

PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018
(AUTONOMOUS)

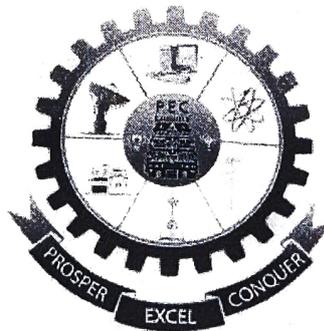
B.E. – COMPUTER SCIENCE AND ENGINEERING

CURRICULUM AND SYLLABI

REGULATIONS 2019
(CHOICE BASED CREDIT SYSTEM)

for

I SEMESTER TO VIII SEMESTER



Institution Vision and Mission

Vision

- To strive to be a globally model Institution all set for taking 'lead-role' in grooming the younger generation socially responsible and professionally competent to face the challenges ahead.

Mission

- To provide goal-oriented, quality-based and value-added education through state-of-the-art technology on a par with international standards.
- To promote nation-building activities in science, technology, humanities and management through research.
- To create and sustain a community of learning that sticks on to social, ethical, ecological, cultural and economic upliftment.

Department Vision and Mission

Vision

- To provide quality technical education and prepare the students to become sustainable well qualified Engineers competent to face global challenges and to serve the society by acquiring adequate professional knowledge and skills by training.

Mission

- **Quality Education:** To produce innovative, competent and goal-oriented computer science engineers through cutting-edge technology and educational experience.
- **Technology Updation:** To enrich the knowledge of students by imparting state-of-the-art technology so that they will satisfactorily serve the society.
- **Employability:** To improve the employability of students through Industry-Institution relationship and make them industry ready.
- **Research & Development:** To widen the knowledge of the faculty members continuously through research and development initiatives.

Programme Educational Objectives (PEOs)		
Engineering Graduates will be able		
PEO I	Global reputation	To create value added, disciplined, high profile Computer Science and Engineering professionals for successful careers in their related Industry that makes them globally reputed.
PEO II	Fundamental Knowledge	To develop the students with a sound foundation in mathematical, scientific and engineering fundamentals necessary to synthesize the technical core concepts focusing on skill development and knowledge up gradation which will lead to technical innovations.
PEO III	Continuous learning	To practice and demonstrate the ability to use the domain knowledge and expertise through periodic assignments performances and projects to continuously prove the functionality of computer science and engineering learning in social and environmental aspects and to make allowances for further improvements.

Programme Outcomes (POs)	
PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development 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.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex

	engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering 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.
PO12	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.

Programme Specific Outcomes (PSOs)	
PSO1	Foundation of Computer System and Software development: Ability to understand the principles and working of computer systems for the development of software solutions.
PSO2	Applications of Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and hence to provide solution with new ideas and innovations.

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CURRICULUM

(For the candidates admitted during the academic year 2019-2020 onwards)

SEMESTER I

S.No.	Category	Course Code	Course Title	Course Mode	L	T	P	C
Theory								
1.	HS	EN19101	English Communication Skills I	Integrated Theory and Laboratory	2	0	2	3
2.	BS	MA19101	Matrices and Calculus	-	3	1	0	4
3.	BS	PH19101	Engineering Physics	Integrated Theory and Laboratory	2	0	2	3
4.	BS	CH19101	Engineering Chemistry	Integrated Theory and Laboratory	2	0	2	3
5.	ES	CS19101	Programming in C	Integrated Theory and Laboratory	2	0	2	3
Practical								
6.	ES	GE19101	Engineering Practices Laboratory	-	0	0	4	2
TOTAL					11	1	12	18

SEMESTER II

S.No.	Category	Course Code	Course Title	Course Mode	L	T	P	C
Theory								
1.	HS	EN19201	English Communication Skills II	Integrated Theory and Laboratory	2	0	2	3
2.	BS	MA19201	Complex Variables and Differential Equations	-	3	1	0	4
3.	BS	PH19202	Physics for Information Science	Integrated Theory and Laboratory	2	0	2	3
4.	BS	CH19201	Material Chemistry	Integrated Theory and Laboratory	2	0	2	3
5.	ES	EE19201	Basic Electrical Engineering	-	3	0	0	3
6.	PC	CS19202	Data Structures and Algorithms	Integrated Theory and Laboratory	2	0	2	3
Practical								
7.	ES	ME19204	Engineering Graphics Laboratory	-	0	0	4	2
TOTAL					14	1	12	21

SEMESTER III

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1.	BS	MA19303	Discrete Mathematics	3	1	0	4
2.	ES	EC19306	Analog and Digital Electronics	3	0	0	3
3.	PC	CS19301	Object Oriented Programming with Java	3	0	0	3
4.	PC	CS19302	Design and Analysis of Algorithms	3	0	0	3
5.	PC	CS19303	Computer Architecture	3	0	0	3
6.	MC	MC19301	Value Education	2	0	0	0
Practical							
7.	ES	EC19307	Analog and Digital Electronics Laboratory	0	0	4	2
8.	PC	CS19304	Design and Analysis of Algorithms Laboratory	0	0	2	1
9.	PC	CS19305	Object Oriented Programming with Java Laboratory	0	0	4	2
TOTAL				17	1	10	21

SEMESTER IV

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1.	BS	MA19403	Probability and Statistics	3	1	0	4
2.	ES	EC19407	Microprocessors and Microcontrollers	3	0	0	3
3.	PC	CS19401	Software Engineering	3	0	0	3
4.	PC	CS19402	Database Management Systems	3	0	0	3
5.	PC	CS19403	Operating Systems	3	0	0	3
6.	MC	MC19401	Environmental Science and Engineering	3	0	0	0
Practical							
7.	PC	CS19404	Database Management Systems Laboratory	0	0	4	2
8.	PC	CS19405	Operating Systems Laboratory	0	0	2	1
9.	EE	EN19401	English Proficiency Course Laboratory	0	0	2	1
TOTAL				18	1	8	20

SEMESTER V

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1.	PC	CS19501	Data Warehousing and Data Mining	3	0	0	3
2.	PC	CS19502	Computer Networks	3	0	0	3
3.	PC	CS19503	Python Programming	3	0	0	3
4.	PC	CS19504	Object Oriented Modeling and Design	3	0	0	3
5.	PC	CS19505	Formal Language and Automata	3	0	0	3
6.	PE	CS1915*	Professional Elective Course I	3	0	0	3
Practical							
7.	PC	CS19506	Computer Networks Laboratory	0	0	4	2
8.	PC	CS19507	Python Programming Laboratory	0	0	4	2
9.	EE	EN19501	Career Development Laboratory I	0	0	2	1
TOTAL				18	0	10	23

SEMESTER VI

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1.	PC	CS19601	Cryptography and Network Security	3	0	0	3
2.	PC	CS19602	Artificial Intelligence	3	0	0	3
3.	PC	CS19603	Cloud Computing	3	0	0	3
4.	PC	CS19604	Big Data Analytics	3	0	0	3
5.	PE	CS1925*	Professional Elective Course II	3	0	0	3
6.	OE	CS1990*	Open Elective I	3	0	0	3
Practical							
7.	PC	CS19605	Big Data Analytics Laboratory	0	0	4	2
8.	PC	CS19606	Cloud Computing Laboratory	0	0	4	2
9.	EE	EN19601	Career Development Laboratory II	0	0	2	1
TOTAL				18	0	10	23

SEMESTER VII

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1.	HS	BA19***	Entrepreneurship Development	3	0	0	3
2.	PC	CS19701	Internet of Things	3	0	0	3
3.	PC	CS19702	Machine Learning	3	0	0	3
4.	PE	CS1935*	Professional Elective Course III	3	0	0	3
5.	PE	CS1945*	Professional Elective Course IV	3	0	0	3
6.	OE	CS1990*	Open Elective II	3	0	0	3
Practical							
7.	PC	CS19703	Internet of Things Laboratory	0	0	2	1
8.	EE	CS19704	Mini Project	0	0	6	3
TOTAL				18	0	8	22

SEMESTER VIII

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1.	PC	CS19801	Software Project Management	3	0	0	3
2.	PE	CS1955*	Professional Elective Course V	3	0	0	3
3.	PE	CS1965*	Professional Elective Course VI	3	0	0	3
Practical							
4.	EE	CS19802	Main Project	0	0	12	6
TOTAL				9	0	12	15

HUMANITIES AND SOCIAL SCIENCES (HS)

S.No.	Category	Course Code	Course Title	L	T	P	C	Semester
1.	HS	EN19101	English Communication Skills I	2	0	2	3	I
2.	HS	EN19201	English Communication Skills II	2	0	2	3	II
3.	HS	BA19***	Entrepreneurship Development	3	0	0	3	VII
TOTAL				7	0	4	9	

BASIC SCIENCES (BS)

S.No.	Category	Course Code	Course Title	L	T	P	C	Semester
1.	BS	MA19101	Matrices and Calculus	3	1	0	4	I
2.	BS	PH19101	Engineering Physics	2	0	2	3	I
3.	BS	CH19101	Engineering Chemistry	2	0	2	3	I
4.	BS	MA19201	Complex Variables and Differential Equations	3	1	0	4	II
5.	BS	PH19202	Physics for Information Science	2	0	2	3	II
6.	BS	CH19201	Material Chemistry	2	0	2	3	II
7.	BS	MA19303	Discrete Mathematics	3	1	0	4	III
8.	BS	MA19403	Probability and Statistics	3	1	0	4	IV
TOTAL				20	4	8	28	

ENGINEERING SCIENCES (ES)

S.No.	Category	Course Code	Course Title	L	T	P	C	Semester
1.	ES	CS19101	Programming in C	2	0	2	3	I
2.	ES	GE19101	Engineering Practices Laboratory	0	0	4	2	I
3.	ES	EE19201	Basic Electrical Engineering	3	0	0	3	II
4.	ES	ME19204	Engineering Graphics Laboratory	0	0	4	2	II
5.	ES	EC19306	Analog and Digital Electronics	3	0	0	3	III
6.	ES	EC19307	Analog and Digital Electronics Laboratory	0	0	4	2	III
7.	ES	EC19407	Microprocessors and Microcontroller	3	0	0	3	IV
TOTAL				11	0	14	18	

PROFESSIONAL CORE COURSES (PC)

S.No.	Category	Course Code	Course Title	L	T	P	C	Semester
1	PC	CS19202	Data Structures and Algorithms	2	0	2	3	II
2	PC	CS19301	Object Oriented Programming with Java	3	0	0	3	III
3	PC	CS19302	Design and Analysis of Algorithms	3	0	0	3	III
4	PC	CS19303	Computer Architecture	3	0	0	3	III
5	PC	CS19304	Design and Analysis of Algorithms Laboratory	0	0	2	1	III
6	PC	CS19305	Object Oriented Programming with Java Laboratory	0	0	4	2	III
7	PC	CS19401	Software Engineering	3	0	0	3	IV
8	PC	CS19402	Database Management Systems	3	0	0	3	IV
9	PC	CS19403	Operating Systems	3	0	0	3	IV
10	PC	CS19404	Database Management Systems Laboratory	0	0	4	2	IV
11	PC	CS19405	Operating Systems Laboratory	0	0	2	1	IV
12	PC	CS19501	Data Warehousing and Data Mining	3	0	0	3	V
13	PC	CS19502	Computer Networks	3	0	0	3	V
14	PC	CS19503	Python Programming	3	0	0	3	V
15	PC	CS19504	Object Oriented Modeling and Design	3	0	0	3	V
16	PC	CS19505	Formal Language and Automata	3	0	0	3	V
17	PC	CS19506	Computer Networks Laboratory	0	0	4	2	V
18	PC	CS19507	Python Programming Laboratory	0	0	4	2	V
19	PC	CS19601	Cryptography and Network Security	3	0	0	3	VI
20	PC	CS19602	Artificial Intelligence	3	0	0	3	VI
21	PC	CS19603	Cloud Computing	3	0	0	3	VI
22	PC	CS19604	Big Data Analytics	3	0	0	3	VI
23	PC	CS19605	Big Data Analytics Laboratory	0	0	4	2	VI
24	PC	CS19606	Cloud Computing Laboratory	0	0	4	2	VI
25	PC	CS19701	Internet of Things	3	0	0	3	VII
26	PC	CS19702	Machine Learning	3	0	0	3	VII
27	PC	CS19703	Internet of Things Laboratory	0	0	2	1	VII
28	PC	CS19801	Software Project Management	3	0	0	3	VIII
TOTAL				56	0	32	72	

PROFESSIONAL ELECTIVE COURSES (PE-I)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	PE	CS19151	Mobile Computing	3	0	0	3
2.	PE	CS19152	Software Quality Assurance	3	0	0	3
3.	PE	CS19153	Cyber Security Essentials	3	0	0	3
4.	PE	CS19154	Soft Computing	3	0	0	3
TOTAL				12	0	0	12

PROFESSIONAL ELECTIVE COURSES (PE-II)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	PE	CS19251	Component Based Technology	3	0	0	3
2.	PE	CS19252	Wireless Sensor Networks	3	0	0	3
3.	PE	CS19253	Natural Language Processing	3	0	0	3
4.	PE	CS19254	Social Network Analysis	3	0	0	3
TOTAL				12	0	0	12

PROFESSIONAL ELECTIVE COURSES (PE-III)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	PE	CS19351	5G Technologies	3	0	0	3
2.	PE	CS19352	Search Engine Optimization	3	0	0	3
3.	PE	CS19353	Linear Programming	3	0	0	3
4.	PE	CS19354	Neural Networks and Deep Learning	3	0	0	3
TOTAL				12	0	0	12

PROFESSIONAL ELECTIVE COURSES (PE-IV)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	PE	CS19451	GPU Computing	3	0	0	3
2.	PE	CS19452	Digital Image Processing	3	0	0	3
3.	PE	CS19453	Cyber Physical Systems	3	0	0	3
4.	PE	CS19454	Decision Support Systems	3	0	0	3
TOTAL				12	0	0	12

PROFESSIONAL ELECTIVE COURSES (PE-V)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	PE	CS19551	Web and Internet Technologies	3	0	0	3
2.	PE	CS19552	Bio-Inspired Computing	3	0	0	3
3.	PE	CS19553	Software Defined Networks	3	0	0	3
4.	PE	CS19554	Virtual Reality	3	0	0	3
TOTAL				12	0	0	12

PROFESSIONAL ELECTIVE COURSES (PE-VI)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	PE	CS19651	Multimedia Systems	3	0	0	3
2.	PE	CS19652	Information Retrieval	3	0	0	3
3.	PE	CS19653	Information Visualization	3	0	0	3
4.	PE	CS19654	Knowledge Representation and Reasoning	3	0	0	3
TOTAL				12	0	0	12

OPEN ELECTIVE COURSES (OE-I)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	OE	CS19901	Data Base Management Systems	3	0	0	3
2.	OE	CS19902	Introduction to Block Chain Technology	3	0	0	3
TOTAL				6	0	0	6

OPEN ELECTIVE COURSES (OE-II)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	OE	CS19903	Web Designing	3	0	0	3
2.	OE	CS19904	Android Application & Development	3	0	0	3
TOTAL				6	0	0	6

EMPLOYABILITY ENHANCEMENT COURSES (EE)

S.No.	Category	Course Code	Course Title	L	T	P	C	Semester
1.	EE	EN19401	English Proficiency Course Laboratory	0	0	2	1	IV
2.	EE	EN19501	Career Development Laboratory I	0	0	2	1	V
3.	EE	EN19601	Career Development Laboratory II	0	0	2	1	VI
4.	EE	CS19704	Mini Project	0	0	6	3	VII
5.	EE	CS19802	Main Project	0	0	12	6	VIII
TOTAL							12	

MANDATORY COURSES (MC)

S.No.	Category	Course Code	Course Title	L	T	P	C	Semester
1.	MC	MC19301	Value Education	2	0	0	0	III
2	MC	MC19401	Environmental Science and Engineering	2	0	0	0	IV
TOTAL							0	

ONE CREDIT COURSES (OCC)

S.No	Category	Institution Code	Course Title	L	T	P	C
1.	OCC	CS20951	Amcat (Online Placement Aptitude Certification)	0	0	2	1
2.	OCC	CS20952	E-litmus(Online Placement Aptitude Certification)	0	0	2	1
3.	OCC	CS20953	Nasscomnac-tech(Online Placement Aptitude Certification)	0	0	2	1
4.	OCC	CS20954	I-pat(Online Placement Aptitude Certification)	0	0	2	1
5.	OCC	CS20955	NPTEL/Swayam (Online Courses)	0	0	2	1
6.	OCC	CS20956	Spoken Tutorial (Online Courses)	0	0	2	1
7.	OCC	CS20957	Oracle-SQL Fundamentals	0	0	2	1
8.	OCC	CS20958	Oracle-Java Fundamentals	0	0	2	1
9.	OCC	CS20959	CCNA-Certification	0	0	2	1
10.	OCC	CS20960	SCJP/OCPJP-Sun Certified Java Programmer / Oracle Certified Professional Java Programmer	0	0	2	1
11.	OCC	CS20961	Android Application Development	0	0	2	1
12.	OCC	CS20962	PC Hardware and Trouble Shooting	0	0	2	1

13.	OCC	CS20963	E-Commerce Security	0	0	2	1
14.	OCC	CS20965	Coursera (Online Courses)	0	0	2	1
15.	OCC	CS20966	Edx (Online Courses)	0	0	2	1
16.	OCC	CS20967	Udemy (Online Courses)	0	0	2	1
17.	OCC	CS20968	Mongo DB	0	0	2	1
18.	OCC	CS20969	Angular JS	0	0	2	1

VALUEADDED COURSES

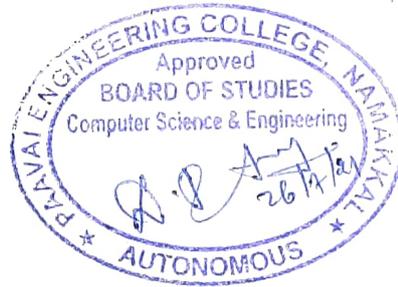
S.No	Course Code	Name of the value added courses (with 30 or more contact hours)
1	19CSVC301	Virtual Reality
2	19CSVC401	Data Analytics with R
3	19CSVC501	Sap
4	19CSVC601	IOS App Development
5	19CSVC701	Amazon Web Services
6	19CSVC801	Android App Development

CURRICULUM STRUCTURE

S.No.	Category	Credit Range		Total Credits	Number of Courses
		Min	Max		
1.	Humanities and Social Sciences (HS)	10	14	9	3
2.	Basic Sciences (BS)	25	28	28	8
3.	Engineering Sciences (ES)	20	24	18	7
4.	Professional Core Courses (PC)	55	70	72	28
5.	Professional Elective Courses (PE)	15	18	18	6
6.	Open Elective Courses (OE)	6	12	6	2
7.	Employability Enhancement Courses (EE)	11	13	12	5
8.	Mandatory Course(MC)	0	0	0	2
TOTAL		142	179	163	61

SUMMARY

S.NO.	CATEGORY	CREDITS AS PER SEMESTER								TOTAL CREDITS
		I	II	III	IV	V	VI	VII	VIII	
1	HS	3	3	-	-	-	-	3	-	9
2	BS	10	10	4	4	-	-	-	-	28
3	ES	5	5	5	3	-	-	-	-	18
4	PC	-	3	12	12	19	16	7	3	72
5	PE	-	-	-	-	3	3	6	6	18
6	OE	-	-	-	-	-	3	3	-	6
7	EE	-	-	-	1	1	1	3	6	12
8	MC	-	-	0	0	-	-	-	-	0
TOTAL		18	21	21	20	23	23	22	15	163



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SEMESTER V

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1.	PC	CS19501	Data Warehousing and Data Mining	3	0	0	3
2.	PC	CS19502	Computer Networks	3	0	0	3
3.	PC	CS19503	Python Programming	3	0	0	3
4.	PC	CS19504	Object Oriented Modeling and Design	3	0	0	3
5.	PC	CS19505	Formal Languages and Automata	3	0	0	3
6.	PE	CS1915*	Professional Elective Course I	3	0	0	3
Practical							
7.	PC	CS19506	Computer Networks Laboratory	0	0	4	2
8.	PC	CS19507	Python Programming Laboratory	0	0	4	2
9.	EE	EN19501	Career Development Laboratory I	0	0	2	1
TOTAL				18	0	10	23

SEMESTER VI

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1.	PC	CS19601	Cryptography and Network Security	3	0	0	3
2.	PC	CS19602	Artificial Intelligence	3	0	0	3
3.	PC	CS19603	Cloud Computing	3	0	0	3
4.	PC	CS19604	Big Data Analytics	3	0	0	3
5.	PE	CS1925*	Professional Elective Course II	3	0	0	3
6.	OE	CS1990*	Open Elective I	3	0	0	3
Practical							
7.	PC	CS19605	Cloud Computing Laboratory	0	0	4	2
8.	PC	CS19606	Big Data Analytics Laboratory	0	0	4	2
9.	EE	EN19601	Career Development Laboratory II	0	0	2	1
TOTAL				18	0	10	23

PROFESSIONAL ELECTIVE COURSES (PE-I)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	PE	CS19151	Mobile Computing	3	0	0	3
2.	PE	CS19152	Software Quality Assurance	3	0	0	3
3.	PE	CS19153	Cyber Security Essentials	3	0	0	3
4.	PE	CS19154	Soft Computing	3	0	0	3
TOTAL				12	0	0	12

PROFESSIONAL ELECTIVE COURSES (PE-II)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	PE	CS19251	Component Based Technology	3	0	0	3
2.	PE	CS19252	Wireless Sensor Networks	3	0	0	3
3.	PE	CS19253	Natural Language Processing	3	0	0	3
4.	PE	CS19254	Social Network Analysis	3	0	0	3
TOTAL				12	0	0	12

OPEN ELECTIVE COURSES (OE-I)

S.No.	Category	Course Code	Course Title	L	T	P	C
1.	OE	CS19901	Database Management Systems	3	0	0	3
2.	OE	CS19902	Introduction to Block Chain Technology	3	0	0	3
TOTAL				6	0	0	6



COURSE OUTCOMES

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

- understand the design of a data warehouse
- apply preprocessing techniques
- identify frequent patterns in large data sets.
- compare and contrast the various classifiers
- apply clustering techniques and methods to large data sets.

TEXT BOOKS

1. Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.

REFERENCES

1. Alex Berson and Stephen J.Smith, —Data Warehousing, Data Mining & OLAPI, Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H.Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcome (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	-	-	-	-	2	3	2
CO2	3	3	2	1	1	-	-	-	-	-	-	3	3	2
CO3	3	3	3	2	2	-	-	-	-	-	-	3	3	2
CO4	3	3	2	2	1	-	-	-	-	-	-	3	3	2
CO5	3	2	2	1	-	-	-	-	-	-	-	3	3	2



COURSE OBJECTIVES

To enable the students to

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

PRE-REQUISITES: Nil

UNIT I	INTRODUCTION AND PHYSICAL LAYER	9
Networks -Network Types; Protocol Layering; TCP/IP Protocol suite; OSI Model- Physical Layer Performance; Transmission media; Switching-Circuit-switched Networks, Packet Switching.		
UNIT II	DATA-LINK LAYER & MEDIA ACCESS	9
Introduction – Link Layer Addressing; DLC Services; Data-Link Layer Protocols - HDLC , PPP ;Media Access Control ;Wired LANs- Ethernet ; Wireless LANs- Introduction, IEEE 802.11 ,Bluetooth, Connecting Devices.		
UNIT III	NETWORK LAYER	9
Introduction-Network Layer Services; IPV4 Addresses ;Forwarding of IP Packets;Network Layer Protocols-IP, ICMP v4; Unicast Routing Algorithms; Multicasting Basics;IPV6 Addressing – IPV6 Protocol.		
UNIT IV	TRANSPORT LAYER	9
Introduction – Services, multiplexing and DE multiplexing; Port Numbers; Transport Layer Protocols- User Datagram Protocol, Transmission Control Protocol; SCTP.		
UNIT V	APPLICATION LAYER	9
WWW and HTTP; FTP; Email; Telnet; SSH; DNS; SNMP; Peer to peer applications.		
TOTAL PERIODS:		45

COURSE OUTCOMES

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

- Identify the components required to build different types of networks.
- Choose the required functionality at each layer for given application.
- Identify solution for each functionality at each layer.
- functions of network layer and the various routing protocols
- Trace the flow of information from one node to another node in the network.

TEXTBOOKS

1. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2012.

REFERENCES

1. Behrouz A. Forouzan, "Data communication and Networking", Fifth Edition, Tata McGraw –Hill, 2013.
2. Nader. F. Mir, "Computer and Communication Networks", Second Edition, Pearson Prentice Hall Publishers, 2014.
3. William Stallings, "Data and Computer Communication", Tenth Edition, Pearson Education, 2013.
4. Walrand – "Communication Networks" – TMH

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcome (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO2	1	2	3	1	1	-	-	-	-	-	2	-	3	2
CO3	3	2	3	-	-	-	-	-	-	-	2	-	3	2
CO4	1	3	2	2	-	-	-	-	-	-	2	-	3	2
CO5	3	2	-	-	-	-	-	-	-	-	1	-	3	3



COURSE OBJECTIVES

To enable the students to

- understand the basics of python programming and its control flow statements.
- discover the need for working with functions and strings.
- illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
- impart knowledge about the files, modules, and handling exceptions.
- use object-oriented concepts and image processing techniques in python.

PRE-REQUISITES: PROGRAMMING IN C**UNIT I INTRODUCTION**

9

Introduction - History and features of python, installing python, basic syntax, interactive shell, Identifiers, keywords; statements and expressions; variables; operators; precedence and associativity; data types; indentation; comments; reading input; printing the output; type conversions.

UNIT II CONTROL FLOW AND FUNCTIONS

9

Control Flow Statements - conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration (looping) - while, for, break, continue and pass statements. Functions-Built-In Functions, function definition and calling the function, the return statement and void function, scope and lifetime of variables, default Parameters, keyword arguments, and command line arguments.

UNIT III STRINGS AND LISTS IN PYTHON

9

Strings-creating and storing strings, basic string operations, accessing characters in string by index number, string slicing and joining, string methods, formatting strings. Lists- creating lists, basic list operations, indexing and slicing in lists, built-in functions used on lists, list methods, the del statement.

UNIT IV TUPLES AND DICTIONARIES

9

Tuples- creating tuples and set, basic tuple operations, indexing and slicing in tuples, built-in functions used on tuples, relation between tuples and lists, relation between tuples and dictionaries, tuple methods; Dictionaries-creating dictionary; Accessing and modifying key-value pairs in dictionaries; Built-in functions used on dictionaries, dictionary methods.

UNIT V FILES, MODULES and OOP CONCEPTS IN PYTHON

9

Files-Types of files-creating and reading text data, file methods to read and write data, reading and writing binary files, reading and writing csv files; Modules – python built-in modules, creating own modules, errors and exception handling in python. Object Oriented Programming (OOP) -Creating classes in python, creating objects in python, the constructor method; encapsulation; inheritance; polymorphism.

TOTAL PERIODS:**45**

COURSE OUTCOMES

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

- implement simple logical programs using python elements and control flow statements.
- develop python programs using functions and strings.
- design applications using list, sets, tuples and dictionaries in python.
- apply the concepts of files and modules in python programming.
- solve a given problem by using OOP and Image processing techniques.

TEXTBOOKS

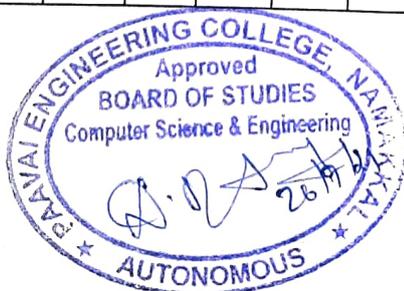
1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372.

REFERENCES

1. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058
2. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", 2nd Edition, O'Reilly Media, 2019.
3. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press
4. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python" Revised and updated for Python 3.2, Network Theory Ltd., 2014.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcome (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Less														
CO	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)	
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CO2	3	3	1	1	1	1	-	-	-	-	-	1	3	2
CO3	3	2	1	1	1	-	-	-	-	-	-	1	2	1
CO4	2	2	1	1	1	-	-	-	-	1	-	1	3	2
CO5	3	2	1	1	1	-	-	-	-	-	-	1	2	1



COURSE OBJECTIVES

To enable the students to

- introduce the concept of object-oriented programming concepts and its analysis about many applications in engineering apart from its use in software domains.
- acquaint the student with the models of programming logic easily with different sector of professionals to commute in groups.
- formulate or design efficiently to the state of the art technologies, as a tool for the solution of several physical processes.
- develop the model for the proper, accountable domain, in a specific software logics for usage.
- implement the model with the practical physical process.

PRE-REQUISITES: OBJECT ORIENTED PROGRAMMING

UNIT I	INTRODUCTION	9
Abstraction; Encapsulation; Inheritance; Polymorphism; Message passing; OOAD methodologies-Object model, Elements; Class and object,-Relationship among objects and classes, Quality classes and objects; Unified approach; Introduction to UML-Usage of UML, Views of UML.		
UNIT II	USE CASE MODELING	9
Use cases in UML - Relationships between use cases, Describing use cases, Testing use cases, Realizing use cases.		
UNIT III	OBJECT MODELING	9
Class diagrams-Perspectives, Associations, Attributes, Operations; Generalization; Constraint rules; Advanced concepts- Object diagram, Multiple and dynamic classification; Aggregation and composition; Derived associations and attributes; Interfaces and abstract classes; Reference objects and value objects; Frozen; Qualified associations- Association and parameterized class.		
UNIT IV	DYNAMIC MODELING	9
Interaction diagrams- Sequence diagrams, Communication diagrams, State diagrams, Concurrent state diagrams, Activity diagrams; Dynamic concurrency; Swim lanes; Case study: Automated Teller Machine (ATM).		
UNIT V	IMPLEMENTATION MODEL	9
Package diagrams-Deployment diagrams, Component diagrams, Combining component and deployment diagrams; Case study: University Enrollment System.		
TOTAL PERIODS		45

COURSE OUTCOMES

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

- apply Object oriented concepts in software analysis
- prepare Class Model, State Model and Interaction Model for any software system
- analyze the application Domain and Prepare models from different view points
- apply the re-engineering in the applications
- use the Concepts of Pattern Oriented design in software design

TEXT BOOKS

1. James Rumbaugh, Ivar Jacobson and Grady Booch, —The Unified Modeling Language Reference Manuall, Pearson Education, New Delhi, 2009
2. Martin Fowler and Kendall Scott, —UML Distilled: A Brief Guide to the Standard Object Modeling Language, Pearson Education, New Delhi, 2013
3. Ali Bahrami, —Object Oriented System Development, Tata McGraw Hill, New Delhi, 2008.

REFERENCES

1. Grady Booch, —Object Oriented Analysis and Design with Applications, Addison Wesley, New Delhi, 2010.
2. Mahesh P Matha, —Object Oriented Analysis and Design using UML: An Introduction to Unified Process and Design Patterns, Prentice Hall, New Delhi, 2008.
3. Atul Kahate, —Object Oriented Analysis and Design, Tata McGraw Hill, New Delhi, 2007.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcome (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO2	3	3	2	2	2	2	1	-	-	-	-	2	3	3
CO3	3	3	2	2	3	2	1	-	-	-	-	2	3	3
CO4	3	3	2	2	3	2	1	-	-	-	-	2	3	3
CO5	3	3	2	2	2	1	1	-	-	-	-	2	3	3



COURSE OBJECTIVES

To enable the students to

- provide introduction to some of the central ideas of theoretical computer science from the Perspective of formal languages and understand deterministic and non-deterministic machines.
- introduce the fundamental concepts of regular expression and finite automata.
- introduce the fundamental concepts of context free grammar.
- employ push down automata to solve problems in computing.
- understand Turing machines and the differences between decidability and undecidability.

PRE-REQUISITES: Nil**UNIT I INTRODUCTION TO FINITE AUTOMATA 9**

Introduction to finite automata structural representations; the central concepts of automata theory; alphabets, strings, languages, problems; Nondeterministic finite automata- formal definition, finite automata with epsilon, transitions; Deterministic finite automata- definition of DFA, DFA process strings, language of DFA, conversion of NFA with ϵ -transitions to NFA without ϵ transitions; conversion of NFA to DFA.

UNIT II REGULAR EXPRESSIONS 9

Regular expressions; finite automata and regular expressions; applications of regular expressions; algebraic laws for regular expressions; properties of regular languages pumping lemma for regular languages; applications of the pumping lemma; closure properties of regular languages; decision properties of regular languages; equivalence and minimization of automata.

UNIT III CONTEXT FREE GRAMMAR 9

Context-Free Grammars- definition of context-free grammars; derivations using a grammar; leftmost and rightmost derivations; the language of a grammar; sentential forms, parse trees; applications of context-free grammars, ambiguity in grammars and languages; Normal forms for context free grammars- eliminating useless symbols; eliminating -productions; Chomsky normal form griebach normal form; Pumping lemma for context-free languages: statement of pumping lemma, applications Closure properties of CFL's, decision properties of CFL's.

UNIT IV PUSH DOWN AUTOMATA 9

Push Down Automata-definition of the pushdown automaton, languages of a PDA, equivalence of PDA's and CFG's, acceptance by final state, acceptance by empty stack; deterministic pushdown automata; CFG to PDA, PDA to CFG.

Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine, Turing machines and halting Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem that is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem.

TOTAL PERIODS: 45

COURSE OUTCOMES

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

- understand the concept of finite automata and their power to recognize the languages.
- convert regular expressions to finite automata and minimize DFA.
- design context free grammars for formal languages.
- design PDA.
- gain proficiency with Turing machine and distinguish between decidability and undecidability.

TEXTBOOKS

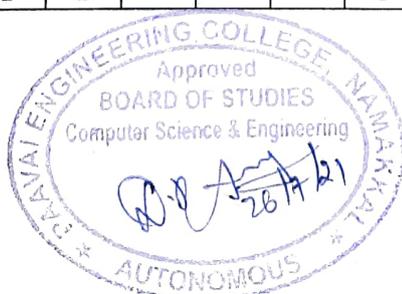
1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.

REFERENCES

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcome (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Less														
CO	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)	
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CO3	3	2	2	2	2	-	-	-	1	1	1	1	3	2
CO4	3	2	2	2	2	-	-	-	1	1	1	1	3	2
CO5	3	2	2	2	2	-	-	-	1	1	1	1	3	2



COURSE OBJECTIVES

To enable students to

- understand the basics and working Networking Protocols using Cisco Packet Tracer
- implement the various mechanism of supporting protocols of each layer through Packet Tracer.
- familiar with the various routing algorithms.
- learn and use simulation tools.

PRE-REQUISITES: Nil**LIST OF EXPERIMENTS**

1. There are 20PC's in your network. Five PC's are connected to one Ethernet hub, and five PC's are connected to another hub. Each hub is connected to separate switch and both the switches are connected to a separate router. The routers are connected via an Ethernet bridge. The remaining 10 PC's are connected directly to one of the two switches. How many Ethernet segments are there? Implement this scenario using cisco packet tracer.
2. Write a code to implement bit stuffing and byte stuffing.
3. In CRC error correction scheme, choose pattern 1101 and data 100100. Write a code to encode the given data.
4. In an IPv4 packet the value of header length is 1000 in binary. Write a code to find, how many bytes of Options are being carried by this packet?
5. Write a code to implement distance vector routing algorithm.
6. Write a code to implement HTTP web client program to download a web page using TCP sockets.
7. Write a code to implement border gateway protocol (BGP).
8. Configure a Web server, DHCP server and a DNS server all together in a single simulation through which IP have to be allocated for the host through DHCP server, Conversion of Canonical Name to IP address to be done by DNS server and Access to the webpage has to give by web server using Cisco Packet Tracer.
9. Study of Packet Analyzer using Wireshark Tool.

TOTAL PERIODS**60**

COURSE OUTCOMES

At the end this course, students will be able to

- demonstrate and Configure Networking Protocols using Cisco Packet Tracer.
- analyze the various working mechanism of supporting protocols of each layer through Packet Tracer.
- implement transport and application layer protocols in data networks.
- use simulation tools to analyze the performance of various network protocols.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE: C / C++ / Cisco Packet Tracer

HARDWARE: Standalone desktops 30 Nos.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcome (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Less														
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CO3	3	3	2	1	-	-	-	-	-	-	2	-	3	3
CO4	2	3	1	3	-	-	-	-	-	-	-	-	2	1



COURSE OBJECTIVES

To enable the students to

- interpret the use of procedural statements like assignments, conditional and looping statements.
- create functions and handle strings in python.
- infer the supported data structures like lists, dictionaries, and tuples in python.
- discover the use of external modules in creating excel files and navigating the file systems.

PRE-REQUISITES: PROGRAMMING IN C LABORATORY**LIST OF EXPERIMENTS**

1. Exercise programs on basic control structures & loops.
2. Exercise programs on operators & I/O operations.
3. Develop python programs using functions, parameter passing and return type.
4. Implement string operations in python.
5. Develop a python program to implement list and its operations.
6. Apply tuple and dictionaries of python programming
7. Python script on files and modules.
8. Python Programming on exception handling.

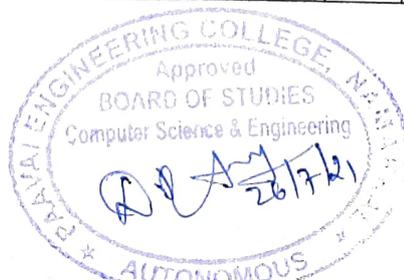
TOTAL PERIODS:**60****COURSE OUTCOMES**

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

- use simulation tools.
- implement the various protocols.
- analyses the performance of the protocols in different layers.
- analyses various routing algorithms.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcome (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Less														
CO	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)	
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CO3	3	2	2	2	3	-	-	-	-	-	-	-	2	3
CO4	2	2	2	2	3	-	-	-	-	-	-	-	1	2



COURSE OBJECTIVES

To enable the students

- enhance their own potential strength and reduce weakness to survive in corporate world
- evaluate their own personality skills to face the interviews in a successful way
- solve the quantitative aptitude problems and improve their problem-solving skills
- solve the quantitative aptitude in advance level tests to get placed in Tier 1 companies
- improve their reasoning skills to get placed in reputed companies

UNIT – I BASICS - SELF ANALYSIS **6**

Introduction - Self Explorations: Who Am I, Know yourself; SWOT Analysis; Corporate resume building; Group Discussion-Level – 0; Role Play-Team.

UNIT – II PERSONALITY DEVELOPMENT **6**

Just A Minute (JAM)- Level 0; Extempore ; Johari Window Model – Goal Setting , Achievement worksheet; Group Discussion- Level-1 ; Mock Interview Practice- Level 0.

UNIT – III QUANTITATIVE APTITUDE I **6**

Number System; LCM & HCF; Square root & Cube root; Percentage; Time; Speed & Distance.

UNIT – IV QUANTITATIVE APTITUDE II **6**

Trains Boats & Streams Average; Ages; Area.

UNIT – V LOGICAL AND VERBAL REASONING **6**

Series Completion- Number Series, Letter Series, Symbol Series ; Blood Relation ; Coding and Decoding; Logical Sequence ; Analogy ; Character Puzzles ; Classification ; Data Sufficiency

TOTAL PERIODS: 30

COURSE OUTCOMES

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

- demonstrate the interpersonal skills in Group Discussions
- enhance their verbal and written ability
- practice soft skills to excel in their jobs
- compute problems based on quantitative aptitude
- reveal their logical and verbal reasoning by scoring the expected percentage to get placed in reputed companies

REFERENCE BOOKS:

1. Agarwal, R.S.” a modern approach to Verbal & Non Verbal Reasoning”, S.Chand& Co Ltd, new delhi.
2. Abhijit Guha, “Quantitative Aptitude “, Tata-Mcgraw Hill.
3. Word Power Made Easy By Norman Lewis, Wr.Goyal Publications.
4. Johnson, D.W. Reaching out – Interpersonal Effectiveness and self-actualization. Boston: Allyn and Bacon.
5. Agarwal, R.S. “ Objective General English”, S.Chand&Co
6. Infosys Campus Connect Program – students’ guide for soft skills.

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CO3	3	2	3	3	3	0	2	1	1	1	2	1	3	3
CO4	2	3	3	3	3	0	1	2	1	1	2	1	2	2
CO5	3	2	3	3	3	0	2	2	2	1	3	2	2	3



COURSE OUTCOMES

At the end this course, students will be able to

- demonstrate the fundamental representation of Network Security.
- analyze and implement the cryptographic algorithms and protocols.
- demonstrate the concepts of public key cryptosystems.
- analyze the algorithms for Internet security.
- demonstrate an ability to use techniques, skills, and modern computing tools to implement and organize.

TEXTBOOKS

1. William Stallings, cryptography and network security, 6th edition. Pearson Education, March 2013.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.

REFERENCES

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill, 2003.
3. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.
4. W. Mao, Modern Cryptography - Theory and Practice, Pearson Education, 2007

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CO3	3	1	2	1	2	-	1	-	2	-	2	-	2	1
CO4	3	1	3	1	3	-	1	-	2	-	2	-	2	1
CO5	3	-	3	1	3	-	1	-	2	-	2	-	2	1



COURSE OBJECTIVES

To enable the students to

- acquire a knowledge of various methods of different problem solving and searching.
- perceive the concepts of knowledge representation.
- understand about inference and how to solve the problems using various inference technique.
- realize the concepts of planning and learning.
- design various AI systems.

PRE - REQUISITE: Nil

UNIT I	INTRODUCTION	9
Introduction to AI - Problem formulation, Problem Definition - Production systems, Control strategies Search strategies. Problem characteristics - Production system characteristics –Specialized productions system – Problem solving methods - Problem graphs - Matching - Indexing and Heuristic functions - Hill Climbing - Depth first and Breath first - Constraints satisfaction - Related algorithms - Measure of performance and analysis of search algorithms.		
UNIT II	REPRESENTATION OF KNOWLEDGE	9
Game playing - Knowledge representation - Knowledge representation using Predicate logic - Introduction to predicate calculus - Resolution - Use of predicate calculus - Knowledge representation using other - Structured representation of knowledge.		
UNIT III	KNOWLEDGE INFERENCE	9
Knowledge representation -Production based system - Frame based system. Inference -Backward logic chaining - Forward chaining - Rule value approach - Fuzzy reasoning.		
UNIT IV	PLANNING AND EXPERT SYSTEM	9
Basic plan generation systems -Strips –Advanced plan generation systems - K strips - Strategic explanations. Why, Why not and how explanations. Expert systems - Architecture of expert systems - Roles of expert systems - Knowledge Acquisition - Typical expert systems Applications: MYCIN –DART - XOON		
UNIT V	AI APPLICATIONS	9
AI Applications-Language Models-Information Retrieval-Information Extraction-Natural Language Processing – Machine Translation – Speech Recognition – Robot -Hardware-Perception-Planning-Moving		
TOTAL PERIODS		45

COURSE OUTCOMES

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

- demonstrate awareness of intelligent agents and problem solving using uninformed, informed and local search methods.
- develop knowledge about usage of propositional logic and first order logic for making inferences.
- use the knowledge and the process of inference to derive new facts.
- describe the use of planning and explain about various expert systems.
- design and develop various AI systems.

TEXT BOOKS

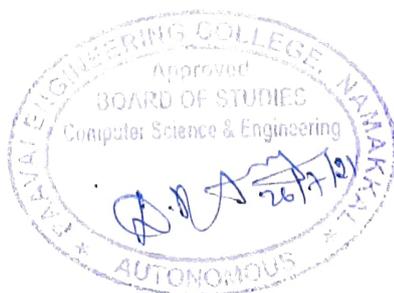
1. Kevin Night and Elaine Rich, Nair B, "Artificial Intelligence", 3rd edition, McGraw Hill- 2017.
2. Stuart Russel and Peter Norvig "AI -A Modern Approach", 3rd Edition, Pearson Education 2015.

REFERENCES

1. Lavika Goel "Artificial Intelligence Concepts and Applications", Wiley 2021.
2. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2015. (Unit - III).
3. DeepakKhemani "Artificial Intelligence", Tata McGraw Hill Education 2013.
4. Tom M. Mitchell "Machine learning", Tata McGraw Hill Education 2017.

CO/PO MAPPING:-

Mapping of Course Outcomes with Programme Outcome (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)	
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CO1	3	3	3	3	2	-	-	-	-	-	-	1	3	2
CO2	3	3	3	3	2	-	-	-	-	-	-	1	3	2
CO3	3	3	3	3	2	-	-	-	-	-	-	1	3	2
CO4	3	3	3	3	2	-	-	-	-	-	-	1	3	2
CO5	3	3	3	3	2	2	-	-	-	-	-	1	3	3



COURSE OBJECTIVES

To enable the students to

- understand the concept of cloud computing.
- appreciate the evolution of cloud from the existing technologies.
- grasp knowledge on the various issues in cloud computing.
- be familiar with the lead players in cloud.
- appreciate the emergence of cloud as the next generation computing paradigm.

PRE-REQUISITES: Computer Networks

UNIT I	INTRODUCTION	9
Introduction to Cloud Computing—defining a cloud, the cloud computing reference model, characteristics and benefits of cloud computing, historical developments, building cloud computing environments, computing platforms and technologies, principles of parallel and distributed computing		
UNIT II	CLOUD ENABLING TECHNOLOGIES	9
Basics of Virtualization – characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization, and computing - pros and cons of virtualization – technology examples: para virtualization, full virtualization		
UNIT III	CLOUD ARCHITECTURE, SERVICES AND STORAGE	9
Cloud Reference Model: Infrastructure / Hardware as a Service – Case Study, Platform as a Service – Case Study, Software as a Service – Case Study, Service provider, cloud storage -Types of Clouds: Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds-Case Study- Economics of the Cloud, Open Challenges.		
UNIT IV	RESOURCE MANAGEMENT AND SECURITY IN CLOUD	9
Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.		
UNIT V	CLOUD TECHNOLOGIES AND ADVANCEMENTS	9
Hadoop – MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine —Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation		
TOTAL PERIODS		45

COURSE OUTCOMES

At the end this course, students will be able to

- articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- learn the key and enabling technologies that help in the development of cloud.
- develop the ability to understand the architecture of compute and storage cloud, service and delivery models.
- learn the core issues of cloud computing such as resource management and security.
- evaluate and choose the appropriate technologies, and approaches for implementation and use of cloud.

TEXTBOOKS

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.

REFERENCES

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
3. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O’Reilly, 2009
4. Cloud Computing: From Beginning to End Book by Ray Rafaeals.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcome (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Less														
CO	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)	
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CO2	3	2	2	2	2	1	1	1	1	2	3	3	2	2
CO3	3	3	3	2	2	1	1	1	1	2	3	3	2	3
CO4	3	2	3	2	2	1	1	1	1	2	3	3	3	3
CO5	3	2	2	2	2	1	1	1	1	2	3	3	3	3



COURSE OBJECTIVES

To enable the students to

- know the fundamental concepts of big data and analytics.
- explore tools and practices for working with big data.
- learn about stream computing.
- know about the research that requires the integration of large amounts of data.
- learn NoSQL databases and management.

PRE-REQUISITES: SQL/DATABASE KNOWLEDGE, DATA MINING**UNIT I INTRODUCTION TO BIG DATA 9**

Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating- The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage –HDFS - MapReduce and YARN– Map Reduce Programming Model.

UNIT II CLUSTERING AND CLASSIFICATION 9

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions - Classification: Decision Trees - Overview of a Decision Tree – The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes – Bayes’ Theorem -Naïve Bayes Classifier.

UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM 9

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Finding Association & finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation – Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT IV STREAM MEMORY 9

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform (RTAP) applications - Case Studies - Real Time Sentiment Analysis.

UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION

NoSQL Databases: Schema-less Models: Increasing Flexibility for Data Manipulation-Key Value Stores-Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding - HBase –Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic DataAnalytic Methods using R.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end this course, students will be able to

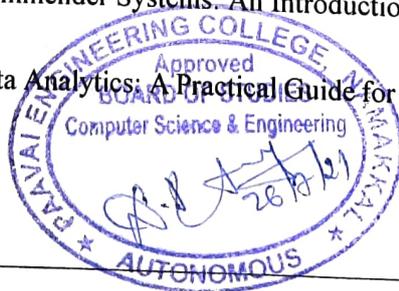
- work with big data tools and its analysis techniques.
- analyze data by utilizing clustering and classification algorithms.
- learn and apply different mining algorithms and recommendation systems for large volumes of data.
- perform analytics on data streams.
- learn NoSQL databases and management.

TEXTBOOKS

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
2. David Loshin,” Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL and Graph”, Morgan Kauffmann/Elsevier Publishers, 2013

REFERENCES

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010
4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers” CRC Press, 2015.



CO-PO MAPPING:

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CO4	3	1	3	1	3	-	-	-	2	-	2	1	2	2	
CO5	3	-	3	1	3	-	-	-	2	-	2	1	2	2	

COURSE OBJECTIVES:

To enable students to

- develop web applications in cloud
- learn the design and development process involved in creating a cloud based application
- learn to implement and use parallel programming using Hadoop
- appreciate the emergence of cloud as the next generation computing paradigm.

List of Experiments

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount.
9. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
10. Find a procedure to transfer the files from one virtual machine to another virtual machine.
11. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

TOTAL PERIODS 60

COURSE OUTCOMES:

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

- configure various virtualization tools such as Virtual Box, VMware workstation.
- design and deploy a web application in a PaaS environment.
- learn how to simulate a cloud environment to implement new schedulers.
- install and use a generic cloud environment that can be used as a private cloud.

CO-PO MAPPING:

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CO2	3	3	3	3	3	0	1	1	1	1	2	2	3	3
CO3	3	2	3	3	3	0	2	1	1	1	2	1	3	3
CO4	2	3	3	3	3	0	1	2	1	1	2	1	2	2



COURSE OBJECTIVES

To enable the students to

- implement map reduce programs for processing big data
- realize storage of big data using H base, Mongo DB
- analyze big data using linear models
- analyze big data using machine learning techniques such as SVM/Decision tree classification and clustering

PRE-REQUISITES: NIL

LIST OF EXPERIMENTS**Hadoop**

- 1.Install,configure and run Hadoop and HDFS
- 2.Implement word count / frequency programs using MapReduce
- 3.Implement an MR program that processes a weather dataset

R

- 4.Implement Linear and logistic regression
- 5.Implement SVM/Decision tree classification techniques
- 6.Implement clustering techniques
- 7.Visualize data using any plotting framweork
- 8.Implement an application that stores big data in Hbase / Mongo DB / Pig using Hadoop /R

TOTAL PERIODS 60

COURSE OUTCOMES

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

- process big data using Hadoop framework
- build and apply linear and logistic regression models
- perform data analysis with machine learning methods
- perform graphical data analysis

CO/PO Mapping:

Mapping of Course Outcomes with Programme Outcome (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
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CO2	3	3	1	2	3	-	2	-	-	-	2	3	2	-
CO3	3	3	-	2	3	-	2	-	-	-	2	3	2	2
CO4	3	3	1	2	3	-	2	-	-	-	2	3	2	1



COURSE OBJECTIVES**To enable the students**

- understand the corporate lifestyle and culture to grab the employment opportunities
- enrich the skills required to crack the interviews
- solve the aptitude questions quickly to improve the level of performance in written test
- articulate the skills required in Group Discussion to increase the possibilities to get selected in companies
- improve their reasoning skills to get placed in reputed companies

PRE-REQUISITES: NIL

UNIT – I	CORPORATE READINESS	6
	Writing Skills -Email Writing , Paragraph writing ; Time Management ;Stress Management; JAM- Level 1 , Self-Introduction ;JAM-Level 2 ,Buddy Presentation ; Role Play –Individual.	
UNIT – II	INTERVIEW SKILLS	6
	Group Discussion- Level II ;Group Discussion- Level III ; General – Interview Techniques, Selection process ,Grooming ,Dress code , Body Language ; Mock Interview Practice -Level 1.	
UNIT – III	QUANTITATIVE APTITUDE- III	6
	Simplification; Time and work; Pipes and cisterns; Ratio and Proportion; Partnership.	
UNIT – IV	QUANTITATIVE APTITUDE –IV	6
	Simple interest and Compound interest ;Profit and loss ; Permutation and combination Probability; Calendar.	
UNIT – V	LOGICAL ANDVERBAL REASONING	6
	Seating arrangement; Direction; Arithmetic reasoning; Syllogisms; Making Judgments; Statements and conclusions; Matching definition - Cause and effect.	
	TOTAL PERIODS	30

COURSE OUTCOMES

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

- place in reputed companies by making themselves ready for corporate expectation
- use the required skills to attend an interview and group discussion
- showcase the presentation skills in an interview
- display their logical and verbal reasoning skills in corporate placement
- calculate the quantitative aptitude questions within the stipulated time

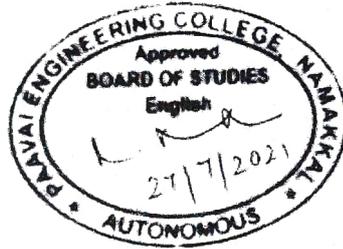
REFERENCE BOOKS

1. Agarwal, R.S.” a modern approach to Verbal & Non Verbal Reasoning”, S.Chand& Co Ltd, new delhi.
2. Abhijit Guha, “Quantitative Aptitude “, Tata-Mcgraw Hill.
3. Word Power Made Easy By Norman Lewis ,Wr.Goyal Publications.

4. Johnson, D.W. Reaching out – Interpersonal Effectiveness and self-actualization. Boston: Allyn And Bacon.
5. Agarwal, R.S. “ Objective General English”, S.Chand&Co
6. Infosys Campus Connect Program – students’ guide for soft skills.

CO-PO MAPPING:

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CO4	2	3	3	3	3	0	1	2	1	1	1	2	1	2	2
CO5	3	2	3	3	3	0	2	2	2	1	1	3	2	2	3



PROFESSIONAL ELECTIVE COURSES I

CS19151

MOBILE COMPUTING

3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the basic concepts of mobile computing.
- be familiar with the network protocol stack.
- learn the basics of mobile telecommunication system.
- be exposed to Ad-Hoc networks.
- gain knowledge about different mobile platforms and application development.

UNIT I INTRODUCTION

9

Mobile Computing – Mobile Computing Vs. Wireless Networking; Mobile Computing Applications; Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.

UNIT II MOBILE TELECOMMUNICATION SYSTEM

9

Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS) – Cellular Networks – Frequency Reuse and Specialization.

UNIT III MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER

9

Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Improvement Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window – in TCP Performance.

UNIT IV WIRELESS AD-HOC NETWORKS

9

Introduction – Wireless Mesh Networks - Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols – Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.

UNIT V MOBILE PLATFORMS AND APPLICATIONS

9

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems - Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M-Commerce – Structure – Pros & Cons– Mobile Payment System – Security Issues.

TOTAL PERIODS

45

COURSE OUTCOMES

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

- explain the basics of mobile telecommunication system.
- choose the required functionality at each layer for given application.
- identify solution for each functionality at each layer.
- use simulator tools and design Ad hoc networks.
- using different platforms to create a different applications.

TEXT BOOKS

1. Jochen H. Schller, —Mobile CommunicationsI, Second Edition, Pearson Education, New Delhi, 2010.
2. Alan Colman, Jun Han, and Muhammad Ashad Kabir, Pervasive Social Computing Socially-Aware Pervasive Systems and Mobile Applications, Springer, 2016.

REFERENCES

1. Prashant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing" PHI Learning Pvt, Ltd. New Delhi-2012.
2. William.C.Y.Lee,—Mobile Cellular Telecommunications-Analog and Digital Systems, Second Edition, TataMcGraw Hill Edition, 2006.
3. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
4. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, —Principles of Mobile ComputingI, Springer, 2003.

CO-PO MAPPING:

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CO3	3	3	1	2	2	-	2	-	-	-	2	3	2	2
CO4	3	3	1	2	2	-	2	-	-	-	2	3	2	1
CO5	3	3	1	2	2	-	2	-	-	-	2	3	2	1



COURSE OBJECTIVES

To enable the students to

- understand the basic tenets of software quality and quality factors.
- learn the software quality assurance (SQA) architecture and the details of SQA components.
- understand of how the SQA components can be integrated into the project life cycle.
- familiar with the software quality infrastructure.
- be exposed to the management components of software quality.

PRE-REQUISITES: Nil

UNIT I	INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE	9
	Need for Software quality – quality challenges, software quality assurance, definition and objectives, software quality factor, McCall’s quality model; SQA system and architecture –software project life cycle components, pre project quality components ,development and quality plans.	
UNIT II	SQA COMPONENTS AND PROJECT LIFE CYCLE	9
	Software Development methodologies–quality assurance activities in the development process, verification & validation, reviews; Software Testing–software testing implementations, quality of software maintenance, pre-maintenance of software quality component, quality assurance tools, case tools for software quality; software maintenance quality; project management.	
UNIT III	SOFTWARE QUALITY INFRASTRUCTURE	9
	Procedures and work instructions – templates, checklists, 3s development, staff training and certification corrective and preventive actions; configuration management– software change control, configuration management audit, documentation control, storage and retrieval.	
UNIT IV	SOFTWARE QUALITY MANAGEMENT & METRICS	9
	Project process control – computerized tools, software quality metrics; objectives of quality measurement, process metrics, product metrics, implementation, limitations of software metrics, cost of software quality, classical quality cost model, extended model, application of cost model.	
UNIT V	STANDARDS, CERTIFICATIONS&ASSESSMENTS	9
	Quality management standards – ISO 9001 and ISO 9000-3, capability maturity models, cmm and cmmi assessment methodologies, bootstrap methodology, spice project, SQA project process standards, ieeec st 1012 & 1028,organization of quality assurance, department management responsibilities, project management responsibilities – SQA units and other actors in SQA systems.	
	TOTAL PERIODS	45

COURSE OUTCOMES

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

- utilize the concepts in software development life cycle.
- demonstrate their capability to adopt quality standards.
- assess the quality of software product.
- apply the concepts in preparing the quality plan & documents.
- know about the standards and assessments.

TEXTBOOKS

1. Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009.
2. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.

REFERENCES

1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, Silicon Press, 2009
2. Mordechai Ben-Menachem "Software Quality: Producing Practical Consistent Software", International Thompson Computer Press, 1997.
3. Software Testing and Quality Assurance: Theory and Practice Kshirasagar Naik, Priyadarshi Tripathy
4. Software Quality Assurance: Principles and Practice by Nina S. Godbole

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcome (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Less														
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CO4	3	3	1	2	1	-	-	-	-	1	-	1	2	2
CO5	3	2	1	2	2	-	-	-	-	1	-	1	1	1



COURSE OBJECTIVES

To enable the students to

- understand the basics of cyber security.
- find the difference between threat, risk, attack and vulnerability.
- know the threats materialize into attacks.
- understand information about threats, vulnerabilities and attacks.
- discuss the typical threats, attacks and exploits and the motivations behind them.

PRE-REQUISITES: COMPUTER NETWORKS**UNIT I INTRODUCTION TO CYBER SECURITY 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 IN 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 DEFENCES: SECURITY 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 PRIVACY IN CYBER SPACE 9

Privacy Concepts -privacy principles and policies, authentication and privacy, data mining, privacy on the web; email security - privacy impacts of emerging technologies, where the field is headed.

UNIT V MANAGEMENT AND INCIDENTS 9

Security Planning - business continuity planning, handling incidents, risk analysis, dealing with disaster; Emerging technologies- internet of things; economics; electronic voting, cyber warfare- cyberspace and the Law, international laws, cybercrime, cyber warfare and homeland security.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- develop their analytical skills.
- analyze data by Group/team working.
- develop problem solving skills.
- do research in cyber related domains.
- learn and apply Innovation/creativity.

TEXTBOOKS

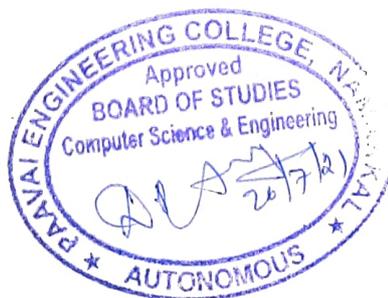
1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015.
2. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.

REFERENCES

1. Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015.
2. Nelson Phillips and Enfinger Steuart, —Computer Forensics and InvestigationsI, Cengage Learning, New Delhi, 2009.
3. Cybersecurity and Cyberwar: What Everyone Needs to Know® Book by Allan Friedman and P. W. Singer.
4. Cybersecurity : the beginner's guide : a comprehensive guide to getting started in cybersecurity Erdal Ozkaya

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CO4	3	1	3	1	3	-	1	-	2	-	2	-	2	1
CO5	3	-	3	1	3	-	1	-	2	-	2	-	2	1



COURSE OBJECTIVES

To enable the students to

- learn the basic concepts of Soft Computing
- become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
- understand soft computing techniques to solve problems.
- understand operators and algorithm.
- introduce and use the idea of Neural Networks, Fuzzy Logic.

PRE-REQUISITES: Nil

UNIT I	INTRODUCTION TO SOFT COMPUTING	9
Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.		
UNIT II	ARTIFICIAL NEURAL NETWORKS	9
Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.		
UNIT III	FUZZY SYSTEMS	9
Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations - Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.		
UNIT IV	GENETIC ALGORITHMS	9
Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators -Convergence of Genetic Algorithm.		
UNIT V	HYBRID SYSTEMS	9
Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller.		
TOTAL PERIODS		45

COURSE OUTCOMES

At the end this course, students will be able to

- develop their analytical skills.
- analyze data by Group/team working.
- develop problem solving skills.
- do research in cyber related domains.
- learn and apply Innovation/creativity.

TEXTBOOKS

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015
2. S.N.Sivanandam, S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd., 2nd Edition, 2011
3. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications", PHI Learning Pvt. Ltd., 2017.

REFERENCES

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, —Neuro-Fuzzy and Soft Computing, Prentice-Hall of India, 2002.
2. Kwang H.Lee, —First course on Fuzzy Theory and Applications, Springer, 2005
3. George J. Klir and Bo Yuan, —Fuzzy Sets and Fuzzy Logic-Theory and Applications, Prentice Hall, 1996.
4. James A. Freeman and David M. Skapura, —Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcome (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Less														
CO	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	3	-	1	-	2	-	2	-	2	1
CO2	3	2	2	3	3	-	1	-	2	-	2	-	2	1
CO3	3	1	2	1	2	-	1	-	2	-	2	-	2	1
CO4	3	1	3	1	3	-	1	-	2	-	2	-	2	1
CO5	3	-	3	1	3	-	1	-	2	-	2	-	2	1



COURSE OUTCOMES

At the end this course, students will be able to

- implement the software components and its architecture.
- develop concepts of client server & event driven programming technologies.
- develop the concepts of corba architecture and its services.
- develop the distributed object database management architecture.
- implement component frameworks and implementation tools.

TEXTBOOKS

1. Component-Oriented Programming By Andy Ju Wang, Kai Qian Publisher: Wiley, 2005.
2. Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 1999.

REFERENCES

1. Clemens Szyperski, "Component Software: Beyond Object-Oriented Programming", Pearson Education publishers, 2003.
2. Dale Rogerson, "Inside COM", Microsoft Press, P. Education 2000.
3. Freeze, "Visual Basic Development Guide for COM & COM+", BPB Publication, 2001.
4. Hortsamann, Cornell, "CORE JAVA Vol-II" Sun Press, 2002.

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CO2	3	2	3	2	3	-	-	-	2	-	2	1	2	2
CO3	3	1	3	1	3	-	-	-	2	-	2	1	2	2
CO4	3	1	3	1	3	-	-	-	2	-	2	1	2	2
CO5	3	-	3	1	3	-	-	-	2	-	2	1	2	2



COURSE OBJECTIVES

To enable the students to

- impart the Fundamentals of WSN and its Advantages.
- learn about the MAC Layer and its Standards.
- know about the Routing Protocols.
- get an idea about the Sensor Network Databases.
- gain knowledge about applications of Wireless Sensor Networks.

PRE-REQUISITES: Computer Networks**UNIT I INTRODUCTION TO WIRELESS SENSOR NETWORKS 9**

Overview of sensor networks - Constraints and challenges - Applications – Contention Collaborative processing - Key definitions in sensor networks - Tracking scenario - Problem formulation - Distributed representation and interference of states - Tracking multiple Objects - Sensor Models - Performance Comparison and metrics.

UNIT II MEDIUM ACCESS CONTROL PROTOCOLS FOR WSN 9

Fundamentals of MAC Protocols: Performance Requirements – Common Protocols – MAC Protocols for WSNs: Schedule Based Protocols – Random Access Based Protocols – Sensor MAC: Protocol Overview – Periodic Listen and Sleep Operations – Schedule Selection and Coordination – Schedule Synchronization – Adaptive Listening – Access Control and Data Exchange – Message Passing – IEEE 802.15.4 LR-WPANs Standard.

UNIT III ROUTING PROTOCOLS FOR WSN 9

Introduction – Data Dissemination and Gathering – Routing Challenges and Design Issues in WSN: Network Scale and Time Varying Characteristics – Resource Constraints – Sensor Applications Data Models – Routing Strategies in WSN: WSN Routing Techniques – Flooding and its Variants – Sensor Protocols for Information via Negotiation – Low-Energy Adaptive Clustering Hierarchy – Power-Efficient Gathering in Sensor Information Systems - Directed diffusion – Geographical Routing.

UNIT IV SENSOR NETWORK DATABASE AND TOOLS 9

Sensor Database Challenges - Querying the Physical Environment - Interfaces – In Network Aggregation - Data Centric Storage - Data indices and Range Queries - Distributed Hierarchical Aggregation - Temporal data - Sensor Node Hardware - Sensor Network Programming Challenges Software Platforms - Operating System TinyOS - Node Level Simulators - State Centric Programming - Applications and Future Directions.

UNIT V APPLICATIONS OF WSN 9

WSN Applications: Home Control - Building Automation - Industrial Automation – Medical Applications – Sensor and Robots - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring - Nanoscopic Sensor Applications

COURSE OUTCOMES

At the end this course, students will be able to

- understand the concepts of Wireless Sensor Networks.
- identify the MAC Layer functions.
- analyses the mechanisms of Routing Protocols.
- design the Network Database and their tools.
- apply the concepts of Wireless Sensor Networks in Real-time Applications.

TEXT BOOKS

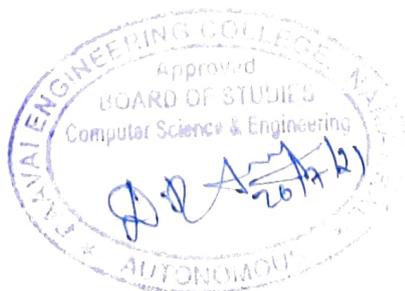
1. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks - An Information process Approach, Elsevier, First Edition , 2004.
2. Kazem Sohraby, Daniel Minoli and Taieb Znati, "Wireless Sensor Networks Technology Protocols, and Applications", John Wiley & Sons, 2007.

REFERENCES

1. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Ltd, 2005.
2. Walteneus Dargie, Christian Poellabauer "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley, 2010.
3. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
4. Jochen H. Schiller "Mobile communications networks" pearson education limited 2003.

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CO4	3	3	3	3	3	3	-	-	3	2	2	3	3	3
CO5	3	3	3	3	3	3	-	-	3	2	2	3	3	3



COURSE OBJECTIVES

To enable the students to

- learn the fundamentals of natural language processing.
- understand the use of components in NLP.
- impart knowledge on parsing and methodologies.
- grasp the role of semantics and pragmatics.
- apply the NLP techniques to the applications.

PRE-REQUISITES: Artificial intelligence , Probability and statistics

UNIT I INTRODUCTION	9
Words-Regular Expressions and Automata -Words and Transducers -N-grams -Part-of-Speech –Tagging - Hidden Markov and Maximum Entropy Models.	
UNIT II SPEECH	9
Speech–Phonetics -Speech Synthesis -Automatic Speech Recognition -Speech Recognition: -Advanced Topics -Computational Phonology	
UNIT III SYNTAX	9
Formal Grammars of English -Syntactic Parsing -Statistical Parsing -Features and Unification -Language and Complexity	
UNIT IV SEMANTICS AND PRAGMATICS	9
The Representation of Meaning -Computational Semantics -Lexical Semantics -Computational Lexical Semantics -Computational Discourse	
UNIT V APPLICATIONS	9
Information Extraction -Question Answering and Summarization -Dialogue and Conversational Agents - Machine Translation: Language similarities and differences –The transfer metaphor -The interlingua idea: Using meaning –Direct translation –Using statistical techniques–Usability and system development	
TOTAL PERIODS	45

COURSE OUTCOMES

At the end this course, students will be able to

- learn the basics Language features.
- design an innovative application using NLP components.
- implement a rule based system to tackle morphology/syntax of a language.
- design a tag set to be used for statistical processing for real-time applications.
- to compare and contrast use of different statistical approaches for different types of NLP applications.

TEXT BOOKS

1. Daniel Jurafsky, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.

REFERENCES

1. Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, —Natural Language Processing with Javal, O'Reilly Media, 2015.
3. Nitin Indurkha and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Siddiqui T., Tiwary U. S.. Natural language processing and Information retrieval, OUP, 2008

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CO4	3	2	3	2	2	1	1	1	1	2	3	3	3	3
CO5	3	2	3	2	2	1	1	1	1	2	3	3	3	3



COURSE OBJECTIVES

To enable the students to

- understand the concept of semantic web and related applications.
- learn knowledge representation using ontology.
- analysis the importance of tool used for extraction and mining
- understand human behavior in social web and related communities.
- learn visualization of social networks.

PRE-REQUISITES: Computer Networks, Data Mining

UNIT I INTRODUCTION 9

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 9

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modeling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS 9

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi- Relational characterization of dynamic social network communities.

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES 9

Understanding and predicting human behavior for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end this course, students will be able to

- develop semantic web related applications.
- represent knowledge using ontology.
- analyzed the extraction and mining tools of social network
- predict human behaviour in social web and related communities.
- visualize social networks.

TEXT BOOKS

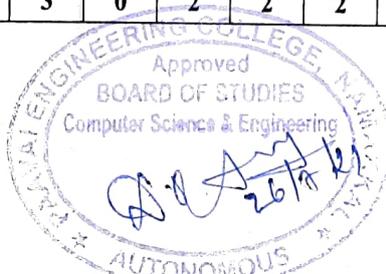
1. Peter Mika, Social Networks and the Semantic Web, First Edition, Springer 2007.
2. Borko Furht, Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.

REFERENCES

1. Guandong Xu ,Yanchun Zhang and Lin Li, Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.
3. John G. Breslin, Alexander Passant and Stefan Decker, The Social Semantic Web, Springer, 2009.
4. Giles, Mark Smith, John Yen, —Advances in Social Network Mining and Analysis, Springer, 2010.

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CO4	2	3	3	3	3	0	1	2	1	1	2	1	2	2
CO5	3	2	3	3	3	0	2	2	2	1	3	2	2	3



OPEN ELECTIVE COURSES (OE-I)

CS19901

DATABASE MANAGEMENT SYSTEMS

3 0 0 3

COURSE OBJECTIVES

To enable the students to

- differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
- demonstrate an understanding of the relational data model.
- formulate solutions to a broad range of query and data update problems using SQL.
- gain experience with SQL procedures and functions.
- demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

PRE-REQUISITES: Nil

UNIT I INTRODUCTION

9

Database System Architecture: Purpose of Database Systems - Views of Data - Database Languages - Data Storage and Querying - Transaction Management – Database Architecture - Database Users and Administrators. Relational Databases: Structure of Relational Databases - Database Schema - Keys - Schema Diagram.

UNIT II QUERY LANGUAGES AND E - R MODEL

9

Formal Relational Query Languages: Relational Algebra - Tuple and Domain Relational Calculus. Database Design and E - R Model: Overview - Entity Relationship Model - Constraints - Removing Redundant Attributes in Entity Sets - E - R Diagrams.

UNIT III STRUCTURED QUERY LANGUAGE (SQL)

9

Introduction to SQL: Overview of SQL Query Languages - SQL Data Definition - Basic Structure Of SQL Queries - Additional Basic Operations - Set Operations - Aggregate Functions - Nested Sub Queries - Join Expressions - Views - Transactions - Integrity Constraints - SQL Data Types and Schemes – Authorization.

UNIT IV ADVANCED SQL

9

Accessing SQL from a Programming Languages - Functions and Procedures - Triggers.

UNIT V RELATIONAL DATABASE DESIGN

9

Features of Good Relational Database Design - Informal Guide Lines For Relational Schemas - Decomposition Using Functional Dependencies - Functional Dependency Theory - First, Second, Third and Boyce Codd Normal Forms.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- define the fundamental elements of a database management system.
- explain the basic concepts of relational data model, entity -relationship model.
- outline relational algebra and database query language(SQL).
- explain relational database design.
- construct a database for a given problem using E - R model, normalization and SQL.

TEXT BOOKS

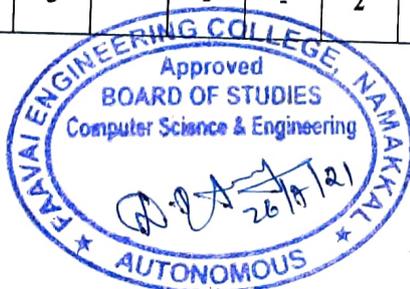
1. Silberschatz, H.Korth and Sudarshan S., “Database System Concepts”, 6th Edition, McGraw-Hill International, 2010.
2. Elmasri R. and Shamakant B. Navathe, “Fundamentals of Database Systems”, 6th Edition, AddisonWesley, 2011.

REFERENCES

1. Abraham Silberschatz, Henry Korth, and S. Sudarshan, “Database System Concepts”, Sixth Edition, McGraw - Hill, 2011.
2. Elmasri and S. Navathe, “Fundamentals of Database Systems”, Pearson Education, Sixth Edition, 2011.
3. Thomas M. Connolly and Carolyn E. Begg, “Database Systems - A Practical Approach to Design, Implementation, and Management”, Pearson Education, Fifth edition, 2010.
4. C.J.Date, A.Kannan and S.Swamynathan, “An Introduction to Database Systems”, Pearson Education, Eighth Edition, 2006.

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CO5	3	3	3	3	3	-	-	-	2	2	2	2	3	3



COURSE OBJECTIVES

To enable the students to

- understand the functionality of current implementation of block chain technology.
- procure the mechanism of Cryptography in Cryptocurrency.
- understand the fundamentals of bitcoin and its applications
- learn the standard rules and regulations of cryptocurrency
- explore the applications of Block chain to Cryptocurrencies.

PRE-REQUISITES: NIL

UNIT I BLOCKCHAIN 9

Introduction; Advantage over conventional distributed database; Block chain Network; Structure Of a Block- Block Header- Block identifiers; Merkle Trees and Simplified Payment Verification; Life of block chain; Private and Public block chain.

UNIT II CRYPTOGRAPHY AND CRYPTOCURRENCIES 9

Cryptographic basics for crypto currency ; a short overview of Hashing Functions; Hash pointers and Data structures; Digital signature schemes; Public key as Identities; Simple Crypto currency.

UNIT III BITCOIN 9

Bitcoin Transactions; Bitcoin Mining; Bitcoin Scripts; Applications of Bitcoin Scripts; Bitcoin Blocks; Bitcoin addresses; Bitcoin Wallets.

UNIT IV MINING AND CONSENSUS 9

Consensus in Bitcoin; Bitcoin Core software; Mining Nodes; Regulations; Mining the Block; Mining Pools; Stakeholders; Roots of bitcoin; Consensus Attacks.

UNIT V BLOCKCHAIN APPLICATIONS 9

Mining Puzzles; Puzzle Requirement; ASIC –Resistant Puzzle; Meta Coin Platforms ;Bit Message; Altcoins- Relationship between Bitcoin and Altcoin; Name coin; Ethereum.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end this course, students will be able to

- gain knowledge about various operations associated with the life cycle of block chain and Cryptocurrency.
- understand and apply the fundamentals of Cryptography in Cryptocurrency.
- gain knowledge about bitcoin.
- acquire fundamental rules and regulations of cryptocurrency.
- educate the Altcoins and the cryptocurrency ecosystem.

TEXT BOOKS

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available)
2. Antonopoulos, A. M. Mastering Bitcoin: unlocking digital cryptocurrencies. OReilly Media, Inc, 2014.

REFERENCES

1. DR. Gavin Wood, ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow pa-per.2014.
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System.
3. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts
4. Arshdeep Bahga, Vijay Madiseti, "Blockchain Applications: A Hands On Approach", VPT, 2017.

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