilation process

UNIT II	ARRAYS AND STRINGS	9

Introduction to Arrays: Declaration, Initialization - One dimensional array - Example Program: Computing Mean, Median and Mode - Two dimensional arrays - Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String- String operations – String Arrays.

UNIT III	FUNCTIONS AND POINTERS	9

Introduction to functions: Function prototype,-function definition,- function call,- Built- in functions (string functions, math functions) - Recursion-Types of Recursion - Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions-Storage Classes - Pointers - Pointer operators - Null Pointers- Pointer arithmetic - Arrays and pointers - Array of pointers - Example Program: Sorting of names - Parameter passing: Pass by value, Pass by reference- Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

UNIT IV	STRUCTURES	9

Structures-Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure – Passing structures to functions – Array of structures – Pointers to structures – Union - Programs using structures and Unions, Enumerated data type-Dynamic Memory Allocation.

UNIT V	FILEPROCESSING	9

Files-Types of file processing: Sequential access, Random access- Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Payroll System and Transaction processing using random access files - Command line arguments

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of the course, students would:

- "Understand the basic syntax and semantics of the programming language constructs"
- "Develop derived data types like arrays in solving problem"
- Solve a problem into modules and reconstruct it using various ways of user-defined functions
- Develop user-defined data types like structures and unions and its applications to solve problems.
- Design applications using sequential and random-access file processing

TEXTBOOKS:

1. Reema Thareja,"Programming in C", Oxford University Press, Second Edition, 2016.

2. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education,2006

CS1202	FUNDAMENTALS OF COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basics of a computer system.
- To gain the knowledge of fundamentals of database.
- To matriculate the various Programming Languages and Operating System.
- To design and develop web pages using HTML and CSS.
- To acquirethe basic knowledge of networking.

UNIT I	COMPUTERBASICS	9

Problem Solving Using Computers- Data Representation- Representation of Characters in Computers, Integers, Fractions- Hexadecimal Representation of Numbers - Decimal to Binary Conversion- Error Detecting Codes- Computer Architecture: Interconnection of Units -Processor to Memory Communication - I/O Devices to Processor Communication - Interrupt Structures - Bus Architecture of Personal Computers – Multiprogramming.

UNIT II	DATABASE	9

Introduction–Database–Characteristics of Database–Conceptual Data Model–Representation of Data Models–Database System-Database Languages–Database System Architecture–Database Applications.

UNIT III	PROGRAMMING LANGUAGES AND OPERATING SYSTEM	9

Need for programming language-assembly language-higher level programming languages- compiling a high level language -Need for OS-batch operating system-multiprogramming operating system-timesharing operating system-online and real-time systems- personal computer operating system-Unix operating system

.

UNIT IV	WEB AND SCRIPTING ESSENTIALS	9

Communication Protocols- LAN/WAN/WWW-Internet Basics – Browser Fundamentals – Authoring Tools – Introduction to HTML5 – HTML5 Tags – HTML5 Forms – Cascading Style Sheets (CSS3) Fundamentals – Need for Scripting Languages – Introduction to JavaScript/ Angular JS

UNIT V	NETWORKING	9

Internet Security- Mobile Technology-Architecture of GSM Cellular Mobile Phone System- Wireless LAN- Personal Area Network—Bluetooth- WiMAX- Mobile Communication Among Portable Computers. Network Computing: Current Computing Scenario - Peer to Peer Computing
Grid Computing -Cloud Computing.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Understand the major components of a computer system and architecture.
- Compare and contrast various indexing strategies in different database systems
- Understand the programming languages and Operating System concepts

- Design websites that meet specified needs and interests using basic elements to control layout
- Understand the basic concepts of networking.

TEXT BOOKS:

1. V. Raja Raman, Neeharika Adabala ―Fundamentals of Computers, PHI, 6th Edition2015.
2. Robin Nixon, Learning PHP, MySQL,JavaScript, CSS&HTML5:AStep-by- Step Guide to Creating Dynamic Websites, O'Reilly Media, Inc,2014.

REFERENCES:

1. Ashok Arora, Computer Fundamentals and applications, Vikas Publishing house pvtLtd.(2007).
2. P. K. SINGH, Computer Fundamentals, VkGlobal Publications, 2015.
3. Anita Goel, Computer fundamentals, Pearson Education (India).

TA1201	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period

UNIT III	MANUFACTURING TECHNOLOGY	3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and gold-Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry-Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING	3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலொறு – மக்களும் பண் பொடும் – கக.கக. பிள்ளள

(தவளியீடு:

2. தமிழ் நொடு பொடநூல் மற்றும் கல் வியியல் பணிகள் கழகம்).
3. கணினித் தமிழ் – முளனவர் இல. சுந்தரம் . (விகடன் பிரசுரம்).
4. கீழடி – ளவளக நதிக்களரயில் சங் ககொல நகர நொகரிகம் (ததொல் லியல் Fளற தவளியீடு)
5. தபொருளந – ஆற்றங் களர நொகரிகம் . (ததொல் லியல் Fளற தவளியீடு)
6. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
7. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
8. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
9. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
10. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
11. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
12. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
13. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

CS1203	PROGRAMMING IN C LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop programs in C using control statements.
- To develop applications in C using arrays, strings, pointers.
- To develop applications in C using functions, structures.
- To develop applications in C using file processing

LIST OF EXPERIMENTS

1. **Input and Output statements.**
2. **Control statements – Branching &Looping.**
   - Write a C program to generate Pascal's triangle.
   - Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*,/,% and use Switch Statement)
   - Write a C program to find the sum of individual digits of a positive integer.
   - A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.

- Write a C program to generate the first n terms of the sequence.
- Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
- Write a C program to swap Numbers Using Temporary Variables.

3.**Arrays**

- Write a C program to search an array element using linear search.
- Write a C program to find both the largest and smallest number in a list of integers.
- Write a C program that uses functions to perform the following:
- Addition of Two Matrices
- Multiplication of Two Matrices
- Write a C program to implement Bubble Sort.

4.Strings

- Write a C program that uses functions to perform following operations

  (i)To insert a sub-string in to given main string from a given position.

  (ii)To delete n Characters from a given position in a given string.

- Write a C program to determine if the given string is a palindrome or not

5.Functions &Pointers:

- Write C programs that use recursive functions

  (i) To find factorial of given number

  (ii)To solve Towers of Hanoi Problem.

  (iii)To swap the variables using call by value and call by reference.

6. Generate mark sheet of students using structures.
7. Compute Salary Slip for five employees using structures and functions Insert, Update, delete and append telephone details of an individual or a company into a telephone directory using random access file.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 terminals
SOFTWARE:C compiler

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Develop C programs for simple applications making use of basic constructs
- Develop C programs for control statements.
- Develop C programs involving arrays, strings and pointers.
- Develop C programs involving functions, and structures.
- Design applications using sequential and random access file processing.

GE1201	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

CIVIL ENGINEERING PRACTICE **13**

Buildings:

Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

Study of pipeline joints, its location and functions: valves, taps, couplings, Unions, reducers, elbows in household fittings.

Study of pipe connections requirements for pumps and turbines.

Preparation of plumbing line sketches for water supply and sewage works.

Hands-on-exercise: Basic pipe connections – Mixed pipe material connection –.pipe connections with different joining components.

Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

Study of the joints in roofs, doors, windows and furniture.

Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

MECHANICAL ENGINEERING PRACTICE **18**

Welding:

Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.

Gas welding Practice basic

Machining:

Simple Turning and Taper turning

Drilling Practice Sheet Metal Work:

Forming & Bending:

Model making – Trays and funnels.

Different type of joints.

Machine assembly practice:

Study of centrifugal pump

Study of air conditioner Demonstration on:

Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of Hexagonal headed bolt.

Foundry operations like mould preparation for gear and step cone pulley.

Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP -B (ELECTRICAL & ELECTRONICS)

ELECTRICAL ENGINEERING PRACTICE **13**

Residential house wiring using switches, fuse, indicator, lamp and energy meter.

Fluorescent lamp wiring.

Stair case wiring

Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.

Measurement of energy using single phase energy meter.

Measurement of resistance to earth of electrical equipment.

ELECTRONICS ENGINEERING PRACTICE **16**

Study of Electronic components and equipment's – Resistor, color coding measurement of AC Signal parameter (peak-peak, rms period, frequency) using CR.

Study of logic gates AND, OR, EX-OR and NOT.
Generation of Clock Signal.
Soldering practice – Components Devices and Circuits – Using general purpose PCB.
Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Understand the basic principle of welding
- Understand the basic principle of Sheet Metal Work
- Understand the basic principle of joints
- Understand the basic principle of Machine assembly practice
- Understand the basic principle of Drilling

CS1204	FUNDAMENTALS OF COMPUTING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Learn to design a static webpage.
- Learn to create and use a database in SQL and Network protocols.
- Be familiar with the configuration of CPU.

LIST OF EXPERIMENTS

1. Use MS office
2. Document creation, Text manipulation with Scientific Notations
3. Table creation, Table formatting and Conversion using MS-Office
4. To design a E-book cover pages and back page using Insert Menu include header and footer.
5. Create a new document and perform the Mail Merge.
6. Presentation and Visualization of graph and charts.
7. Practice hyperlink and create links between word document, Play songs from Microsoft word text, create the link between internal and external files.
8. Design power point presentation with animation.
9. Create an excel sheet for storing students marks and perform basic operations by analyzing the results and also Create a chart to show the mark comparison among the students.
10. Demonstrates the client and server connectivity using network protocols.
11. Design of webpage using various HTML formatting tags.
12. Apply the inline and block level elements to identify the difference in the layout.
13. Design the HTML forms (text boxes, text areas, radio buttons, check boxes and other elements by understanding the input types and specified needs).
14. Include image/audio and video elements in the webpages.
15. Create tables and implement the SQL commands.
16. Create Business Cards using Shapes, text, and colours using Adobe Photoshop.
17. Components of computer hardware and assembling.
18. Installation of an Operating system (formatting, partitioning), drivers for peripheral Devices.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
HARDWARE: 30 terminals
SOFTWARE: MS Word,My SQL

COURSE OUTCOMES:
Upon Completion of the course, the students will be able to:

- Use MS-Office for designing a Document, Presentations and Excel sheet.
- Design and develop static web pages by using the Mark up languages that meet the specified needs and interests.
- Understand the Networking Concepts.
- Use typical data definitions and manipulation commands.
- Assemble Computer Hardware and Install software.

CY1201	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To understand nature and the facts about the environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management

UNIT I	ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY	14

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of major ecosystem – Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity – Biodiversity at global, national and local levels – India as a mega- diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT II	ENVIRONMENTAL POLLUTION	8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

UNIT III	NATURAL RESOURCES	10

Forest resources: Use and over-exploitation, deforestation, case studies- dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water – Mineral resources: environmental effects of extracting and using mineral resources, case studies – Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy

sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – 12 Principles of Green chemistry, role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT IV	SOCIAL ISSUES AND THE ENVIRONMENT	7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act –- central and state pollution control boards.

UNIT V	HUMAN POPULATION AND THE ENVIRONMENT	6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Students will be able to understand the functions of ecosystems and appreciate the bio diversity.
- Students will be able to know the measures to control environmental pollution.
- Students will be able to understand the usage as well as the effects of over exploitation of natural resources.
- Students will have knowledge about finding technological, economic and political solutions to environmental problems with various Environmental Protection Act in mind.
- Students will be able to understand the interrelationship between population explosion and the environment and also role of IT in environment and human health.
- Students will be able to understand that Environmental problems can only be solved by Public participation in all aspects and cannot be solved by mere laws.

TEXT BOOKS:

1. Environmental Science and Engineering by AnubhaKaushik and C.P.Kaushik-New Age International Publishers. New Delhi, 2017.

REFERENCES:

1. Benny Joseph, Environmental Studies, Tata mcgraw-Hill Publishing Company, Ltd., New Delhi, 2006.
2. Dr.B.S.Chauhan,. Environmental Studies, University Science Press, New Delhi, 2011.

MA1303	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

(Common to second semester AIDS and third semester CSE/IT)

COURSE OBJECTIVES:

- To extend student‘s logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of

Ideas to solve practical problems.

- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.

UNIT I	**LOGIC AND PROOFS**	**12**

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT II	**SET THEORY**	**12**

Basic concepts – Notations – Subset – Algebra of sets – The power set – Ordered pairs and Cartesian product – Relations on sets –Types of relations and their properties – Relational matrix and the graph of a relation – Partitions – Equivalence relations – Partial ordering – Poset – Hasse diagram – Lattices and their properties – Sub lattices – Boolean algebra – Homomorphism.

UNIT III	**COMBINATORICS**	**12**

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications

UNIT IV	**GRAPHS**	**12**

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT V	**ALGEBRAIC STRUCTURES**	**12**

Algebraic systems – Definitions-Examples-Properties-Semi groups and monoids–Homomorphism's-Groups – Subgroups – Normal subgroup and cosets – Lagrange's theorem – Codes and group codes – Basic notions of error correction-Error recovery in group codes.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Have knowledge of the concepts needed to test the logic of a program.
- Be aware of the counting principles.
- Learn the concepts of Graph Theory that would help them to define new levels of networks which are implemented in AI and ANN.
- Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.
- Be Expose the concepts and properties of Lattices and Boolean algebra used in Coding and Decoding theory of Cryptography.

TEXTBOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw
2. Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
3. Tremblay, J.P. and Manohar. R, " Discrete Mathematical Structures with Applications To Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

REFERENCES:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition
2. Pearson Education Asia, Delhi, 2007.
3. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw

Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
4. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

IT1301	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads and generics classes
- To design and build simple Graphical User Interfaces

UNIT I	INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	9

Inheritance–Superclasses-subclasses–Protectedmembers–constructors in subclasses-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, Array Lists-Strings

UNIT II	INHERITANCE AND INTERFACES	9

Inheritance–Superclasses-subclasses–Protectedmembers–constructors in subclasses-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, Array Lists-Strings

UNIT III	EXCEPTION HANDLING AND I/O	9

Exceptions-exception hierarchy-throwing and catching exceptions –built-in exceptions, 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	MULTITHREADING AND GENERIC PROGRAMMING	9

Understanding Threads, Thread Priorities, Synchronizing Threads, Thread lifecycle, Inter-thread communication. Generic Programming–Generic classes–generic methods–Bounded Types–Restrictions and Limitations-Introduction to JDBC, JDBC Drivers and Architecture, Accessing Database with JDBC.

UNIT V	EVENT DRIVEN PROGRAMMING	9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes -actions - mouse events - Introduction to Swing –Swing GUI Components – Text Fields , Text Areas – Buttons- Check Boxes –Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes. Swing packages-Swing Control classes and Methods.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Develop Java programs using OOP principles.
- Develop Java programs using inheritance, interfaces.

- Build Java applications using Exceptions and I/O streams.
- Develop Java applications with Threads, generics classes and JDBC
- Develop interactive Desktop application using Swing and JDBC.

TEXT BOOKS:

1. Herbert Schildt, Java The complete reference, 8th Edition, McGraw Hill Education, 2011.
2. CayS.Horstmann, Gary Cornell, Core Java Volume–I Fundamentals, 9th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, Java SE8 for programmers, 3rd Edition, Pearson, 2015.
2. Steven Holzner, Java2Blackbook, Dream tech press, 2011.
3. Timothy Budd, Understanding Object-oriented programming with Java Updated Edition, Pearson Education, 2000.

CS1301	DATA STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Study the concepts of ADTs
- To Acquire linear data structures – lists, stacks, and queues
- To learn non-linear data structures and apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms

UNIT I	LINEAR DATA STRUCTURES – LIST	9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists-doubly-linked lists – circularly-linked list-applications of lists –Polynomial Manipulation.

UNIT II	LINEAR DATA STRUCTURES – STACKS, QUEUES	9

Stack ADT – Operations – Evaluating arithmetic expressions- Other Applications-Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue –Double Ended Queues – applications of queues.

UNIT III	NON LINEAR DATA STRUCTURES – TREES	9

Introduction to Tree ADT – Implementations of trees- Binary Tree ADT -tree traversals -expression trees — binary search tree ADT –Threaded Binary Trees- AVL Trees –Multi-way Search Trees-B-Tree – B+ Tree- Heap-Priority Queue.

UNIT IV	GRAPHS AND HASHING	9

Graph and their representations-Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS)-Topological Sort- Hashing- Hash Functions – Collision in hashing-Separate Chaining – Open Addressing-Rehashing-Applications of Hashing.

UNIT V	SEARCHING AND SORTING	9

Searching- Linear Search – Binary Search. Sorting – Bubble Sort – Selection Sort – Insertion Sort – Quick Sort-Merge Sort-Shell Sort – Radix Sort-Heap Sort.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Apply the concept and operations of List ADT.
- Understand and apply the concept and operations of Stack and Queue ADT
- Demonstrate the various Tree ADT and its Applications
- Apply Graph data structures and hashing concept in real-world scenarios
- Interpet the implementation of sorting and searching

TEXT BOOKS:-

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 1997.
2. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2011

REFERENCES:-

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
3. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.

EC1306	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	C
		3	0	0	3

(Common to second semester AIDS and third semester CSE/IT)

COURSE OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

UNIT I	BOOLEAN ALGEBRA AND LOGIC GATES	12

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Arithmetic Operations – Binary Codes- Boolean Algebra and Logic Gates – Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Simplification of Boolean Functions using Karnaugh Map – Logic Gates – NAND and NOR Implementations.

UNIT II	COMBINATIONAL LOGIC	12

Combinational Circuits – Analysis and Design Procedures, Design of Half and Full Adders, Half and Full Subtractors – Binary Adder-Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Introduction to HDL – HDL Models of Combinational circuits.

UNIT III	SYNCHRONOUS SEQUENTIAL LOGIC	12

Sequential Circuits – Storage Elements: Latches, Flip-Flops -SR, JK, T, D, – operation and excitation tables – Analysis of Clocked Sequential Circuits – Moore/Mealy models, State Reduction and Assignment – Design Procedure – Registers and Counters – HDL Models of Sequential Circuits.

UNIT IV	**ASYNCHRONOUS SEQUENTIAL LOGIC**	**12**

Analysis and Design of Asynchronous Sequential Circuits – cycles and races, Reduction of State and Flow Tables – Race-free State Assignment – Hazards, Essential Hazards, and Design of Hazard free circuits

UNIT V	**MEMORY AND PROGRAMMABLE LOGIC**	**12**

RAM – Memory Decoding – Error Detection and Correction – ROM – Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices. Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using PLA, PAL

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Simplify Boolean functions using K-Map
- Design and Analyze Combinational Circuits
- Design and Analyze Sequential Circuits.
- Implement designs using Programmable Logic Devices
- Write HDL code for combinational and Sequential Circuits

TEXT BOOK:

1. M. Morris R. Mano, Michael D. Ciletti, ―Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, 6th Edition, Pearson Education, 2017.

REFERENCES:

1. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE
4. Learning, 2013
5. Donald D. Givone, Digital Principles and Design‖, Tata Mc Graw Hill, 2003.

CS1302	**SOFTWARE ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the basic concepts of software engineering applied in developing various software development life cycle models and agile process models.
- Understand the software requirements and the SRS documents for software projects.
- Understand the software design engineering, user-interface design and component level design.
- Learn various testing approaches applied in software development.
- Learn the methods of software project management: estimation, scheduling, planning and software risk management.

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

Introduction: The Nature of Software, Software Engineering, The Software Process, Software Engineering practice, Software Myths, Process models: Prescriptive Process Perspective and Specialized

Process Models, Agile development: Introduction to Agility - Agile Process Models: Scrum, Dynamic system development and Agile unified process-Tool Set for the Agile Process- Extreme programming-XP Process

UNIT II	REQUIREMENT ENGINEERING PROCESS AND MODELING	9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management. Requirements Modeling: Behavior, patterns, and web/mobile apps, Case Study: SRS-Library Management, Student Fee Registration Details.

UNIT III	SOFTWARE DESIGN	9

Design engineering: Design Process, Design Concepts, Design Model. Architectural design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Architectural Mapping using Data Flow. User-Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps. Component level Design: Designing Class based components-Component-Level Design for WebApps and Mobile Apps.

UNIT IV	TESTING STRATEGIES	9

Software testing strategies: A Strategic Approach to Software Testing, Test Strategies for Conventional Software and Object Oriented Software, Validation Testing, White- Box Testing, Basis Path Testing, Black-Box Testing, System Testing. Software Implementation Techniques: Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.

UNIT V	PROJECT AND RISK MANAGEMENT	9

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, Risk management: Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, RMMM, RMMM Plan-Case Study: Risk Management-Manufacturing Company, Banks.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Develop the project by adopting suitable lifecycle models.
- Determine an appropriate process model depending on the user requirements
- Identify the suitable software design with appropriate user and component level design.
- Apply a suitable testing strategy for the designed software product.
- Apply appropriate project estimation techniques and manage the risk.

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering - A Practitioner's Approach", 6thEdition, TMH, 2010.
2. Sommerville, "Software Engineering", 9th Edition, Pearson Education, 2011.

REFERENCES:

1. K.K.Agarwal& Yogesh Singh, "Software Engineering", 3rd Edition, New Age International Publishers, 2008.
2. Shely Cashman Rosenblatt, "System Analysis and Design", 2nd Edition, Thomson Publications, 2011.

3. PankajJalote, "An Integrated Approach to Software Engineering", 3rd Edition, Narosa Publishing House, 2011.

IT1302	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, array list, exception handling and file processing.
- To develop applications using generic programming and event handling

LIST OF EXPERIMENTS

1. Develop a java application using classes & objects
2. Develop a java application using packages.
3. Develop a java application using Inheritance.
4. Design a Java interface for ADT Stack. Provide necessary exception handling.
5. Write a program to perform string operations using Array List. Write functions for the following
   a. Append-add at end

b. Insert–add at particular index
c. Search
d. List all string starts with given letter.

6. Write a Java Program to create an abstract class named and demonstrate polymorphism.
7. Write a Java program to implement user defined exception handling.
8. Write a Java program that reads a filename from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
9. Write a java program that implement multi-threading.
10. Write a java program to create generic function.
11. Design a calculator using event-driven programming paradigm of Java with the following options.
    a) Decimal manipulations
    b) Scientific manipulations
12. Develop a simple student database management system using event-driven and concurrent programming paradigms of Java. Use JDBC to connect a back-end database.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 terminals
SOFTWARE:Java

TOTAL: 60 PERIODS

COURSE OUTCOMES:

- Develop and implement Java programs for simple applications that make use of classes, packages, inheritance and interfaces.
- Develop and implement Java programs with array list and exception handling
- Develop and implement Java programs using the concept of Multithreading.
- Design and develop the applications using file processing, generic programming.
- Design and develop the applications using event handling mechanism.

CS1303	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To implement graph algorithms
- To get familiarized to sorting, searching and hashing algorithms

LIST OF EXPERIMENTS

1. Array implementation of List ADT
2. Implement the following data structures
   Singly Linked List & Doubly Linked List
3. Array implementation of Stack and Queue ADTs
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Search Trees
6. Implementation of AVL Trees
7. Implementation of heaps using priority queues.
8. Programs for implementation of graph traversals
   BFS & DFS
9. Implementation of searching algorithms
10. Implementation of Insertion Sort, Merge Sort, Quick Sort and Heap Sort algorithms
11. Programs to implement hashing
    Separate Chaining & Open Addressing

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 terminals
SOFTWARE:C compiler

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Demonstrate appropriate operations and applications of Linear datastructures(List, Stack and Queue) using array
- Examine functions to implement operations of Linear datastructures(List, Stack and Queue) using Linked List
- Determine the different operations of various Trees
- Apply graph traversal algorithms and techniques
- Examine various sorting, searching and hashing algorithms

HS1301	INTERPERSONAL SKILLS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in

specific academic speaking activities.

- Improve general and academic listening skills.
- Make effective presentation.

UNIT I		**6**

Listening as a key skill- its importance- Speaking- give personal information- asks for personal information- Improving pronunciation- pronunciation basics- Taking lecture notes- preparing to listen to a lecture- articulate a complete idea.

UNIT II		**6**

Interpersonal skills- nurturing- empathetic- self-control- patient- sociability- warmth- social skills-Team Work-Work Ethic- willing to work- initiative- self-motivated - Integrity.

UNIT III		**6**

Factors influence fluency- deliver a five-minute informal talk- greet- respond to greetings-describe health and symptoms-invite and offer- accept- decline- take leave- listen for and follow the gist- listen for detail.

UNIT IV		**6**

Being an active listener: giving verbal and non-verbal feedback- participating in a group discussion- asking and getting clarifications- Summarizing academic readings and lectures- Conversational speech- listening to and participating in conversations- persuade.

UNIT V		**6**

Formal and informal talk- listen to follow and respond to explanations, directions and instructions in academic and business contexts- Strategies for formal presentations and interactive communication- group/pair presentations.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

- Illustrate the communication skills in articulating a complete idea with a clarity in pronunciation
- Demonstrate Interpersonal skills with a willingness to work in team following the social work ethics
- Relate the speaking ability to respond in any informal talk detailing the content of the information in any form
- Participate in group discussions expressing active listening and reading skills to persuade the group to the desired target
- Make effective formal presentations and interactive communication in any academic and business contexts

TEXT BOOKS:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.

2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013

MA1403	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I	PROBABILITY AND RANDOM VARIABLES	12

Probability – The axioms of probability – Conditional probability – Total probability – Baye‘s theorem – Discrete and continuous random variables – Probability mass function – Probability density function– Properties – Mathematical Expectations – Conditional Expectations – Moments – Moment generating functions – characteristic function –Chebyshev’s inequality.

UNIT II	STANDARD DISTRIBUTION	12

Discrete distribution – Bernoulli’ trial – Binomial distribution – Poisson distribution – Geometric distribution – Negative Binomial distribution – Continuous distribution – Uniform distribution – Exponential distribution – Gamma distribution – Weibull distribution – Normal distribution.

UNIT III	TWO – DIMENSIONAL RANDOM VARIABLES	12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT IV	TESTING OF HYPOTHESIS	12

Sampling distributions – Estimation of parameters – Statistical hypothesis – Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion – Contingency table (test for independent) – Goodness of fit.

UNIT V	DESIGN OF EXPERIMENTS AND STATISTICAL QUALITY CONTROL	12

One way and Two way classifications – Completely randomized design – Randomized block design – Latin square design – 2^2 factorial design – Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.

- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Have the notion of sampling distributions and statistical techniques used in engineering

TEXT BOOKS:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.
3. Kapoor, V.K. and Gupta, S.P. (1978): Fundamentals of applied statistics, Sultan Chand & Sons.

REFERENCES:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unni krishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum‘s Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers.S.L.andYe.K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.
6. Grant, E,L. and Laven Worth, R.S.: Statistical Quality Control, McGraw Hill.

CS1401	COMPUTER ARCHITECTURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To learn the basics of pipelined execution.
- To understand parallelism and multi-core processors.
- To understand the memory hierarchies, cache memories and virtual memories.
- To learn the different ways of communication with I/O devices.

UNIT I	FUNDAMENTALS OF COMPUTER ARCHITECTURE	9

Overview- Eight great Ideas in Computer architecture-components of computer system- Instructions – Operations and Operands – Representing Instructions – Arithmetic & Logical operations – control operations – Performance - Needs and types of various addressing modes.

UNIT II	ARCHITECTURE OF COMPUTERARITHMETIC OPERATION	9

Data Representation, Architecture of Hardware implementation of arithmetic unit for common arithmetic operations: addition, subtraction, multiplication, division (Fixed point and floating point)-Sub-word Parallelism

UNIT III	ARCHITECTURE OF INSTRUCTION EXECUTION	9

Introduction- Building a data path for MIPS implementation – A simple Control Implementation scheme – An Overview of Pipelining – Pipelined data path and control – Handling Data hazards &Control Hazards-Exceptions.

UNIT IV	PARALLELISIM	9

Parallel processing challenges – Flynn‘s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Symmetric Multiprocessor Organization -Multiprocessor Operating System Design Considerations -Hardware multithreading –Homogeneous and Heterogeneous Multi-core Architectures-Multi-core processors and other Shared Memory Multiprocessors -Introduction to Graphics and Graphics Processing Units(GPU).

UNIT V	MEMORY SYSTEM &INPUT/ OUTPUT ORGANIZATION	9

Exploiting Memory Hierarchy-Memory Technologies-Basics of caches-Measuring and improving Cache Performance-Virtual Memory-Programmed I/O-Interrupt Driven I/O-Direct Memory Access-Bus Arbitration-Buses-synchronous Bus-Asynchronous Bus- Standard I/O Interfaces-Universal serial Bus(USB)-Introduction to Edge Devices.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Examine the basic structure of computers, operations and instructions.
- Analyze the Design of the arithmetic and logic unit.
- Categorize the pipelined execution and design of control unit
- Illustrate the parallel processing architectures
- Classify the various memory systems and I/O communication.

TEXT BOOKS:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, Fifth Edition, Tata McGraw Hill, 2012.
3. W. Stallings, Computer organization and architecture, Prentice-Hall, 2012 M. M. Mano, Computer System Architecture, 3rd Edition,1992,Prentice-Hall

REFERENCES:

1. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
2. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

IT1401	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of data models, conceptualize and depict a database system using ER diagram.
- To study the principles to be followed to create an effective relational database and write SQL queries to store/retrieve data to/from database systems.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To learn about the internal storage structures using different file and indexing techniques and the basics of query processing and optimization.
- To study the basics of distributed databases, semi-structured and un-structured data models

UNIT I	RELATIONAL DATABASES	9

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL.

UNIT II	DATABASE DESIGN	9

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd's Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form .

UNIT III	TRANSACTIONS	9

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT IV	IMPLEMENTATION TECHNIQUES	9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

UNIT V	ADVANCED TOPICS	9

Overview of Distributed Databases – Data Fragmentation – Replication — Introduction to Object-based Databases - Enhanced Data bases: Temporal Database –Spatial Database –Multimedia Database - XML Databases: XML schema - NOSQL Database: Characteristics –Schema-less models– Applications – Current Trends.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Model an application's data requirements using conceptual modeling and design database schemas based on the conceptual model and Formulate solutions to a broad range of query
- Analyze the components of normalization and evaluate how different normal forms impact the structure and efficiency of a database
- Develop transactions and estimate the procedures for controlling the consequences of concurrent data access
- Compare and analyze the performance of different file storage models and indexing strategies, assessing their influence on the efficiency of query processing and optimization processes
- Explore the features of distributed, semi-structured, and unstructured database systems to evaluate how they address specific data storage and retrieval challenges.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts, Sixth Edition, Tata McGraw Hill, 2014.
2. RamezElmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2017.
3. DavidLoshin,"Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools,Techniques,NoSQL,andGraph",Morgan Kaufmann/El Sevier Publishers,2013.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, ―Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015. 3. G.K.Gupta,"Database Management Systems, Tata McGraw Hill, 2011.
3. G. K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
4. Carlos Coronel, Steven Morris, Peter Rob, "Database Systems: Design, Implementation and Management", Ninth Edition, Cengage Learning, 2011.

CS1402	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To construct algorithms that is efficient in space and time complexities.
- To understand different design technique like Brute force and Divide and Conquer
- To understand Greedy and Dynamic Programming design techniques
- To understand Backtracking and Branch & Bound design technique
- To understand the Tractability and Scalability problems.
- To know the best algorithm technique to solve problems.

UNIT I	INTRODUCTION	9

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

UNIT II	BRUTE FORCE AND DIVIDE-AND-CONQUER	9

Brute Force: Closest-Pair - String Matching – Selection Sort – Bubble Sort- Divide and Conquer Methodology: Binary Search – Merge sort – Quick sort – Randomized version of Quick sort- Analysis of Quick sort–Multiplication of Large Integers

UNIT III	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	9

Dynamic programming: Computing a Binomial Coefficient -Warshall'sandFloyd's algorithm for All Pairs shortest Path Problem- Single Source Shortest Path Problem-Bellman ford Problem-Multi Stage Graph– 0/1 Knapsack Problem and Memory functions.Greedy Technique: Prim's algorithm and Kruskal's Algorithm - Dijkstra's Algorithm - Fractional Knapsack problem, Huffman Trees.

UNIT IV	BACKTRACKING AND BRANCH & BOUND	9

Backtracking: n-Queen's problem -Hamiltonian Circuit Problem – Subset Sum Problem- Graph Colouring .Branch and Bound: Assignment problem – Knapsack Problem – Travelling Sales person Problem .

UNIT V		9

Lower – Bound Arguments – P, NP NP- Complete- Dominating Set Problem - NP Hard Problems – Clique Decision Problem – Node Cover Decision Problem – NP Hard Scheduling Problems –Job Shop Scheduling- Approximation Algorithm for NP Hard Problems – Travelling Salesperson Problem – Knapsack Problem.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Apply efficient algorithms for both recursive and non-recursive relations to compute space and time complexity.
- Critically analyze the different algorithms using design techniques like Brute force and Divide and Conquer.
- Demonstrate algorithms using design paradigms like Greedy and Dynamic Programming for a given problem.
- Examine algorithms using Backtracking and Branch & Bound design techniques.
- Analyze various algorithms and interpret solutions to evaluate NP Hard problems.

TEXT BOOKS:

1. AnanyLevitin, ―Introduction to the Design and Analysis of Algorithms‖, Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.

3. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, ―Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012

REFERENCES:

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ―The Design and Analysis of Computer Algorithms‖, Pearson Education, Twelth impression, 2013.
2. Harsh Bhasin, ―Algorithms Design and Analysis‖, Oxford university press, 2016.
3. S. Sridhar, ―Design and Analysis of Algorithms‖, Oxford university press, 2014.

HV1401	UNIVERSAL HUMAN VALUES	L	T	P	C
		2	1	0	3

Universal Human Values : Understanding Harmony

COURSE OBJECTIVE:

The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

COURSE TOPICS:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education 9

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself! 9

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
8. Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Module 3: Understanding Harmony in the Family and Society- Harmony in

Human Relationship **9**

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence **9**

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all pervasive space
21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics **9**

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c.Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. discuss the conduct as an engineer or scientist etc.

COURSE OUTCOMES:

- Understand the essentials of human values and skills, self-exploration, happiness and prosperity.
- Examine harmony in human being.
- Illustrate the role of harmony in family, society and universal order.
- Categorize the holistic perception of harmony at all levels of existence.
- Infer appropriate technologies and management patterns to create harmony in professional and personal lives.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria,Excel Books, New Delhi, 2010

REFERENCE BOOKS:

1. JeevanVidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)13. Gandhi - Romain Rolland (English)

CS1403	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To understand the fundamentals of object analysis and design.
- To understand and differentiate Unified Process from other approaches.
- To design with static UML diagrams and identify the concept.
- To design with the UML dynamic and implementation diagrams.
- To design the software with appropriate design patterns.
- To test the software against its requirements specification

UNIT I	UNIFIED PROCESS AND USECASEMODELING	9

Introduction to OOAD with OO Basics - Unified Process – UML diagrams – Use Case –Case study – the Next Gen POS system, Inception -Use case Modelling – Relating Use cases – include, extend and generalization – When to use Use-cases

UNIT II	STATIC UML DIAGRAMS ANDTHEIRRELATIONSHIP	9

Class Diagram— Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition - Relationship between sequence diagrams and use cases – When to use Class Diagrams

UNIT III	DYNAMIC AND IMPLEMENTATION UML DIAGRAMS	9

Dynamic Diagrams – UML interaction diagrams - System sequence diagram – Relationship between sequence diagrams and use cases ,Logical architecture and UML package diagram – Logical architecture refinement- Collaboration diagram – When to use Communication Diagrams - State machine diagram and Modelling – When to use State Diagrams - Activity diagram – When to use activity diagrams Implementation Diagrams - UML package diagram - When to use package diagrams - Component and Deployment Diagrams – When to use Component and Deployment diagrams.

UNIT IV	DESIGN PATTERNS(GRASP,GOF)	9

GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioral – Strategy – observer –Applying GoF design patterns – Mapping design to code

UNIT V	TESTING	9

Object Oriented Methodologies – Testing: Issues in OO Testing – Class Testing – OO Integration Testing – GUI Testing – OO System Testing- Software Quality Assurance – Impact of object orientation on Testing – Develop Test Cases and Test Plans.

THEORY 45 PERIODS
PRACTICALS 30 PERIODS
TOTAL 75 PERIODS

LIST OF EXPERIMENTS

1. Draw standard UML diagrams using an UML modeling tool for a given case study and mapdesign to code and implement a 3 layered architecture.
2. Test the developed code and valid at whether the SRS is satisfied.
3. Identify a software system that needs to be developed.
4. Document the software requirement specification(SRS) for the identified system.
5. Identify use case and develop the use case model.
6. Identify the conceptual classes and develop a Domain Model and also derive a class diagram form thatUsing the identified scenarios, find the interaction between objects and represent them using UML sequence and collaboration diagrams.
7. Draw relevant state chart and activity diagrams for the system.
8. Implement the system as per the detailed design.
9. Test the software system for all the scenarios identified as per the usecase diagram.
10. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
11. Implement the modified system and test it for various scenarios.

SUGGESTED DOMAINS FOR MINI PROJECT

1. Passport Automation System
2. Book Bank
3. Exam registration
4. Stock maintenance system
5. Online course reservation system
6. Airline/Railway registration system
7. Software personnel management system
8. Credit card processing
9. E-book management system
10. Recruitment system
11. Foreign trading system
12. Conference management system
13. BPO management system
14. Library management system
15. Student information system

COURSE OUTCOMES:

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

- Apply the software design with UML diagrams
- Demonstrate the software applications using Object Oriented concepts
- Determine the various scenarios based on software requirements
- Experiment the UML based software design into pattern based design using design patterns
- Illustrate the various testing methodologies for Object Oriented software

TEXT BOOKS:

1. Craig Larman, ―Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, Pearson Education,2005.
2. Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition-1999

REFERENCES:

3. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, ―Design patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley,1995.
4. Martin Fowler, ―UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third edition, Addison Wesley,2003.

IT1402	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To be familiar with the use of a front end tool for GUI based application development

EXPERIMENTS:

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins
3. Views, Sequences, Synonyms
4. Database Programming: Implicit and Explicit Cursors
5. Procedures and Functions
6. Triggers
7. Exception Handling
8. Database Design using ER modeling, normalization and Implementation for any application
9. Create Document, column and graph based data using NOSQL database tools.
10. Develop a simple GUI based database application

COURSE OUTCOMES:

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

- Use typical data definitions and manipulation commands.
- Design applications to test Nested and Join Queries
- Implement simple applications that use Views, Sequences, Synonyms, Cursors and critically analyze the use of Tables, Functions, Procedures, Triggers and Exception Handling using PL/SQL
- Create and manipulate data using NOSQL database.
- Design database using ER modeling, Normalize and Implement a GUI application that require a Front-end and Back end Tool

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 Terminals.

SOFTWARE: Front end: VB/VC ++/JAVA or Equivalent Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent.

CS1404	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY	L	T	P	C

		0	**0**	**4**	**2**

COURSE OBJECTIVES:

- To study algorithm for solving the problem and represent its Asymptotic notation
- To acquire knowledge about different approach to solve same problems.
- To Design and implement efficient algorithms to get optimal solution for the problem.
- Strengthen the ability to identify and apply the suitable algorithm for the real world problem.
- To understand and analyse the Approximation algorithms.
- To understand the best algorithm for solving the problem.

LIST OF EXPERIMENTS

1. To find the factorial of a given number using recursive algorithm
2. To find the number of bits in integer
3. Create Diamond Pattern Printing
4. Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the 1st to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
5. Implement merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
6. Implement 0/1 Knapsack problem using Dynamic Programming.
7. Compute the transitive closure of a given graph using Warshall's algorithm
8. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved.
9. Find Minimum Cost Spanning Tree of a given graph using Prim's andKruskal's algorithm
10. Implement the Single source Shortest path algorithm
11. Implement any scheme to find the optimal solution for the Traveling Sales Person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
12. Implement N Queen's problem using Back Tracking.

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Interpret algorithms for given problem and trace its complexity.
- Understand the importance of different algorithm for solving same problem
- Analyze efficient algorithms to get optimal solution for the problem
- Apply the suitable algorithm for the given problem using backtracking method.
- Understand the approximation algorithms

REFERENCES:

1. Levitin A, "Introduction to the Design And Analysis of Algorithms", Pearson Education, 2008.
2. Goodrich M.T.,RTomassia, "Algorithm Design foundations Analysis and Internet Examples", John Wileyn and Sons, 2006.
3. Base Sara, Allen Van Gelder ," Computer Algorithms Introduction to Design and Analysis", Pearson, 3 rd Edition, 1999

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 terminals

SOFTWARE:C compiler

HS1401	EMPLOYABILITY AND SOFT SKILLS LAB	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- Strengthen the Employability skills of the students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students' critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.
- Enrich the Soft Skills of the students.

UNIT I		6

Soft Skills- Professionalism- Courtesy- manners - etiquette- business etiquette- Flexibility- Positive attitude- Responsibility-Teamwork- Time Management

UNIT II		6

Communication - oral speaking capability- written- presenting- listening- clear speech & writing- Motivation and initiative-Leadership- Reliability/dependability- Adaptability- Patience- Problem solving- Negotiation and persuasion

UNIT III		6

Writing- Plan before writing- Use of Graphic organisers- Develop a paragraph: topic sentence, supporting sentences, concluding sentence- Write a descriptive paragraph- opinion paragraph- argumentative- analytical.

UNIT IV		6

Reading- Genres and Organization of Ideas- Writing- Email writing- resumes- Job application- project writing- writing convincing proposals.

UNIT V		6

Aptitude- Verbal- Logical Reasoning- Critical reading and thinking- understanding how the text positions the reader- Writing- Statement of Purpose- letter of recommendation- Vision statement

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Write for different purposes in general and technical context skills in articulating a complete idea with a clarity in pronunciation
- Write formal job applications
- Excel in Verbal aptitude, read and evaluate texts logically to solve the puzzles.
- Develop and demonstrate the employability and soft skills.
- Display critical thinking in various professional contexts.

TEXT BOOKS:

1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011
2. Debra Daise, CharlNorloff, and Paul Carne Reading and Writing (Level 4) Oxford University Press: Oxford, 2011

REFERENCES:

1. Davis, Jason and Rhonda Liss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012

3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000
5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well and Knowing Why. Business & Professional Publishing: Australia, 2004

MA1501	ALGEBRA AND NUMBER THEORY	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic notions of groups, rings, fields which will then be used to solve related problems.
- To introduce and apply the concepts of rings, finite fields and polynomials.
- To understand the basic concepts in number theory
- To examine the key questions in the Theory of Numbers.
- To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

UNIT I	GROUPS AND NGS	9

Groups : Definition – Properties – Homomorphism – Isomorphism – Cyclic groups – Cosets – Lagrange's theorem. Rings: Definition – Sub rings – Integral domain – Field – Integer modulo n – Ring homomorphism.

UNIT II	FINITE FIELDS AND POLYNOMIALS	9

Rings – Polynomial rings – Irreducible polynomials over finite fields – Factorization of polynomials over finite fields.

UNIT III	DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS	9

Division algorithm – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.- Linear Diophantine equations

UNIT IV	CONGRUENCES AND CLASSICAL THEOREMS	9

Congruence's – Linear Congruence's – Applications: Divisibility tests – Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems- Wilson's theorem Fermat's little theorem – Euler's theorem

UNIT V	MULTIPLICATIVE FUNCTIONS AND PRIMITIVE ROOTS	9

Euler's Phi functions – Tau and Sigma functions-The order of a Positive Integer-Primality test-Primitive Roots for Primes-Composite with Primitive Roots-Quadratic Residues.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Apply the basic notions of groups, rings, fields which will then be used to solve related problems
- Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- Demonstrate accurate and efficient use of advanced algebraic techniques.
- Demonstrate their mastery by solving non – trivial problems related to the concepts, and by proving simple theorems about the, statements proven by the text.
- Apply integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

TEXT BOOKS:

1. Grimaldi, R.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson

Education, 5th Edition, New Delhi, 2007.
2. Koshy, T., ―Elementary Number Theory with Applications‖, Elsevier Publications, New Delhi, 2002.

REFERENCES:

1. Davis, Jason and Rhonda Liss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012
3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000
5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well and Knowing Why. Business & Professional Publishing: Australia, 2004

IT1501	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the protocol layering and physical level communication.
- To analyze the performance of a network.
- To understand the various components required to build different networks.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport Layer.

UNIT I	INTRODUCTION AND PHYSICAL LAYER	9

Motivation-Goals of networking-Need for a layered architecture, Network hardware-Network software - Reference models - Network standardization, RS-232 over serial line - Guided Transmission media - Wireless transmission media

UNIT II	THE DATA LINK LAYER	9

The Data Link Layer: Data link layer design issues – services provided to the network layer, Framing –Flow and error control :Error detection and correction - Elementary data link protocols – A simplex stop and wait protocol –stop and wait ARQ-Sliding window protocols, piggy backing - Wired LANs: Ethernet - Wireless LANs – IEEE 802.11, Bluetooth – Connecting Devices.

UNIT III	THE NETWORK LAYER	9

Network layer design issues –Switching techniques, IP addressing modes- IPV4, IPV6 subnetting, Routing algorithms: Flooding, Distance vector and Link state routing, Hierarchical routing, Multicasting and broadcasting - Congestion control algorithms –Internetworking

UNIT IV	THE TRANSPORT LAYER	9

Duties of Transport layer– Services – Port Numbers -Multiplexing -Demultiplexing-Congestion control, Internet transport protocols UDP, TCP, SCTP, Case Study: ATM protocols.

UNIT V	THE APPLICATION LAYER	9

WWW and HTTP–FTP–Email–Telnet–SSH–DNS–SNMP.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Describe the basics of the network and discuss the functions of the physical layer.
- Summarize the basics of data flow from one node to another.
- Demonstrate the various services and protocols of the network layer.
- Determine the services of different transport layer protocols.
- Examine the working of various application layer protocols.

TEXTBOOK:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH,2013.

REFERENCES:

1. Larry L. Peterson, Bruce S.Davie ,Computer Networks: A Systems Approach, Fifth Edition ,Morgan Kaufmann Publishers Inc.,2012.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education,2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall,2014.
4. Ying-DarLin , Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach ,McGraw Hill Publisher.
5. James F. Kurose, Keith W.Ross, Computer Networking, ATop-Down Approach Featuring the Internet, Sixth Edition, Pearson Education,2013.

CS1501	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts, functions, processes and threads of operating systems.
- To analyse Scheduling algorithms and understand the concept of Deadlocks.
- To analyse various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.
- To study the distributed operating systems and its applications.

UNIT I	OPERATING SYSTEM OVERVIEW	7

Operating system overview-objectives and functions, Evolution of Operating System - Computer System Organization-Virtualization-Operating System Structure and Operations- System Calls, OS Generations, Process Concept, Threads- Overview, Multithreading Models, Threading issues

UNIT II	PROCESS MANAGEMENT	11

Processes-Process Scheduling, Operations on Processes, Inter-process Communication; ; CPU Scheduling - Scheduling criteria, CPU Scheduling Algorithms, Process Synchronization - Critical Section Problem, Mutex Locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III	MEMORY MANAGEMENT	9

Main Memory-Non Contiguous Memory Allocation - Contiguous Memory Allocation, Paging, Segmentation, Examples; Virtual Memory- Demand Paging, Page Placement and Replacement policies - FIFO Page Replacement, Optimal Page Replacement, LRU Page Replacement, Allocation, Thrashing;

UNIT IV	FILE SYSTEMS AND I/O SYSTEMS	9

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management; swap space management; File concept, Access methods, Directory Structure, File Sharing and

Protection, File System Structure, Directory Implementation, Allocation Methods, Free-Space Management, I/O Systems - I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

UNIT V	CASE STUDY	9

Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS - iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Understand the basic concepts, functions, processes and threads of operating systems.
- Analyze various scheduling algorithms, Understand deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Illustrate the functionality of file systems.
- Perform administrative tasks on Linux Servers and compare iOS and Android Operating Systems.

TEXT BOOK :

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCES :

1. RamazElmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. AchyutS.Godbole, AtulKahate, "Operating Systems", McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Pearson Education, 2004.
4. Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 2004.
6. Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
7. Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.

CS1502	THEORY OF COMPUTATION	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To understand the language hierarchy.
- To construct automata for any given pattern and find its equivalent regular expressions.
- To understand the real time applications on automata theory.
- To design a context free grammar for any given language.
- To understand Turing Machine and their capability.
- To understand undecidable problems and NP class problems.

UNIT I	AUTOMATA FUNDAMENTALS	9

Introduction to formal proof – Additional forms of Proof – Inductive Proofs –Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Equivalence of NFA and DFA – Finite Automata with Epsilon Transitions – Equivalence of NFA with epsilon transitions and NFA without Epsilon Transitions

UNIT II	REGULAR EXPRESSIONS	9

Regular Languages – Regular Expressions – FA and Regular Expressions – Arden's Theorem –Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata

UNIT III	CONTEXT FREE GRAMMAR AND NORMAL FORMS	10

CFG – Parse Trees – Ambiguity in Grammars and Languages – Normal Forms for CFG- Chomsky Normal Form – Griebach Normal Forms- Pumping Lemma for CFL – Closure Properties of CFL – Conversion of normal forms to Regular Expression.

UNIT IV	PUSH DOWN AUTOMATA AND TURING MACHINE	9

Definition of the Pushdown Automata – Instantaneous Descriptions – Languages of Pushdown Automata – Equivalence of Pushdown Automata and CFG -– Turing Machines – Programming Techniques for TM.

UNIT V	UNDECIDABILITY	8

Language not recursively enumerable – Undecidable Problem with RE – RICE Theorem – Undecidable Problems about TM – Recursive and recursively enumerable languages - Post's Correspondence Problem – The Class P and NP.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Construction Of DFA,NFA and ε-NFA and Regular expression for the languages
- Understand the concept of converting NFA to DFA, ε-NFA to DFA,automata to regular expressions and regular expression to automata
- Remembering pumping lemma for regular languages and context free languages
- Construct a CFG,Parse trees and PDA.
- Understand the working Principles of Turning Machine and Post correspondence problem

TEXT BOOKS:

1. J.E.Hopcroft, R.Motwani and J.D Ullman, ―Introduction to Automata Theory, Languages and Computations‖, Second Edition, Pearson Education, 2003.

REFERENCE BOOKS:

1. H.R.Lewis and C.H.Papadimitriou, ―Elements of the theory of Computation‖, Second Edition, PHI, 2003.
2. J.Martin, ―Introduction to Languages and the Theory of Computation‖, Third Edition, TMH, 2003.
3. MichealSipser, ―Introduction of the Theory and Computation‖, Thomson Brokecole, 1997.
4. Laurel Brodkorb, -- The Entscheidungs problem and Alan Turing, 2019.
5. Deepak D' Souza – Modern Applications of Automata Theory, 2021.

EC1515	EMBEDDED SYSTEM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The student should be made to:

- Learn the basics of Embedded system design
- Learn the architecture and programming of ARM processor.
- Be familiar with the embedded computing platform design and analysis.
- Be exposed to the basic concepts of real time systems and networks
- Model real-time applications using embedded-system concepts

UNIT I	INTRODUCTION TO EMBEDDED COMPUTING	9
Complex systems and microprocessors– Embedded system design process –Design example: Model train controller- Design methodologies- Design flows – Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques		
UNIT II	**ARM PROCESSOR AND PERIPHERALS**	**9**
ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3 MCU		
UNIT III	**EMBEDDED COMPUTING PLATFORM DESIGN**	**9**
The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer Electronics architecture – platform-level performance analysis - Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.		
UNIT IV	**REAL TIME SYSTEMS AND NETWORKS**	**9**
Structure of a Real Time System — Estimating program run times – Task Assignment and Scheduling – Fault Tolerance Techniques – Reliability, Evaluation – Clock Synchronization Distributed embedded systems-CAN, I2C, Ethernet, – MPSoCs and shared memory multiprocessors.		
UNIT V	**CASE STUDY**	**9**
FOSS tools for Embedded Systems, I2C, Data compressor - Alarm Clock - Audio player - Software modem- Digital still camera – Telephone answering machine-Engine control unit – Video accelerator- Chocolate Vending Machine		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, students will be able to:

- Describe the architecture and programming of ARM processor
- Outline the concepts of embedded systems
- Explain the basic concepts of real time operating system design
- Use the system design techniques to develop software for embedded systems
- Differentiate between the general purpose operating system and the real time operating system

TEXT BOOK:

1. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”, Third Edition “Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

REFERENCES:

1. Jonathan W.Valvano, “Embedded Microcomputer Systems Real Time Interfacing”, Third Edition Cengage Learning, 2012.
2. David. E. Simon, “An Embedded Software Primer”, 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.
3. Raymond J.A. Buhr, Donald L.Bailey, “An Introduction to Real-Time Systems- From Design to Networking with C/C++”, Prentice Hall, 1999.
4. C.M. Krishna, Kang G. Shin, “Real-Time Systems”, International Editions, McGraw Hill 1997
5. K.V.K.K.Prasad, “Embedded Real-Time Systems: Concepts, Design & Programming”, Dream Tech Press, 2005.
6. Sriram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming”, Tata McGraw Hill, 2004.
7. Larry Pyeatt, “Modern Assembly Language Programming with ARM processor”, Elsevier.

IT1503	NETWORKS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The student should be made to:

- To learn and use network commands.
- To learn socket programming.
- To implement and analyze various network protocols.
- To learn and use simulation tools.
- To use simulation tools to analyze the performance of various network protocols.
- To learn error detection and correction techniques

LIST OF EXPERIMENTS

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like:
   Echo client and echo server, Chat , File Transfer
4. Simulation of DNS using UDP sockets.
5. Write a code simulating ARP /RARP protocols.
6. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms
7. Study of TCP/UDP performance using Simulation tool.
8. Simulation of Distance Vector/ Link State Routing algorithm.
9. Performance evaluation of Routing protocols using Simulation tool.
10. Simulation of error correction code (like CRC).
11. Configuring Network Operating Systems and network devices

TOTAL: 60 PERIODS

COURSE OUTCOMES

At the end of the course, the student should be able to:

- Illustrate the use of TCP and UDP protocols.
- Examine the performance of different transport layer protocols.
- Use simulation tools to determine the performance of various network protocols.
- Apply various routing algorithms.
- Demonstrate the use of simulation tools

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:

HARDWARE: 30 Terminals.

SOFTWARE: 1. C / C++ / Java / Python / Equivalent Compiler 30.2. Network simulator like NS2/Glomosim/OPNET/ Packet Tracer / Equivalent

CS1503	OPERATING SYSTEMS LABORATORY	L	T	P	C

		0	**0**	**4**	**2**

COURSE OBJECTIVES

- To learn UNIX commands and shell programming.
- To implement Process Creation, Inter Process Communication and various CPU Scheduling Algorithms.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms.
- To implement Page Replacement Algorithms.
- To implement File Allocation Strategies.

LIST OF EXPERIMENTS

1. Installation of LINUX using Virtual Machine
2. Basics of UNIX and LINUX commands
3. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir
4. Write C programs to simulate UNIX commands like cp, ls, grep, etc.
5. Shell Programming
6. Write C programs to implement the various CPU Scheduling Algorithms
7. Implementation of Semaphores
8. Implementation of Shared memory and IPC
9. Bankers Algorithm for Deadlock Avoidance
10. Implementation of Deadlock Detection Algorithm
11. Write C program to implement Threading & Synchronization Applications
12. Implementation of the following Memory Allocation Methods for fixed partition a) First Fit b) Worst Fit c) Best Fit
13. Implementation of Paging Technique of Memory Management
14. Implementation of the following Page Replacement Algorithms a) FIFO b) LRU c) LFU
15. Implementation of the various file organization techniques and the following File Allocation Strategies a) Sequential b) Indexed c) Linked

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Learn various UNIX commands, shell programming
- Create processes, implement IPC and Semaphores and to compare the performance of various CPU Scheduling Algorithms
- Implement Deadlock avoidance and Detection Algorithms
- Analyze the performance of the various Page Replacement Algorithms
- Implement File Organization and File Allocation Strategies

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 terminals

SOFTWARE: C / C++ / Java

CS1601	**INTERNET PROGRAMMING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES :

- To understand the basics of Web Designing using HTML, CSS, and XML.
- To understand the basics of Client side scripting.
- To understand the basics of Server side scripting.
- To understand the Recent Trends in Internet programming.

UNIT I	**CSS, XML**	**9**
HTML –Cascading Style sheets - Types - Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations- XML - Document type definition - XML Schemas - Document Object model.		
UNIT II	**CLIENT SIDE SCRIPTING**	**9**
Introduction to Client Side scripting - JavaScript - Control statements - Functions - Arrays - Built in Objects - Document Object Model - Regular Expression -Events - Validation - Dynamic HTML with Java Script - JSON- AJAX: Ajax Client Server Architecture - XML Http Request Object - Call Back Methods.		
UNIT III	**SERVER SIDE SCRIPTING-JAVA TECHNOLOGIES**	**9**
Introduction to Web servers - Apache Tomcat Servers - Server Side Scripting - Java Servlets:- Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies - Database Connectivity with MySQL - JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.		
UNIT IV	**SERVER SIDE SCRIPTING-PHP**	**9**
Introducing PHP - Configuring Your Environment - PHP Basics - Functions - Arrays - Error and Exception Handling - : Strings and Regular Expressions - Working with the File - Working with HTML Forms Session Handlers - Using PHP with MySQL.		
UNIT V	**RECENT TRENDS IN INTERNET PROGRAMMING**	**9**
Fundamentals of JQuery and Bootstrap -Introduction to AngularJS - Fundamentals of ReactJS - Introduction to NodeJS and Express - Node JS MongoDB.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students should be able to:

- Understand the basics of Web Designing using HTML, CSS, and XML
- Design and implement dynamic web page with validation using Java Script and JSON
- Develop server side programs using Servlet and JSP.
- Construct simple web pages in PHP
- Develop interactive web applications using modern internet programming.

TEXT BOOKS:

1. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, “Internet & World Wide Web How to Program”, Fifth Edition, Deitel Series, 2012.
2. Jason Gilmore, “Beginning PHP and MySQL from Novice to Professional”, Fourth Edition, Apress Publications, 2010.
3. Dayley B., “Node.js, MongoDB, and AngularJS Web Development”, Addison-Wesley Professional, 2014.

REFERENCES:

1. Robert W. Sebesta, “Programming with World Wide Web”, Fourth Edition, Pearson, 2008.
2. David William Barron, “The World of Scripting Languages”, Wiley Publications, 2000.
3. Brown, Ethan, “Web Development with Node and Express: Leveraging the JavaScript Stack”, O'Reilly Media, 2019.
4. Anthony, Accomazzo, Murray Nathaniel, Lerner Ari, “Fullstack React: The Complete Guide to React JS and Friends”, Fullstack.io, 2017.
5. Kozlowski, Pawel, “Mastering Web Application Development with Angular JS”, Packt Publishing Ltd., 2013.

CS1602	COMPILER DESIGN	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement front-end of the compiler.
- To learn to implement code generator.

UNIT I	INTRODUCTION TO COMPILERS	9

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA, Applications of Compiler.

UNIT II	SYNTAX ANALYSIS	12

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar –Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT III	INTERMEDIATE CODE GENERATION	8

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

UNIT IV	RUN-TIME ENVIRONMENT AND CODE GENERATION	8

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management - Issues in Code Generation - Design of a simple Code Generator.

UNIT V	CODE OPTIMIZATION	8

Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks- Global Data Flow Analysis - Efficient Data Flow Algorithm.

LIST OF EXPERIMENTS:

1. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, Comments, Operators etc.). Create a symbol table, while recognizing identifiers.
2. Implement a Lexical Analyzer using Lex Tool
3. Implement an Arithmetic Calculator using LEX and YACC
4. Generate three address codes for a simple program using LEX and YACC.
5. Implement simple code optimization techniques (Constant folding, Strength reduction and Algebraic transformation)
6. Implement back-end of the compiler for which the three address code is given as input and the 8086 assembly language code is produced as output.

PRACTICALS 30 PERIODS
THEORY: 45 PERIODS
TOTAL : 75 PERIODS

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

- Differentiate phases of the compiler and design a lexical analyzer for a sample language.
- Apply different parsing algorithms to develop the parsers for a given grammar

- Construct syntax-directed translation
- Illustrate code optimization techniques
- Design and implement a scanner and a parser using LEX and YACC tools.

TEXT BOOK:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools‖, Second Edition, Pearson Education, 2009.

REFERENCES :

1. Randy Allen, Ken Kennedy, and Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, Advanced Compiler Design and Implementation‖, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, Engineering a Compiler‖, Morgan Kaufmann Publishers Elsevier Science, 2004.
4. V. Raghavan, Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.
5. Allen I. Holub, Compiler Design in C‖, Prentice-Hall Software Series, 1993.

CS1603	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To apply logical and probabilistic reasoning in solving AI problems
- To know about the various applications of AI.

UNIT I INTRODUCTION **9**

Introduction–Definition – Future of Artificial Intelligence- Production systems, Types of Production systems –Typical Intelligent Agents – Agents and Environments – concept of rationality – nature of environments – Structure of agents.

UNIT II PROBLEM SOLVING METHODS **9**

Search Strategies - Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games

UNIT III LOGICAL REASONING **9**

Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution.

UNIT IV PROBABILISTIC REASONING **9**

Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks

UNIT V APPLICATIONS AND LEARNING **9**

Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition –Introduction to Machine Learning-Types of Machine Learning

TOTAL :45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

- Illustrate the intelligent agent frameworks and its environments.
- Analyze real life problems and solve those using searching algorithms and AI techniques.
- Analyze and apply logical reasoning in solving AI problems using first order and predicate logic.
- Demonstrate the applications of Probabilistic Reasoning in Bayesian Networks.
- Examine the various applications of AI and types of Learning.

TEXT BOOKS:

1 S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2 I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

REFERENCES:

1. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press, 2009.
3. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
4. William F. Clocksin and Christopher S. Mellish,‖ Programming in Prolog: Using the ISO Standard‖, Fifth Edition, Springer, 2003.
5. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013.
6.David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, 2010.

CS1604	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks

UNIT I	INTRODUCTION	9

Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Cyber threats and their defense (Phishing Defensive measures, web based attacks, SQL injection & Defense techniques

UNIT II	BLOCK CIPHER AND SYMMETRIC KEY CRYPTOGRAPHY	9

Algebraic structures, Modular arithmetic-Euclid‟s algorithm- Congruence and matrices SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution

UNIT III	NUMBER THEORY & ASYMETRIC KEY CRYPTOGRAPHY	9

Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange -Elliptic curve cryptography

UNIT IV	MESSAGE AUTHENTICATION AND INTEGRITY	9
Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signatures – DSS- Entity Authentication applications - Kerberos, X.509		
UNIT V	**WEB, EMAIL SECURITY AND ADVANCED ENCRYPTION**	**9**
Web Security: SSL, TLS – EMAIL Security: PGP - Advanced Encryption: Shamir's secret sharing and BE, Identity-based Encryption (IBE), Attribute-based Encryption (ABE) – Functional Encryption - Introduction to Quantum Cryptography		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Understand the fundamentals of network security, security architecture, threats, and vulnerabilities
- Apply symmetric cryptographic algorithms to perform encryption and decryption
- Demonstrate public-key cryptographic operations for secure communication
- Implement and analyze authentication mechanisms to ensure secure access control in information systems.
- Experiment with advanced encryption methods, including identity-based encryption and quantum cryptography techniques

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.
2. Douglas R Stinson "Cryptography – Theory and practice", First Edition, CRC Press, 1995.

REFERENCES:

1. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.
2. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007.
3. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
4. Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.
5. Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
6. Nptel.ac.in
7. "Cryptography Theory and Practice" by Douglas.R. Stinson and Maura.B. Paterson, CRC Press, Fourth Edition
8. " Attribute based Encryption and Access Control" by Dijiang Huang and Qiuxiang Dong, CRC Press
9. Functional Encryption, by Khairol Amali Bin Ahmad, Khaleel Ahmad, Uma N. Dulhare, Springer Publication
10. "Quantum Cryptography" by YoannPeitri ,Imperial College, London (Research Paper)

CS1605	INTERNET PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To be familiar with Web page design using HTML/XML and style sheets
- To learn to create dynamic web pages using client side scripting.
- To be exposed to creating applications with AJAX
- To learn to write Client Server applications using java technologies.
- To learn to write Client Server applications using PHP.
- To develop web applications using modern tools.

LIST OF EXPERIMENTS

1. Create a web page with the following.
   a. Cascading style sheets.
   b. Embedded style sheets.
   c. Inline style sheets. Use our college information for the web pages.
2. Demonstrate XML DTD and XML Schema
3. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
4. Install TOMCAT web server. Write programs in Java using Servlets:
   i. To invoke servlets from HTML forms
   ii. Session tracking using hidden form fields and Session tracking for a hit count
5. Write programs in Java to create three-tier applications using servlets for conducting on-line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
6. Write programs in Java to create three-tier applications to create registration form and login form using form using JSP
7. Write programs in PHP
   i. Validate the form using regular expression
   ii. Create a three-tier applications using PHP
8. Write a client side scripting to demonstrate JQuery and Bootstrap
9. Write a client side scripting to demonstrate AngularJS
10. Write a client side scripting to demonstrate ReactJS
11. Write a Server side scripting to demonstrate Node JS with MongoDB

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to:

- Design and Implement Web pages using HTML/XML and style sheets.
- Develop Client side dynamic web pages with validation using Java Script and JSON
- Develop Server side dynamic web pages with validation using Servlet and JSP
- Construct simple dynamic and interactive Web pages using PHP.
- Develop interactive web applications using recent Tools

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 terminals

SOFTWARE:Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP ,JQuery,AngularJS, ReactJS, Node JS.

CS1606	SECURITY LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To learn different cipher techniques
- To implement the algorithms DES, RSA,MD5,SHA-1
- To use network security tools and vulnerability assessment tools

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 techniques
i) Rail fence ii) row & Column Transformation

3. Apply DES algorithm for practical applications.
4. Apply AES algorithm for practical applications.
5. Implement RSA Algorithm using HTML and JavaScript
6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7. Calculate the message digest of a text using the SHA-1 algorithm.
8. Implement the SIGNATURE SCHEME - Digital Signature Standard.
9. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
10. Automated Attack and Penetration Tools
Exploring N-Stalker, a Vulnerability Assessment Tool
11. Defeating Malware
i) Building Trojans ii) Rootkit Hunter

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to:

- Develop code for classical Encryption Techniques to solve the problems
- Build cryptosystems by applying symmetric and public-key encryption algorithms.
- Construct code for authentication algorithms.
- Develop a signature scheme using the Digital Signature Standard.
- Demonstrate the network security system using open-source tools.

REFERENCES:

1. Build Your Own Security Lab, Michael Gregg, Wiley India

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE: C / C++ / Java or equivalent compiler GnuPG, Snort, N-Stalker or Equivalent

HARDWARE: 30 Terminals.

HS1601	PROFESSIONAL COMMUNICATION	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

The course aims to:

- Enhance the employability and career skills of students
- Orient the students towards grooming as a professional
- Enable them to become employable, industry ready graduates
- Build their self-esteem and guide them in achieving success in interviews
- Aid them to fit into any professional working environment

UNIT I		9

Introduction to Employability Skills – Hard Skills & Soft Skills - Career Skills - Professional Grooming with Values - Emotional Intelligence- General Awareness of Current Affairs

UNIT II		9

Presentation Skills -Topic Selection – Organizing the Material – Introducing Oneself to the Audience – Introducing the Topic – Answering Questions - Presenting the Visuals/Graphics Effectively – Mini Presentation (General and Technical – 5 Minutes)

UNIT III		9

Group Discussion (GD) Strategies – Introduction to GD Activities – Preparation Tips for GDs - Participating in GDs on Current Issues -Understanding Group Dynamics- Brainstorming the Topic – Questioning and Clarifying – Mock GDs

UNIT IV		9

Job Interview Tips - Etiquette – Dress Code – Non-Verbal Communication during GDs and Interviews – Tips and Practice for Attending Interviews –Telephone/Skype Interview – One-to-one interview & Panel Interview – Self-Introduction Practice- FAQs related to Job interviews –Mock Interview		
UNIT V		**9**
Recognizing Differences between Group and Teamwork – Multitasking – Stress Management – Networking professionally- Importance of Team Spirit – Respecting Social Protocols- Work Ethics - Developing a Long-term Career plans – Making career changes		
		TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course Learners will be able to:

- Listen and respond appropriately
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal
- Persuade through conversations.

RECOMMENDED SOFTWARE

Globearena

https://placement.freshersworld.com/

Related Online Repositories for Soft Skill Development

Videos from TED and YouTube

REFERENCES:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
3. Interact English Lab Manual for Undergraduate Students. Orient BalckSwan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
5. S. Hariharan et al. Soft Skills. MJP Publishers: Chennai, 2010.
6. Singh, Prachi, Professional Communication JBC Press: Daryaganj, 2015.
7. Eric H. Glendinning, Oxford English for Careers Technology for Engineering and Applied Sciences:Student Book, Oxford University Press, Oxford, 2013.

IT1701	DISTRIBUTED SYSTEMS AND CLOUD COMPUTING	L	T	P	C
		3	0	0	3
UNIT I	**INTRODUCTION TO DISTRIBUTED SYSTEM CONCEPTS**				**9**
Introduction to Distributed Systems – Characteristics – Issues in Distributed Systems -Distributed System Model – Request/Reply Protocols – RPC – RMI – Logical Clocks and Casual Ordering of Events – Election Algorithm – Distributed Mutual Exclusion -Distributed Deadlock Detection Algorithms.					
UNIT II	**PROCESSES AND PROCESSORS IN DISTRIBUTED SYSTEMS**				**9**

Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, Real time distributed systems, Process migration and related issues

UNIT III	INTRODUCTION TO CLOUD COMPUTING	9

Introduction to Cloud Computing – Evolution of Cloud Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning – NIST Cloud Computing Reference Architecture– Architectural Design Challenges – Deployment Models: Public, Private and Hybrid Clouds – Service Models: IaaS – PaaS – SaaS – Benefits of Cloud Computing.

UNIT IV	CLOUD ENABLING TECHNOLOGIES	9

Introduction to Web Service and Service Oriented Architecture – SOAP – REST – Basics of Virtualization – Full and Para Virtualization– Implementation Levels of Virtualization – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Desktop Virtualization – Server Virtualization.

UNIT V	CLOUD MANAGEMENT, STORAGE AND SECURITY	9

Resource Provisioning and Methods – Cloud Management Products – Cloud Storage – Provisioning Cloud Storage – Managed and Unmanaged Cloud Storage – Cloud Security Overview – Cloud Security Challenges –Security Architecture. Case Studies: Openstack, Amazon EC2, AWS, Microsoft Azure, Google Compute Engine.

TOTAL: 45 PERIODS

COURSE OUTCOME:

At the end of the course, the student should be able to:

- Critically analyze and evaluate the diverse web services and emerging technologies employed in modern IT solutions.
- Create dynamic web pages using DHTML and java script that is easy to navigate and use.
- Construct server-side web pages to process and respond to client-side requests.
- Analyze web data structures for XML representation and examine XML integration in JSP for dynamic web page development.
- Explore the categorization of various web services and emerging technologies.

TEXT BOOKS:

1. Buyya R., Broberg J., Goscinski A., “Cloud Computing: Principles and Paradigm”, John Wiley, 2011.
2. John W. Rittinghouse, James F. Ransome, “Cloud Computing: Implementation “Management and Security”, CRC Press, 2016.
3. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.

REFERENCE BOOKS:

1. Andrew S. Tanenbaum, Maarten Van Steen, “Distributed Systems - Principles and Paradigms”, Second Edition, Pearson, 2016.
2. Mukesh Singhal, “Advanced Concepts In Operating Systems”, McGraw Hill Series in Computer Science, 2017.

CS1701	MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the concepts of machine learning and types of problems tackled by machine learning.
- To explore the different supervised learning techniques.
- To learn different aspects of unsupervised learning and reinforcement learning.
- To learn the role of probabilistic methods for machine learning
- To understand the basic concepts of neural networks and deep learning

UNIT I	INTRODUCTION TO MACHINE LEARNING	7

Types of Machine Learning, Supervised learning: Classification, Regression, Unsupervised learning, Generative and Discriminative Models ,Some basic concepts in machine learning, The Machine Learning Process, Reinforcement Learning.

UNIT II	SUPERVISED LEARNING	11

Supervised Learning, learning a Class from Examples, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Classification, Decision trees – Support vector machines -Neural networks (Gradient Descent and Back Propagation), Naïve Bayes Algorithm, Linear Regression and Logistic Regression, Random Forest, Ensemble Learning

UNIT III	UNSUPERVISED LEARNING	9

Introduction - Clustering Algorithms -K – Means – Hierarchical Clustering - Cluster Validity - Dimensionality Reduction –Principal Component Analysis — EM algorithm.

UNIT IV	REINFORCEMENT LEARNING	9

Reinforcement Learning – Elements –Uses- Model based Learning – Temporal Difference Learning - Generalization - Markov Decision Processes- Partially Observable States Example: Getting Lost-Values:Q-Learning and Sarsa Algorithm - Back on Holiday: Using Reinforcement Learning, The Tiger Problem

UNIT V	PROBABILISTIC METHODS FOR LEARNING	9

Introduction - Maximum Likelihood -Maximum Apriori -Bayesian Belief Networks -Probabilistic Modelling of Problems -Inference in Bayesian Belief Networks – Probability Density Estimation - Sequence Models – Markov Models – Generative Models :Hidden Markov Models

COURSE OUTCOMES:

Upon the completion of course, students will be able to

- Understand the basic concepts of machine learning and its types
- Solve the problems of different applications using supervised learning algorithms
- Analyze typical Unsuperrised learning algorithms for different types of applications.
- Demonstrate the various Reinforcement algorithms
- Examine probabilistic methods for real world applications.

TEXTBOOKS:

1. Ethem Alpaydin, “Introduction to Machine Learning”, Third Edition, Adaptive Computation and Machine Learning Series, MIT Press, 2014

2. Stephen Marsland, “Machine Learning: An Algorithmic erspective”, Chapman & Hall/CRC, 2nd Edition, 2014.

REFERENCES
1.Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 20122
2. Tom M Mitchell, "Machine Learning", McGraw Hill Education, 2013.

3. Christopher M.Bishop ,Pattern Recognition and Machine Learning, Springer Publications,
4. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.

5.Ameet V Joshi, Machine Learning and Artificial Intelligence, Springer Publications, 2020

THEORY: 45 PERIODS

MG 1701	PRINCIPLES OF MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To enable the students to study the evolution of Management.
- To study the functions and principles of management and to learn the application of the principles in an organization.

UNIT I	INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS	9

Definition of Management – Science or Art – Manager Vs. Entrepreneur – types of managers – managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current trends and issues in Management.

UNIT II	PLANNING	9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III	ORGANISING	9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV	DIRECTING	9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V	CONTROLLING	9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

COURSE OUTCOMES :

- Understand about the planning and decision making process of management.
- Understand the organization structure, HR planning and control.
- Apply functions of management like motivation, leadership and communication.
- Analyze the performance controlling process, techniques of control and reporting to the management.
- Apply principles of management in order to execute the role as a manager in IT industry.

TEXTBOOKS:

1. Stephen P. Robbins & Mary Coulter, "Management", 10th Edition, Prentice Hall (India) Pvt. Ltd., 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo& Mary Coulter, "Fundamentals of Management" 7th Edition, Pearson Education, 2011.
2. Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata Mc Graw Hill, 1998.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999.

CS1702	**MACHINE LEARNING LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

LIST OF EXPERIMENTS:

1. Implement the concept of decision trees with suitable data set from real world problem and classify the data set to produce new sample.
2. Detecting Spam mails using Support vector machine
3. Implement facial recognition application with artificial neural network
4. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
5. Implement character recognition using Multilayer Perceptron
6. Implement the kmeans algorithm
7. Implement the Dimensionality Reduction techniques
8. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
9. Using Weka Tool Perform a. Data preprocessing by selecting or filtering attributes b. Data preprocessing for handling missing value
10. Mini-project: students work in team on any socially relevant problem that needs a machine learning based solution, and evaluate the model performance.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Implement supervised learning algorithms for real world dataset
- Apply the concept of unsupervised learning algorithms for suitable application.
- Make use of appropriate probabilistic methods for real time application
- Apply various tools Weka/MATLAB etc for implementing machine learning algorithms

- Implement Machine Learning algorithms to solve real world problems

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
SOFTWARE: Python/Java with ML Package/R
HARDWARE: 30 terminals.

		L	T	P	C
IT1702	**CLOUD COMPUTING LAB**	**0**	**0**	**4**	**2**

COURSE OBJECTIVES:

- To learn the fundamentals of Cloud Computing and designing Private Cloud and Public Cloud Environment.
- To learn the basic ideas and principles of Virtualization Technology.
- To learn the dynamic programming models for Cloud.
- To gain knowledge on various cloud components mechanism for data center design and management.

LIST OF EXPERIMENTS

1. Virtualization
a. Find procedure to run the virtual machine of different configuration using virt-manager.
b. Virtualize a machine and check how many virtual machine can be utilized at a particular time.
c. Create a VM clone and attach virtual block to the cloned virtual machine and check whether it holds the data even after the release of the virtual machine.

2. Public Cloud
a. Develop a simple application to understand the concept of PAAS using GAE/Amazon Elastic Beanstalk/IBM Blue Mix/GCC and launch it.
b. Test how a SaaS applications scales in response to demand.
c. Find the procedure to launch a Cloud instance using a Public IaaS cloud like AWS/GCP.

3. **Private Cloud**
a. Setup a Private Cloud by performing the procedure using a Single node Openstack/Opennebula implementation.
b. Perform Creation, Management and Termination of a CentOS instance in Openstack/Opennebula.
c. Show the virtual machine migration based on certain conditions from one node to the other.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
On completion of this course, the students will be able to:

- Demonstrate the cloud, its characteristics, various delivery and deployment models
- Relate fundamental cloud components mechanism with which cloud data centers are managed and administered.
- Design and deploy a web application in a PaaS &SaaS environment.
- Outline the strength of virtualization and its role in enabling the cloud computing model

- Validate Hadoop single node cluster and run applications with map reduce commands

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
SOFTWARE: VM Ware,Windows OS,VM Workstation,CentOS,OpenNebula,C,Java
HARDWARE: 30 terminals.

CS1703	SUMMER INTERNSHIP	L	T	P	C
		0	0	0	2

COURSE OBJECTIVES:

To enable the students to

- Get connected with reputed industry/ laboratory/academia / research institute
- Get practical knowledge on Product Development / Services and operations / Software Design and Development / Testing / Analytics/ research/ startups/ professionalism / business processes and insights / domain knowledge/ Industry Practices/ and other related aspects and develop skills to solve related problems
- Develop technical, soft, team skills to cater to the needs of the industry / academia / businesses / research / organizations in the core aspects of Automation, Digitalization

The students individually undergo training in reputed firms/ research institutes / laboratories for the specified duration. After the completion of training, a detailed report should be submitted within ten days from the commencement of next semester. The students will be evaluated as per the Regulations.

No. of Weeks: 04

COURSE OUTCOMES:

At the end of the course, students would:

- Understand the basic concepts related to the assigned project work during industrial training/certification course.
- Analyze the assigned problem by considering its impact on society and environment
- Justify and discuss the design solution for the problem.
- Demonstrate the ability to work effectively in team with commitments to professional ethics.
- Conclude the project work through proper documentation in the form of project report.

PROFESSIONAL ELECTIVE – I

CS1607	CYBER SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Cyber security.
- To know about the security aspects of operating systems and networks.
- To explore Cryptography, IDS and IPS
- To study the privacy principles and policies.

- To know about the Security management and incidents.

UNIT I	**INTRODUCTION TO CYBERSECURITY**	**9**

Introduction-Computer Security-Threats-Harm-Vulnerabilities-Controls–Authentication-Access Control and Cryptography-Web-User Side-Browser Attacks-Web Attacks-Targeting -Users – Obtaining User or Website Data-Email Attacks.

UNIT II	**SECURITY APPLICATIONS FOR OPERATING SYSTEM & NETWORKS**	**9**

Security in Operating Systems - Security in the Design of Operating Systems -Rootkit – Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service-Distributed Denial-of-Service.

UNIT III	**SECURITY DETECTION AND COUNTERMEASURES**	**9**

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems –Network Management-Databases-Security Requirements of Databases-Reliability and Integrity-Database Disclosure-Data Mining and Big Data.

UNIT IV	**CYBERSPACE AND PRIVACY POLICIES**	**9**

Privacy Concepts-Privacy Principles and Policies-Authentication and Privacy-Data Mining-Privacy on the Web –Email Security-Privacy Impacts of Emerging Technologies.

UNIT V	**MANAGEMENT OF CYBER SECURITY**	**9**

Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis – Dealing with Disaster –Emerging Technologies –The Internet of Things-Economics-Electronic Voting-Cyber Warfare- the Law-International Laws-Cybercrime-Cyber Warfare and Home Land Security.

COURSE OUTCOMES:

After the completion of this course, students will be able to:

- Acquire the basic concepts of Cyber Security.
- Determine the security applications for operating system and networks
- Discover the security detection and classify their various security countermeasures.
- Infer the various applicable Privacy principles and policies
- Identify security planning and effective management of cyber security

TOTAL:45 PERIODS

TEXTBOOKS:

1. Jan L.Harrington, ”NetworkSecurity– A Practical Approach”, Morgan Kaufmann Publishers–An Imprint of Elsevier,2005.

2. William Stallings,"Cryptography and NetworkSecurity–Principles and Practice", Pearson Education Asia,FourthEdition,2005

REFERENCES:

1. Edward Amoroso,"Cyber Security", SiliconPress, 2006
2. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing,5thEdition ,PearsonEducation,2015
3. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press,2013.
4. MarttiLehto,PekkaNeittaanmäki,CyberSecurity:Analytics,TechnologyandAutomationedited,SpringerInternationalPublishingSwitzerland2015
5. Nelson Phillips and Enfinger Steuart,"Computer Forensics and Investigations",Cengage Learning, New Delhi,2009.
6. Introduction to Cyber Security available at http://uou.ac.in/foundation-course
7. Fundamentals of Information Security http://uou.ac.in/progdetail?pid=CEGCS-17
8. Cyber Security Techniques http://uou.ac.in/progdetail?pid=CEGCS-17
9. Cyber Attacks and Counter Measures: User Perspective http://uou.ac.in/progdetail?pid=CEGCS-17
10. Information System http://uou.ac.in/progdetail?pid=CEGCS-17

CS1608	SOFTWARE TESTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To expose the criteria for test cases.
- To learn the design of test cases.
- To understand the various levels of testing.
- To become familiar with test managing.
- To become familiar with test automation techniques, test metrics and measurement.
- To develop and validate a test plan.

UNIT I	INTRODUCTION	9

Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model- Testing axioms – Basic definitions – Software Testing Principles – The Tester's Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design –Defect Examples- Developer/Tester Support of Developing a Defect Repository.

UNIT II	TEST CASEDESIGN STRATEGIES	9

Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing - Random Testing – Requirements based testing – Using White Box Approach to Test design – Test Adequacy Criteria static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – code complexity testing – Additional White box testing approaches- Evaluating Test Adequacy Criteria.

UNIT III	LEVELS OF TESTING	9

The need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing –Compatibility testing – Testing the documentation – Website testing.

UNIT IV	**TEST MANAGEMENT**	**9**

People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group- The Structure of Testing Group- .The Technical Training Program.

UNIT V	**TEST AUTOMATION**	**9**

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Understand the fundamentals of software testing
- Design test cases suitable for a software development for different domains
- Design test cases and document test plan
- Apply a wide variety of testing techniques in an effective and efficient manner
- Apply automatic testing tools in different domains

TEXT BOOKS:

1. SrinivasanDesikanandGopalaswamyRamesh,―SoftwareTesting–PrinciplesandPractices‖, Pearson Education,2006.
2. Ron Patton,―Software Testing‖,Second Edition, Sams Publishing, Pearson Education, 2007. AULibrary.com

REFERENCES:

1. Ilene Burnstein,―Practical Software Testing‖, Springer International Edition,2003.
2. Edward Kit, ‖Software Testing in the RealWorld–Improving the Process‖, Pearson Education,1995.
3. Boris Beizer,‖Software Testing Techniques‖ –2nd Edition, Van Nostrand Reinhold, New York,1990.
4. Aditya P.Mathur,―Foundations of Software Testing _ Fundamental Algorithms andTechniques‖,DorlingKindersley(India)Pvt.Ltd.,PearsonEducation,2008.

CS1609	**AGILE METHODOLOGIES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.

- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

UNIT I	AGILEMETHODOLOGY	9

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT II	AGILEPROCESSES	9

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III	AGILITY AND KNOWLEDGEMANAGEMENT	9

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV	AGILITY AND REQUIREMENTSENGINEERING	9

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V	AGILITY AND REQUIREMENTSENGINEERING	9

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.
- Develop techniques and tools for improving team collaboration and software quality.
- Perform Software process improvement as an ongoing task for development teams.

Show how agile approaches can be scaled up to the enterprise level.

TEXT BOOKS:

1. David J.Anderson and Eli Schragenheim,― AgileManagement for Software Engineering:
2. Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
3. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

REFERENCES:

1. Craig Larman, ―Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.
2. Kevin C.Desouza,― Agile Information Systems: Conceptualization, Construction, and Management‖,Butterworth-Heinemann,2007.

CS1610	GRAPH THEORY AND APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.

UNIT I		**9**

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT II		**9**

Trees -Properties- Distance and Centres - Types - Rooted Tree -- Tree Enumeration- Labeled Tree - Unlabeled Tree - Spanning Tree - Fundamental Circuits- Cut Sets - Properties - Fundamental Circuit and Cut-set- Connectivity- Separability -Related Theorems.

UNIT III		**9**

Network Flows - Planar Graph - Representation - Detection - Dual Graph - Geometric and Combinatorial Dual - Related Theorems - Digraph - Properties - Euler Digraph.

UNIT IV		**9**

Matrix Representation - Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - Chromatic Partitioning - Matching - Covering - Related Theorems.

UNIT V		**9**

Graph Algorithms- Connectedness and Components- Spanning Tree - Fundamental Circuits- Cut Vertices- Directed Circuits- Shortest Path – Applications overview.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Understand the basic concepts of graphs, and different types of graphs
- Understand the properties, theorems and be able to prove theorems.
- Apply suitable graph model and algorithm for solving applications.

TEXT BOOKS:

1. NarsinghDeo, "Graph Theory with Application to Engineering and Computer
2. Science", Prentice-Hall of India Pvt.Ltd, 2003.
3. L.R.Foulds , "Graph Theory Applications", Springer ,2016.

REFERENCES:

1. Bondy, J. A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication, 2008.
2. West,D.B.,―Introduction to GraphTheory‖, PearsonEducation,2011.
3. John Clark, Derek Allan Holton, ―A First Look at Graph Theory‖, World Scientific Publishing Company, 1991.
4. Diestel, R, "Graph Theory", Springer, 3rd Edition, 2006.
5. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", McGrawHill, 2007.

CS1611	**DATA WAREHOUSING AND DATAMINING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools.

UNIT I	**DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING(OLAP)**	**9**
Basic Concepts - Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors - Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.		
UNIT II	**DATA MINING–INTRODUCTION**	**9**
Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.		
UNIT III	**DATA MINING - FREQUENTPATTERN ANALYSIS**	**9**
Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns		
UNIT IV	**CLASSIFICATION AND CLUSTERING**	**9**
Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis-Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.		
UNIT V	**WEKATOOL**	**9**
Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database - Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Design a Data warehouse system and perform business analysis with OLAP tools.
- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis
- Apply appropriate classification and clustering techniques for data analysis

TEXT BOOK:

1. JiaweiHan and MichelineKamber, ―Data Mining Concepts and Techniques‖, Third Edition, Elsevier, 2012.

REFERENCES:

1. Alex Bersonand Stephen J.Smith, ―Data Warehousing, Data Mining &OLAP‖, Tata McGraw – Hill Edition, 35th Reprint2016.
2. K.P.Soman, Shyam DiwakarandV.Ajay,―Insightin to Data Mining Theory and Practice‖, Eastern Economy Edition, Prentice Hall of India,2006.

3. Ian H.WittenandEibeFrank, ―Data Mining: Practical Machine Learning Tools and Techniques‖, Elsevier, Second Edition.

PROFESSIONAL ELECTIVE – II

CS1704	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn fundamentals of XML
- To provide an overview of Service Oriented Architecture and Web services and their importance
- To learn web services standards and technologies
- To learn service oriented analysis and design for developing SOA based applications

UNIT I	XML	9

XML document structure–Well-formed and valid documents– DTD – XML Schema – Parsing XML using DOM,SAX–XPath-XML Transformation and XSL–Xquery

UNIT II	SERVICEORIENTEDARCHITECTURE(SOA)BASICS	9

Characteristics of SOA, Benefits of SOA, Comparing SOA with Client-Server and Distributed architectures–--Principles of Service Orientation–Service layers

UNIT III	WEBSERVICES (WS)ANDSTANDARDS	8

Web Services Platform – Service descriptions – WSDL – Messaging with SOAP –Service discovery– UDDI–Service - Level Interaction Patterns – and Choreography

UNIT IV	WEBSERVICES EXTENSIONS	8

WS-Addressing-WS-Reliable Messaging-WS-Policy–WS-Coordination–WS-Transactions-WS-Security-Examples

UNIT V	SERVICE ORIENTEDANALYSISANDDESIGN	11

SOA delivery strategies–Service oriented analysis–Service Modelling–Service oriented design - Standards and composition guidelines—Service design–Business process design–Case Study

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of this course, the students will be able to:

- Understand XML technologies
- Understand service orientation, benefits of SOA
- Understand web services and WS standards
- Use web services extensions to develop solutions
- Understand and apply service modeling, service oriented analysis and design for application development

CS1705	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To facilitate the understanding of Quality Management principles and process.

UNIT I	INTRODUCTION	9

Introduction - Need for quality -Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, and Customer retention.

UNIT II	**TQM PRINCIPLES**	**9**

Leadership-Quality Statements, Strategic quality planning, Quality Councils-Employee involvement Motivation, Empowerment, Team and Team work, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen – Supplier partnership-Partnering, Supplier selection, Supplier Rating.

UNIT III	**TQM TOOLS AND TECHNIQUES I**	**9**

The seven traditional tools of quality – New management tools –Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking – Reason to bench mark, Bench marking process-FMEA-Stages, Types.

UNIT IV	**TQM TOOLS AND TECHNIQUES II**	**9**

Quality Circles - Cost of Quality - Quality Function Deployment (QFD)- Taguchi quality loss function - TPM -Concepts, improvement needs- Performance measures.

UNIT V	**QUALITY MANAGEMENT SYSTEM**	**9**

Introduction—Benefits of ISO Registration—ISO9000 Series of Standards—Sector Specific Standards—AS9100, TS16949 and TL9000--ISO9001Requirements—Implementation—Documentation—Internal Audits—Registration-

ENVIRONMENTAL MANAGEMENT SYSTEM:

Introduction—ISO14000 Series Standards— Concepts of ISO14001—Requirements of ISO14001—Benefits of EMS.

TOTAL: 45 PERIODS

COURSE OUTCOME:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

CS1706	**MULTI-CORE ARCHITECTURES AND PROGRAMMING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the need for multi-core processors, and their architecture.
- To understand the challenges in parallel and multi-threaded programming.
- To learn about the various parallel programming paradigms,
- To develop multicore programs and design parallel solutions.

UNIT I	**MULTI-CORE PROCESSORS**	**9**

Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks - Symmetric and Distributed Shared Memory Architectures – Cache coherence – Performance Issues–Parallel program design.

UNIT II	**PARALLEL PROGRAMCHALLENGES**	**9**

Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and live locks – communication between threads (condition variables, signals, message queues and pipes).

UNIT III	**SHARED MEMORY PROGRAMMING WITH OpenMP**	**9**

OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs - Library functions – Handling Data and Functional Parallelism – Handling Loops – Performance Considerations.

UNIT IV	DISTRIBUTED MEMORY PROGRAMMING WITH MPI	9

MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point andCollectivecommunication–MPIderiveddatatypes–Performanceevaluation

UNIT V	PARALLEL PROGRAM DEVELOPMENT	9

Case studies - n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Describe multicore architectures and identify their characteristics and challenges.
- Identify the issues in programming Parallel Processors.
- Write programs using OpenMP and MPI.
- Design parallel programming solutions to common problems.
- Compare and contrast programming for serial processors and programming for parallel processors.

TEXTBOOKS:

1. Peter S. Pacheco, an Introduction to Parallel Programming‖, Morgan-Kauffman/Elsevier, 2011.
2. DarrylGove,―MulticoreApplicationProgrammingforWindows,Linux,andOracleS olaris‖,Pearson,2011 (unit2)

REFERENCES:

1. Michael J Quinn, Parallel programming in C with MPI and OpenMP‖, Tata Mc GrawHill, 2003.
2. Victor Alessandrini, Shared Memory Application Programming, 1st Edition, Concepts and Strategies in Multicore Application Programming, Morgan Kaufmann, 2015.
3. Yan Solihin, Fundamentals of Parallel Multicore Architecture, CRC Press, 2015

CS1707	HUMAN COMPUTER INTERACTION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guide lines for user interface.

UNIT I	FOUNDATIONS OF HCI	9

The Human: I/O channels–Memory–Reasoning and problem solving; The Computer: Devices - Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles –elements– interactivity-Paradigms.-Case Studies

UNIT II	DESIGN & SOFTWARE PROCESS	9

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle–usability engineering–Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques–Universal Design

UNIT III	MODELS AND THEORIES	9

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models - Hypertext, Multimedia and WWW.		
UNIT IV	**MOBILE HCI**	**9**
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.-Case Studies		
UNIT V	**WEB INTERFACE DESIGN**	**9**
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students should be able to:

- Learn the effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities
- Understand the importance of user feedback.
- Comprehend the HCI implications for designing multimedia/ ecommerce/ e-learning Websites.
- Develop meaningful user interface.

TEXTBOOKS:

1. AlanDix,JanetFinlay,GregoryAbowd,RussellBeale,―HumanComputerInteraction‖ ,3rdEdition,Pearson Education,2004 (UNITI,II& III)
2. Brian Fling, ―Mobile Design and Development‖, First Edition, O'Reilly Media Inc., 2009 (UNIT –IV)
3. BillScottandTheresaNeil,―DesigningWebInterfaces‖,FirstEdition,O'Reilly,2009.(UNIT-V)

CS1708	**C#AND.NETPROGRAMMING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To learn basic programming in C# and the object oriented programming concepts.
- To update and enhance skills in writing Windows applications, ADO.NET and ASP .NET.
- To study the advanced concept sin data connectivity, WPF, WCF and WWF with C# and .NET4.5.
- To implement mobile applications using .Net compact framework
- To understand the working of base class libraries, their operations and manipulation of data using XML.

UNIT I	**C# LANGUAGE BASICS**	**9**
.Net Architecture-Core C#-Variables-Data Types-Flow control-Objects and Types- Classes and Structs - Inheritance- Generics – Arrays and Tuples – Operators and Casts-Indexers		
UNIT II	**C# ADVANCED FEATURES**	**9**
Delegates – Lambdas – Lambda Expressions – Events – Event Publisher – Event Listener – Strings and Regular Expressions – Generics – Collections – Memory Management and Pointers-Errors and Exceptions-Reflection		
UNIT III	**BASE CLASS LIBRARIESAND DATAMANIPULATION**	**9**

Diagnostics-Tasks,ThreadsandSynchronization-.NetSecurity-Localization-Manipulating XML- SAX and DOM - Manipulating files and the Registry- Transactions -ADO.NET- Peer-to-Peer Networking - PNRP - Building P2P Applications – Windows Presentation Foundation (WPF).

UNIT IV	WINDOW BASED APPLICATIONS,WCFAND WWF	9

Window based applications-Core ASP.NET - ASP.NET Web forms-Windows Communication Foundation (WCF)- Introduction to Web Services - .Net Remoting –Windows Service-Windows Workflow Foundation(WWF)-Activities– Workflows

UNIT V	NETFRAMEWORK AND COMPACT FRAMEWORK	9

Assemblies-Sharedassemblies-CustomHostingwithCLRObjects-Appdomains-Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging –Optimizing performance – Packaging and Deployment – Networking and Mobile Devices

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

- Develop a simple applications using C# and describe the .Net framework
- Develop various applications using C# advanced features in .Net Framework.
- Develop distributed applications by implementing base class libraries and database connectivity using ADO.Net.
- Develop window based applications using .Net Framework.
- Design a mobile application using .NET compact framework.

TEXTBOOKS:

1. Christian Nagel, Bill Evjen, JayGlynn, Karli Watson, Morgan Skinner ―Professional C# 2012 and .NET 4.5 ‖,Wiley,2012
2. Harsh Bhasin, ―Programming in C# ‖, Oxford University Press, 2014.

REFERENCES

1. Ian Gariffiths, Mathew Adams, Jesse Liberty, ―Programming C# 4.0‖,O_Reilly, Fourth Edition, 2010.
2. Andrew Troelsen, Pro C# 5.0 and the .NET4.5 Framework, A press publication, 2012.
3. Andy Wigley, Daniel Moth, Peter Foot, ― Mobile Development Handbook ‖, Microsoft Press, 2011.

CS1709	WIRELESS ADHOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn about the issues and challenges in the design of wireless adhoc networks.
- To understand the working of MAC and Routing Protocols for adhoc and sensor networks
- To learn about theTransport Layer protocols and their QoS for adhoc and sensor networks.
- To understand various security issues in adhoc and sensor networks and the corresponding solution.

UNIT I	MAC &ROUTING IN ADHOC NETWORKS	9

Introduction–Issues and challenges in adhoc networks–MAC Layer Protocols for wireless adhoc networks – Contention - Based MAC protocols – MAC Protocols Using Directional Antennas – Multiple

– Channel MAC Protocols – Power –Aware MAC Protocols – Routing in Adhoc Networks – Design Issues –Proactive, Reactive and Hybrid Routing Protocols		
UNIT II	**TRANSPORT & QOS INAD HOC NETWORKS**	**9**
TCP‟s challenges and Design Issues in Ad Hoc Networks – Transport protocols for adhoc networks – Issues and Challenges in providing QoS – MAC Layer QoS solutions – Network Layer QoS solutions– QoSModel		
UNIT III	**MAC& ROUTING IN WIRELESS SENSOR NETWORKS**	**9**
Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks – Low duty cycle protocols and wakeup concepts – Contention-Based protocols– Schedule-Based protocols IEEE 802.15.4 Zigbee –Topology Control–Routing Protocols		
UNIT IV	**TRANSPORT& QOSINWIRELESS SENSOR NETWORKS**	**9**
Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control in network processing – Operating systems for wireless sensor networks–Examples		
UNIT V	**SECURITYINADHOCAND SENSORNETWORKS**	**9**
Security Attacks–Key Distribution and Management–Intrusion Detection Software based Anti-tamper techniques – Water marking techniques – Defense against routing attacks –Secure Adhoc routing protocols–Broad cast authentication WSN protocols – TESLA –Biba–Sensor Network Security Protocols –SPINS		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

- Identify different issues in wireless adhoc and sensor networks.
- To analyze protocols developed for adhoc and sensor networks.
- To identify and understand security issues in adhoc and sensor networks.

TEXTBOOKS:

1. C.SivaRam Murthy and B.S.Manoj,―AdHoc Wireless Networks–Architectures and Protocols‖, Pearson Education, 2006.
2. Holger Karl, Andreas Willing, ―Protocols and Architectures for Wireless Sensor Networks‖, John Wiley &Sons, Inc.,2005.

REFERENCES

1. Subir Kumar Sarkar, TG Basavaraju, C Puttamadappa, ―AdHoc Mobile Wireless Networks‖, Auerbach Publications, 2008.
2. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, ―AdHoc and Sensor Networks: Theory and Applications (2nd Edition)‖,World Scientific Publishing, 2011.
3. Waltenegus Dargie, Christian Poellabauer,―Fundamentals of Wireless Sensor Networks Theory and Practice ‖,John Wiley and Sons,2010
4. Xiang- YangLi, **“**Wireless Ad Hoc and Sensor Networks: Theory and Applications‖, 1227 the edition, Cambridge university Press, 2008.

CS1710	ADVANCED TOPICS ON DATABASES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the modeling and design of databases.
- To acquire knowledge on parallel and distributed databases and their applications.

- To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the usage of advanced data models.
- To learn emerging databases such as XML, Cloud and Big Data.
- To acquire inquisitive attitude towards research topics in databases.

UNIT I	PARALLEL AND DISTRIBUTED DATABASES	9

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies

UNIT II	OBJECT AND OBJECT RELATIONAL DATABASES	9

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance - Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

UNIT III	INTELLIGENT DATABASES	9

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases- TSQL2- Deductive Databases: Logic of Query Languages – Datalog- Recursive Rules-Syntax and Semantics of Datalog Languages- Implementation of Rules and Recursion- Recursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial Relationships- Spatial Data Structures- Spatial Access Methods- Spatial DB Implementation.

UNIT IV	ADVANCED DATA MODELS	9

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data Warehousing- Data Mining- Text Mining.

UNIT V	EMERGING TECHNOLOGIES	9

XML Databases: XML-Related Technologies-XML Schema- XML Query Languages- Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases- Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages- Introduction to Big Data-Storage-Analysis.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon Completion of the course, the students will be able,

- To develop in-depth understanding of relational databases and skills to optimize database performance in practice.
- To understand and critique on each type of databases.
- To design faster algorithms in solving practical database problems.
- To implement intelligent databases and various data models.

TEXT BOOKS:

1. Ramez Elmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems‖, Sixth Edition, Pearson, 2011.
2. Thomas Cannolly and Carolyn Begg, ―Database Systems, A Practical Approach to Design, Implementation and Management‖, Fourth Edition, Pearson Education, 2008.

REFERENCES:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, ―Database System Concepts‖, Sixth Edition, McGraw Hill, 2011.
2. C.J.Date, A.Kannan, S.Swamynathan, an Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006.
3. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T. Snodgrass, V.S. Subrahmanian, Roberto Zicari, ―Advanced Database Systems‖, Morgan Kaufmann publishers, 2006.

CS1711	FULL STACK WEB DEVELOPMENT	L	T	P	C
		2	0	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of web programming and client side scripting.
- To learn client side development using ReactJS.
- To understand and architect databases using NoSQL and SQL databases.
- To understand API development with Express Framework
- To learn the deployment of web application in Cloud

UNIT I	ADVANCED CSS &JAVASCRIPT CONCEPTS	9

Introduction to bootstrap- BS Grid- Images- Buttons- pagination- Icons-Dropdowns- Forms-Input- Carousel- Navigation bar and Tabs- Modal components - Objects – Promises – ES6 Let and Const – this keyword –Hoisting – type of - type Conversion – Template literals – Arrow function – Default parameter – Async Await – JSON

UNIT II	ADVANCED CLIENT SIDE PROGRAMMING	9

React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - -JS Localstorage - Events - Lifting State Up - Composition and Inheritance

UNIT III	ADVANCED NODE JS AND DATABASE	9

Introduction to No SQL databases – MongoDB system overview - Basic querying with MongoDB shell – Request body parsing in Express – NodeJS Mongo DB connection – Adding and retrieving data to MongoDB from NodeJS – Handling SQL databases from NodeJS – Handling Cookies in NodeJS – Handling User Authentication with NodeJS

UNIT IV	SERVER SIDE PROGRAMMING WITH NODE JS	9

Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines Static Files - async/await - Fetching JSON from Express

UNIT V	APP IMPLEMENTATION IN CLOUD	9

Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of the course the students should be able to:

- Utilize CSS and JavaScript for effective client-side scripting.

- Design and implement the client-side architecture of web applications.
- Develop web applications using NodeJS.
- Design and manage NoSQL databases with MongoDB.
- Build and deploy a full-stack Single Page Application (SPA) utilizing React, NodeJS, and MongoDB in a cloud environment.

REFERENCES:

1. David Flanagan, "Java Script: The Definitive Guide", O'Reilly Media, Inc, 7th Edition, 2020
2. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019.
3. Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020
4. Marc Wandschneider, "Learning Node", Addison-Wesley Professional, 2nd Edition, 2016
5. Joe Beda, Kelsey Hightower, Brendan Burns, "Kubernetes: Up and Running", O'Reilly Media, 1 st edition, 2017
6. Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, SaiVennam, "Cloud Without Compromise", O'Reilly Media, 1st edition, 2021

CS1712	HUMAN RIGHTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I		9

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II		9

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III		9

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV		9

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V		9

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL: 45 PERIODS

COURSE OUTCOME:

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., ―Human Rights under International law and Indian Laws‖, Central Law Agency, Allahabad, 2014.
2. Chandra U., ―Human Rights‖, Allahabad Law Agency, Allahabad, 2014.
Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi

CS1713	BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Understand how blockchain systems (mainly Bitcoin and Ethereum) work,
- To securely interact with them
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from blockchain technology into their own projects.

UNIT I	BASICS	9

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

UNIT II	BLOCKCHAIN	9

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

UNIT III	DISTRIBUTED CONSENSUS	9

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

UNIT IV	CRYPTOCURRENCY	9

History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

UNIT V	CRYPTOCURRENCY REGULATION	9

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Block chain.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon the successful completion of the Course, the Student would be able to

- Understand the basics of Blockchain
- Examine the differences between conventional distributed database and Blockchain
- Illustrate the Satoshi Nakamoto consensus and differences between proof-of-work and proof-of-stake consensus
- Show the various concepts used in Cryptocurrency and Ethereum
- Demonstrate the various Cryptocurrency regulation and applications.

TEXT BOOK:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

REFERENCE BOOKS:

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Crypto currencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger, "Yellow paper. 2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

CS1802	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the basics in deep neural networks
- To understand the basics of associative memory and unsupervised learning networks
- To apply CNN architectures of deep neural networks
- To analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
- To apply autoencoders and generative models for suitable applications

UNIT I	INTRODUCTION	9

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction-Evolution of Neural Networks-Basic Models of Artificial Neural Network- Important Terminologies of ANNs-Supervised Learning Network

UNIT II	ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS	9

Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network

UNIT III	THIRD-GENERATION NEURAL NETWORKS	9

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression

UNIT IV	DEEP FEEDFORWARD NETWORKS	9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets

UNIT V	RECURRENT NEURAL NETWORKS	9

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs

– Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Apply Convolution Neural Network for image processing.
- Understand the basics of associative memory and unsupervised learning networks.
- Apply CNN and its variants for suitable applications.
- Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.
- Apply autoencoders and generative models for suitable applications

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
2. Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

REFERENCES:

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly, 2018.
2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
3. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 1st Edition, 2018.
4. Learn Keras for Deep Neural Networks, JojoMoolayil, Apress,2018
5. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
6. Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND,2017.
7. S Rajasekaran, G A Vijayalakshmi Pai, "Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications", PHI Learning, 2017.
8. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017
9. James A Freeman, David M S Kapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.

GE1801	PROFESSIONAL ETHICS IN ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I	HUMAN VALUES	9

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation

– Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II	ENGINEERING ETHICS	9

Senses of _Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III	ENGINEERING AS SOCIAL EXPERIMENTATION	9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law

UNIT IV	SAFETY, RESPONSIBILITIES AND RIGHTS	9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) Discrimination

UNIT V	GLOBAL ISSUES	9

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Understand the human values with regard to the individual life style for the society
- Examine the role of ethics to the engineering field
- Categorize how engineering is applied in association with ethics based on engineering experimentation
- Illustrate the engineering ethics-based safety, responsibilities and rights
- Classify the global issues of professional ethics in engineering.

TEXTBOOKS:

1. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCES:

1. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E.Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.
3. John R Boatright, ―Ethics and the Conduct of Business‖, Pearson Education, New Delhi, 2003
4. Edmund GSeebauer and Robert L Barry, ―Fundamentals of Ethics for Scientists and Engineers‖, Oxford University Press, Oxford, 2001.
5. Laura P.Hartman and Joe Desjardins, ―Business Ethics: Decision Making for Personal Integrity and Social Responsibility‖ Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, _ Value Education', Vethathiri publications, Erode, 2011.

Web sources:

1. www.onlineethics.org
2. www.nspe.org

3. www.globalethics.org
4. www.ethics.org

CS1803	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand big data.
- To learn and use NoSQL big data management.
- To learn mapreduce analytics using Hadoop and related tools.
- To work with map reduce applications
- To understand the usage of Hadoop related tools for Big Data Analytics

UNIT I	UNDERSTANDING BIG DATA	9

Introduction to big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data applications– big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

UNIT II	NOSQL DATA MANAGEMENT	9

Introduction to NoSQL – aggregate data models – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – master-slave replication – consistency - Cassandra – Cassandra data model – Cassandra examples – Cassandra clients.

UNIT III	MAP REDUCE APPLICATIONS	9

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling– shuffle and sort – task execution – MapReduce types – input formats – output formats

UNIT IV	BASICS OF HADOOP	9

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures - Cassandra – Hadoop integration.

UNIT V	HADOOP RELATED TOOLS	9

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Describe big data and use cases from selected business domains.
- Explain NoSQL big data management.
- Install, configure, and run Hadoop and HDFS.
- Perform map-reduce analytics using Hadoop.
- Use Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

TEXTBOOKS:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
3. Sadalage, Pramod J. “NoSQL distilled”, 2013

REFERENCES:

1. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
2. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
3. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
4. Alan Gates, "Programming Pig", O'Reilley, 2011.

CS1804	PRINCIPLES OF PROGRAMMING LANGUAGES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

UNIT I	SYNTAX AND SEMANTICS	9

Evolution of programming languages – describing syntax – context-free grammars – attribute grammars – describing semantics – lexical analysis – parsing – recursive-descent – bottom up parsing

UNIT II	DATA, DATA TYPES, AND BASIC STATEMENTS	9

Names – variables – binding – type checking – scope – scope rules – lifetime and garbage collection – primitive data types – strings – array types – associative arrays – record types – union types – pointers and references – Arithmetic expressions – overloaded operators – type conversions – relational and boolean expressions – assignment statements – mixed mode assignments – control structures – selection – iterations – branching – guarded statements.

UNIT III	SUBPROGRAMS AND IMPLEMENTATIONS	9

Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions – semantics of call and return – implementing simple subprograms – stack and dynamic local variables – nested subprograms – blocks – dynamic scoping.

UNIT IV	OBJECT-ORIENTATION, CONCURRENCY, AND EVENT HANDLING	9

Object-orientation – design issues for OOP languages – implementation of object-oriented constructs – concurrency – semaphores – monitors – message passing – threads – statement level concurrency – exception handling – event handling

UNIT V	FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES	9

Introduction to lambda calculus– fundamentals of functional programming languages – Programming

with Scheme– Programming with ML– Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Describe syntax and semantics of programming languages
- Explain data, data types, and basic statements of programming languages
- Design and implement subprogram constructs
- Apply object-oriented, concurrency, and event handling programming constructs and Develop programs in Scheme, ML, and Prolog
- Understand and adopt new programming languages

TEXTBOOKS:

1. Robert W. Sebesta, "Concepts of Programming Languages", Twelfth Edition (Global Edition), Pearson, 2022.
2. Michael L. Scott, "Programming Language Pragmatics", Fourth Edition, Elsevier, 2018.
3. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, Prentice Hall, 2011.
4. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Pearson, 1997.
5. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

CS1805	SECURITY AND PRIVACY IN CLOUD	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Introduce Cloud Computing terminology, definition & concepts
- To understand the security design and architectural considerations for Cloud
- To understand the Identity, Access control in Cloud
- To follow best practices for Cloud security using various design patterns
- To be able to monitor and audit cloud applications for security

UNIT I	FUNDAMENTALS OF CLOUD SECURITY CONCEPTS	9

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non-repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures

UNIT II	SECURITY DESIGN AND ARCHITECTURE FOR CLOUD	9

Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key.

UNIT III	ACCESS CONTROL AND IDENTITY MANAGEMENT	9

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention.

UNIT IV	CLOUD SECURITY DESIGN PATTERNS	9
Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud.		
UNIT V	**MONITORING, AUDITING AND MANAGEMENT**	**9**
Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Understand the cloud concepts and fundamentals.
- Explain the security challenges in the cloud.
- Define cloud policy and Identity and Access Management.
- Understand various risks and audit and monitoring mechanisms in the cloud.
- Define the various architectural and design considerations for security in the cloud.

TEXTBOOKS:

1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, "Cloud Computing:‖, Wiley 2013
2. Dave shackleford, "Virtualization Security‖, SYBEX a wiley Brand 2013.
3. Mather, Kumaraswamy and Latif, "Cloud Security and Privacy‖, OREILLY 2011

REFERENCES:

1. Mark C. Chu-Carroll "Code in the Cloud‖,CRC Press, 2011
2. Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi

CS1806	GAME DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of a game engine.
- To survey the gaming development environment and tool kits.
- To learn and develop simple games using Pygame environment

UNIT I	3D GRAPHICS FOR GAME DESIGN	9
Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.		
UNIT II	**GAME DESIGN PRINCIPLES**	**9**
Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction,		

Production and Post – Production.		
UNIT III	**GAME ENGINE DESIGN**	**9**
Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Pathfinding		
UNIT IV	**OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS**	**9**
Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity Single player and Multi-Player games		
UNIT V	**GAME DEVELOPMENT USING PYGAME**	**9**
Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Games.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Explain the concepts of 2D and 3d Graphics
- Design game design documents.
- Implementation of gaming engines.
- Survey gaming environments and frameworks.
- Implement a simple game in Pygame.

REFERENCES:

1. Sanjay Madhav, "Game Programming Algorithms and Techniques: A Platform Agnostic Approach", Addison Wesley,2013.
2. Will McGugan, "Beginning Game Development with Python and Pygame: From Novice to Professional", Apress,2007.
3. Paul Craven, "Python Arcade games", Apress Publishers,2016.
4. David H. Eberly, "3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics", Second Edition, CRC Press,2006.
5. Jung Hyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 2011.

CS1807	**MULTIMEDIA AND ANIMATION**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To grasp the fundamental knowledge of Multimedia elements and systems
- To get familiar with Multimedia file formats and standards
- To learn the process of Authoring multimedia presentations
- To learn the techniques of animation in 2D and 3D and for the mobile UI
- To explore different popular applications of multimedia

UNIT I	**INTRODUCTION TO MULTIMEDIA**	**9**
Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing. Multimedia metadata, Multimedia databases, Hypermedia, Multimedia Learning		
UNIT II	**MULTIMEDIA FILE FORMATS AND STANDARDS**	**9**

File formats – Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web

UNIT III	MULTIMEDIA AUTHORING	9

Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools, audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual learning, simulations

UNIT IV	ANIMATION	9

Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D, 2 ½ D, and 3D animation, Animation techniques: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, , Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality

UNIT V	MULTIMEDIA APPLICATIONS	9

Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, media on demand, security and forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Get the bigger picture of the context of Multimedia and its applications
- Use the different types of media elements of different formats on content pages.
- Author 2D and 3D creative and interactive presentations for different target multimedia applications.
- Use different standard animation techniques for 2D, 21/2 D, 3D applications
- Understand the complexity of multimedia applications in the context of cloud, security, bigdata streaming, social networking, CBIR etc.,

TEXTBOOKS:

1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia", Third Edition, Springer Texts in Computer Science, 2021. (UNIT-I, II, III)

REFERENCES:

1. John M Blain, The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC press, 3rd Edition, 2016.
2. Gerald Friedland, Ramesh Jain, "Multimedia Computing", Cambridge University Press, 2018.
3. Prabhat K.Andleigh,KiranThakrar,"Multimedia System Design",Pearson Education, 1st Edition, 2015.
4. Mohsen Amini Salehi, Xiangbo Li, "Multimedia Cloud Computing Systems", Springer Nature, 1st Edition, 2021.
5. Mark Gaimbruno, "3D Graphics and Animation", Second Edition, New Riders, 2002.
6. Rogers David, "Animation: Master – A Complete Guide (Graphics Series)", Charles River Media, 2006.
7. Rick parent, "Computer Animation: Algorithms and Techniques", Morgan Kauffman, 3rd Edition, 2012.
8. Emilio Rodriguez Martinez, Mireia Alegre Ruiz, "UI Animations with Lottie and After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native",

Packt Publishing, 2022.

CS1808	UI and UX Design	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide a sound knowledge in UI & UX
- To understand the need for UI and UX
- To understand the various Research Methods used in Design
- To explore the various Tools used in UI & UX
- Creating a wireframe and prototype

UNIT I	FOUNDATIONS OF DESIGN	9

UI vs. UX Design - Core Stages of Design Thinking -Divergent and Convergent Thinking -Brainstorming an Game storming - Observational Empathy.

UNIT II	FOUNDATIONS OF UI DESIGN	9

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides.

UNIT III	FOUNDATIONS OF UX DESIGN	9

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals.

UNIT IV	WIREFRAMING, PROTOTYPING AND TESTING	9

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration.

UNIT V	RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE	9

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Understand the Foundations of Design thinking
- Apply Visual and UI Design Principles
- Illusrtate and Define UX Design Principles
- Outline Wireframes, Prototypes, and Usability Tests
- Apply Research, Ideation, and Information Architecture

TEXTBOOKS:

1. Joel Marsh, “UX for Beginners”, O’Reilly , 2022
2. Jon Yablonski, “Laws of UX using Psychology to Design Better Product & Services” O’Reilly 2021

REFERENCES:

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3 rdEdition , O’Reilly 2020
2. Steve Schoger, Adam Wathan “Refactoring UI”, 2018
3. Steve Krug, “Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile”, Third Edition, 2015
4. https://www.nngroup.com/articles/
5. https://www.interaction-design.org/literature.

CS1809	GREEN COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of Green Computing.
- To analyze the Green computing Grid Framework.
- To understand the issues related with Green compliance.
- To study and develop various case studies.

UNIT I	FUNDAMENTALS	9

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics

UNIT II	GREEN ASSETS AND MODELING	9

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models

UNIT III	GRID FRAMEWORK	9

Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

UNIT IV	GREEN COMPLIANCE	9

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT V	CASE STUDIES	9

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
- Understand the Green green assets and modeling.
- Enhance the skill in energy saving practices in their use of hardware.
- Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders.
- Understand the ways to minimize equipment disposal requirements.

TEXTBOOKS:

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

REFERENCES:

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

CS1810	MOBILE AND PERVASIVE COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basic architecture and concepts till Third Generation Communication systems.
- To understand the latest 4G Telecommunication System Principles.
- To introduce the broad perspective of pervasive concepts and management
- To explore the HCI in Pervasive environment
- To apply the pervasive concepts in mobile environment

UNIT I	INTRODUCTION	9

History – Wireless communications: GSM – DECT – TETRA – UMTS – IMT – 2000 – Blue tooth, WiFi, WiMAX, 3G ,WATM.- Mobile IP protocols -WAP push architecture-Wml scripts and applications. Data networks – SMS – GPRS – EDGE – Hybrid Wireless100 Networks – ATM – Wireless ATM.

UNIT II	OVERVIEW OF A MODERN 4G TELECOMMUNICATIONS SYSTEM	9

Introduction. LTE-A System Architecture. LTE RAN. OFDM Air Interface. Evolved Packet Core. LTE Requirements. LTE-Advanced. LTE-A in Release. OFDMA – Introduction. OFDM Principles. LTE Uplink—SC-FDMA. Summary of OFDMA.

UNIT III	PERVASIVE CONCEPTS AND ELEMENTS	9

Technology Trend Overview - Pervasive Computing: Concepts - Challenges - Middleware - Context Awareness - Resource Management - Human–Computer Interaction - Pervasive Transaction Processing - Infrastructure and Devices - Wireless Networks - Middleware for Pervasive Computing Systems - Resource Management - User Tracking- Context Management -Service Management - Data Management - Security Management – Pervasive Computing Environments - Smart Car Space - Intelligent Campus

UNIT IV	HCI IN PERVASIVE COMPUTING	9

Prototype for Application Migration - Prototype for Multimodalities - Human–Computer Interface in Pervasive Environments - HCI Service and Interaction Migration - Context- Driven HCI Service Selection - Interaction Service Selection Overview - User Devices - Service-Oriented Middleware Support - User History and Preference - Context Manager - Local Service Matching - Global Combination - Effective Region - User Active Scope - Service Combination Selection Algorithm

UNIT V	PERVASIVE MOBILE TRANSACTIONS	9

Pervasive Mobile Transactions - Introduction to Pervasive Transactions - Mobile Transaction Framework - Unavailable Transaction Service - Pervasive Transaction Processing Framework - Context-Aware Pervasive Transaction Model - Context Model for Pervasive Transaction Processing - Context-Aware

Pervasive Transaction Model - A Case of Pervasive Transactions - Dynamic Transaction Management - Context-Aware Transaction Coordination Mechanism - Coordination Algorithm for Pervasive Transactions - Participant Discovery - Formal Transaction Verification - Petri Net with Selective Transition.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Obtain a through understanding of Basic architecture and concepts of till Third Generation Communication systems.
- Explain the latest 4G Telecommunication System Principles.
- Incorporate the pervasive concepts.
- Implement the HCI in Pervasive environment.
- Work on the pervasive concepts in mobile environment.

REFERENCES:

1. Alan Colman, Jun Han, and Muhammad Ashad Kabir, Pervasive Social Computing Socially-Aware Pervasive Systems and Mobile Applications, Springer, 2016.
2. J.Schiller, ―Mobile Communication‖, Addison Wesley, 2000.
3. Juha Korhonen, ―Introduction to 4G Mobile Communications‖ , Artech House Publishers, 2014
4. Kolomvatsos, Kostas, Intelligent Technologies and Techniques for Pervasive
5. Computing, IGI Global, 2013.
6. M. Bala Krishna, Jaime Lloret Mauri, ―Advances in Mobile Computing and Communications: Perspectives and Emerging Trends in 5G Networks‖, CRC 2016
7. Minyi Guo, Jingyu Zhou, Feilong Tang, Yao Shen, ― Pervasive Computing: Concepts, Technologies and Applications CRC Press, 2016.

CS1811	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the need for SDN and its data plane operations
- To understand the functions of control plane
- To comprehend the migration of networking functions to SDN environment
- To explore various techniques of network function virtualization
- To comprehend the concepts behind network virtualization

UNIT I	SDN: INTRODUCTION	9

Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane , Control plane and Application Plane.

UNIT II	SDN DATA PLANE AND CONTROL PLANE	9

Data Plane functions and protocols - OpenFLow Protocol - Flow Table - Control Plane Functions - Southbound Interface, Northbound Interface – SDN Controllers - Ryu, OpenDaylight, ONOS - Distributed Controllers.

UNIT III	SDN APPLICATIONS	9

SDN Application Plane Architecture – Network Services Abstraction Layer – Traffic Engineering – Measurement and Monitoring – Security – Data Center Networking.

UNIT IV	NETWORK FUNCTION VIRTUALIZATION	9
Network Virtualization - Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefits and Requirements – Reference Architecture.		
UNIT V	**NFV FUNCTIONALITY**	**9**
NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration – NFV Use cases – SDN and NFV.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Describe the motivation behind SDN
- Identify the functions of the data plane and control plane
- Design and develop network applications using SDN
- Orchestrate network services using NFV
- Explain various use cases of SDN and NFV

TEXTBOOKS:

1. William Stallings, "Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud", Pearson Education, 1st Edition, 2015.

REFERENCES:

2. Ken Gray, Thomas D. Nadeau, "Network Function Virtualization", Morgan Kauffman, 2016.
3. Thomas D Nadeau, Ken Gray, "SDN: Software Defined Networks", O'Reilly Media, 2013.
4. Fei Hu, "Network Innovation through OpenFlow and SDN: Principles and Design", 1st Edition, CRC Press, 2014.
5. Paul Goransson,Chuck BlackTimothy Culver,"SoftwareDefinedNetworks: A Comprehensive Approach", 2nd Edition, Morgan Kaufmann Press, 2016
6. Oswald Coker, Siamak Azodolmolky, "Software-Defined Networking with OpenFlow", 2nd Edition, O'Reilly Media, 2017.

CS1812	DIGITAL MARKETING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. The primary objective of this module is to examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
2. It also focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.

UNIT I	INTRODUCTION TO ONLINE MARKET	9
Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing		
UNIT II	**SEARCH ENGINE OPTIMISATION**	**9**
Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page		

Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement.

UNIT III	E- MAIL MARKETING	9

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting.

UNIT IV	SOCIAL MEDIA MARKETING	9

Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing

UNIT V	DIGITAL TRANSFORMATION	9

Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Understand about the designing, developing and promoting through Blogs
- Apply the search engine techniques for better visibility in the online world
- Develop an e-mail / Mobile marketing for promotional activities
- Apply social media marketing techniques to build customer relationships.
- Apply digital transformation techniques in email,mobile and social media

TEXTBOOKS:

1.Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education; First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373.

2.Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press (April 2015). ISBN- 10: 0199455449

3.Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.

4.Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited..

5.Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.

6.Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education.

CS1813	KNOWLEDGE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Knowledge Engineering.
- To discuss methodologies and modeling for Agent Design and Development.
- To design and develop ontologies.
- To apply reasoning with ontologies and rules.

- To understand learning and rule learning.

UNIT I	REASONING UNDER UNCERTAINTY	9

Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning – Knowledge Engineering.

UNIT II	METHODOLOGY AND MODELING	9

Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios.

UNIT III	ONTOLOGIES – DESIGN AND DEVELOPMENT	9

Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification

UNIT IV	REASONIING WITH ONTOLOGIES AND RULES	9

Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge.

UNIT V	LEARNING AND RULE LEARNING	9

Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- Understand the basics of Knowledge Engineering.
- Apply methodologies and modelling for Agent Design and Development.
- Design and develop ontologies.
- Apply reasoning with ontologies and rules.
- Understand learning and rule learning.

TEXTBOOKS:

1. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016. (Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4 / Unit 3 – Chapter 5, 6 / Unit 4 - 7 , Unit 5 – Chapter 8, 9)

REFERENCES:

1. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.

2. Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018.

3. John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.
4. King , Knowledge Management and Organizational Learning , Springer, 2009.
5. Jay Liebowitz, Knowledge Management Learning from Knowledge Engineering, 1st Edition,2001.

CS1814	ETHICAL HACKING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of computer based vulnerabilities.
- To explore different foot printing, reconnaissance and scanning methods.
- To expose the enumeration and vulnerability analysis methods.
- To understand hacking options available in Web and wireless applications.
- To explore the options for network protection.
- To practice tools to perform ethical hacking to expose the vulnerabilities.

UNIT I	INTRODUCTION	9

Ethical Hacking Overview - Role of Security and Penetration Testers .- Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware – Protecting Against Malware Attacks.- Intruder Attacks - Addressing Physical Security

UNIT II	FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS	9

Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall.

UNIT III	ENUMERATION AND VULNERABILITY ANALYSIS	9

Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss.

UNIT IV	SYSTEM HACKING	9

Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade

UNIT V	NETWORK PROTECTION SYSTEMS	9

Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network-Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

- To express knowledge on basics of computer based vulnerabilities

- To gain understanding on different foot printing, reconnaissance and scanning methods.
- To demonstrate the enumeration and vulnerability analysis methods.
- To gain knowledge on hacking options available in Web and wireless applications
- To acquire knowledge on the options for network protection.

TEXTBOOKS:

1. The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.
2. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, DafyddStuttardand Marcus Pinto, 2011.

REFERENCES:

1. Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz , 2014.