AL-AMEEN ENGINEERING COLLEGE

(AUTONOMOUS)

Accredited by NAAC with "A" Grade :: An ISO Certified Institution
(Affiliated to Anna University, Chennai & Approved by AICTE, New Delhi)
Karundevanpalayam, NanjaiUthukkuli Post, Erode – 638 104, Tamilnadu, INDIA.

CURRICULUM & SYLLABI

SEMESTERS – I to VIII

(Regulations 2020)

CHOICE BASED CREDIT SYSTEM

B.Tech. Information Technology

Applicable to the Students admitted in the AY 2020-21 only

KNOWLEDGE LEVELS (BLOOM'S TAXONOMY)

Notation	Knowledge Levels
K1	Remembering
K2	Understanding
K3	Applying
K4	Analysing
K5	Evaluating
K6	Creating

VISION	
	The department of Information Technology aspires to become a **school of excellence** in providing **quality education, constructive research** and **professional opportunities in Information Technology**.

MISSION	
	To provide academic programs that engage, enlighten and empower the students to **learn technology through practice, service and outreach.** To educate the students about **social responsibilities and entrepreneurship** To encourage **research through continuous improvement** in infrastructure, curriculum and faculty development in collaboration with industry and institutions.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)	
PEO 1	Graduates will have progressive learning and successful career in Information, Communication Technologies and their applications.
PEO 2	Graduates will be leaders in their chosen field.
PEO 3	Graduates will utilize the acquired technical skills and knowledge for the benefit of society.

PROGRAM OUTCOMES (POs)	
PO 1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/Development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

PROGRAM SPECIFIC OUTCOMES (PSOs)	
PSO 1	**Technical Skills:** Apply the fundamental knowledge to **develop computer based solutions** in the areas related to information management and networking.
PSO 2	**Leadership Skills:** Demonstrate **professionalism and ethics** in managing academic/ non-academic activities as a team and an individual.

CURRICULUM

SEMESTER I

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20MA1T1	Engineering Mathematics I	BS	50	50	3	1	0	4
2	20CY1T2	Engineering Chemistry	BS	50	50	3	0	0	3
3	20EN1T3	Communicative English I	HS	50	50	3	1	0	4
4	20PH1T4	Engineering Physics	BS	50	50	3	0	0	3
5	20CS1T5	Fundamental of Computing and Programming	ES	50	50	3	0	0	3
LABORATORY COURSES									
6	20GE1L1	Physics and Chemistry Laboratory	BS	50	50	0	0	3	1.5
7	20CS1L2	Computer Practices Laboratory	ES	50	50	0	0	3	1.5
MANDATORY COURSE									
8		Universal Human Values 1 - Induction Programme	MC	-	-	-	-	-	-
Total						**15**	**2**	**6**	**20**

SEMESTER II

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20MA2T1	Engineering Mathematics II	BS	50	50	3	1	0	4
2	20EN2T3	Communicative English II	HS	50	50	3	0	0	3
3	20EE2T4	Basics of Electrical Engineering	ES	50	50	3	0	0	3
4	20CSCT5	Python Programming	ES	50	50	3	0	0	3
LABORATORY COURSES									
5	20EM2L1	Engineering Practices Laboratory	ES	50	50	0	0	3	1.5
6	20ME2L2	Engineering Drawing Laboratory	ES	50	50	0	0	3	1.5
7	20CS2L3	Python Programming Laboratory	ES	50	50	0	0	3	1.5
MANDATORY COURSE									
8	20CY2T2	Environmental Sciences	MC	100	-	3	0	0	0
Total						**15**	**1**	**9**	**17.5**

SEMESTER III

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20MA3T1	Probability and Queuing Theory	BS	50	50	3	1	0	4
2	20CS3T2	Data Structures & Algorithms	PC	50	50	3	1	0	4
3	20EC3T3	Digital Principles and System Design	ES	50	50	3	0	0	3
4	20CS3T4	Computer Architecture	PC	50	50	3	0	0	3
5	20CS3T5	Object Oriented Programming with Java	PC	50	50	3	0	0	3
LABORATORY COURSES									
6	20CS3L1	Data Structures Laboratory	PC	50	50	0	0	3	1.5
7	20CS3L2	Object Oriented Programming with Java Laboratory	PC	50	50	0	0	3	1.5
8	20EC3L3	Digital Systems Laboratory	ES	50	50	0	0	3	1.5
MANDATORY COURSE									
9	20MCCT1	Constitution of India	MC	100	-	3	0	0	0
Total						**18**	**2**	**9**	**21.5**

SEMESTER IV

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20EC4T1	Microprocessor and Microcontroller	ES	50	50	3	0	0	3
2	20CS4T2	User Interface Design	PC	50	50	3	1	0	4
3	20CS4T3	Database Management Systems	PC	50	50	3	0	0	3
4	20CS4T4	Operating Systems	PC	50	50	3	1	0	4
5	20__OE_	Open Elective - I	OE	50	50	3	0	0	3
LABORATORY COURSES									
6	20ENCL1	Communication Skills Laboratory	HS	50	50	0	0	2	1
7	20CS4L2	Database Management Systems Laboratory	PC	50	50	0	0	3	1.5
8	20CS4L3	Operating Systems Laboratory	PC	50	50	0	0	3	1.5
MANDATORY COURSE									
9	20HS4T1	Universal Human Values 2: Understanding Harmony	HS	100	-	2	1	0	3
Total						**17**	**3**	**8**	**24**

SEMESTER V

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1		Professional Elective - I	PE	50	50	3	0	0	3
2		Open Elective – II	OE	50	50	3	0	0	3
3	20HSCT2	Professional Ethics	HS	50	50	3	0	0	3
THEORY COURSE WITH LABORATORY COMPONENTS									
4	20CSCLT1	Data Communication and Networks	PC	50	50	2	0	4	4
5	20CS5LT2	Internet of Things	PC	50	50	2	0	4	4
6	20IT5LT3	Internet Programming	PC	50	50	2	0	4	4
EMPLOYABILITY ENHANCEMENT COURSE									
7	20PT5T1	Career Guidance - I	EEC	100	--	2	1	0	0
Total						**17**	**1**	**12**	**21**

SEMESTER VI

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1		Professional Elective - II	PE	50	50	3	0	0	3
2	20IT6T1	Big Data Analytics	PC	50	50	3	1	0	4
3		Open Elective - III	OE	50	50	3	0	0	3
4		Professional Elective - III	PE	50	50	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENTS									
5	20IT6LT1	Mobile Application Development	PC	50	50	2	0	4	4
6	20IT6LT2	Graphics and Multimedia	PC	50	50	2	0	4	4
EMPLOYABILITY ENHANCEMENT COURSE									
7	20PT6T1	Career Guidance - II	EEC	100	--	2	1	0	0
Total						**18**	**2**	**8**	**21**

SEMESTER VII

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1		Professional Elective - IV	PE	50	50	3	0	0	3
2	20IT7T1	Block Chain Fundamentals	PC	50	50	3	1	0	4
3		Open Elective - IV	OE	50	50	3	0	0	3
4		Professional Elective - V	PE	50	50	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENTS									
5	20IT7LT1	Information Security	PC	50	50	2	0	4	4
6	20IT7LT2	Advanced Java Programming	PC	50	50	2	0	4	4
LABORATORY COURSE									
7	HX8001	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	100	-	0	0	6	3
Total						**16**	**1**	**14**	**24**

SEMESTER VIII

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
LABORATORY COURSES									
1	20IT8L1	Project Work	EEC	50	50	0	0	20	10
2	20IT8L2	Internship in Industry	EEC	100	-	4 Weeks			3
Total						**0**	**0**	**20**	**13**

Total Credits: 162

HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT (HS)

S. No.	Course Code	Course Title	L	T	P	C
1	20EN1T3	Communicative English I	3	1	0	4
2	20EN2T3	Communicative English II	3	0	0	3
3	20ENCL1	Communication Skills Laboratory	0	0	2	1
4	20HS4T1	Universal Human Values 2: Understanding Harmony	2	1	0	3
5	20HSCT2	Professional Ethics	3	0	0	3

BASIC SCIENCES (BS)

Sl. No.	Course Code	Course Title	L	T	P	C
1	20MA1T1	Engineering Mathematics – I	3	1	0	4
2	20CY1T2	Engineering Chemistry	3	0	0	3
3	20PH1T4	Engineering Physics	3	0	0	3
4	20GE1L1	Physics and Chemistry Laboratory	0	0	3	1.5
5	20MA2T1	Engineering Mathematics – II	3	1	0	4
6	20MA3T2	Probability and Queuing Theory	3	1	0	4

ENGINEERING SCIENCES (ES)

Sl. No.	Course Code	Course Title	L	T	P	C
1	20CS1T5	Fundamentals of Computing and Programming	3	0	0	3
2	20CS1L2	Computer Practices Laboratory	0	0	3	1.5
3	20EE2T4	Basics of Electrical Engineering	3	0	0	3

4	20CSCT5	Python Programming	3	0	0	3
5	20EM2L1	Engineering Practices Laboratory	0	0	3	1.5
6	20ME2L2	Engineering Drawing Laboratory	0	0	3	1.5
7	20CS2L3	Python Programming Laboratory	0	0	3	1.5
8	20EC3T3	Digital Principles & System Design	3	0	0	3
9	20EC3L3	Digital System Laboratory	0	0	3	1.5
10	20EC4T1	Microprocessor and Microcontroller	3	0	0	3

PROFESSIONAL CORE (PC)

Sl. No.	Course Code	Course Title	L	T	P	C
1	20CS3T2	Data Structures & Algorithms	3	1	0	4
2	20CS3T4	Computer Architecture	3	0	0	3
3	20CS3T5	Object Oriented Programming with Java	3	0	0	3
4	20CS3L1	Data Structures Laboratory	0	0	3	1.5
5	20CS3L2	Object Oriented Programming with Java Laboratory	0	0	3	1.5
6	20CS4T3	Database Management Systems	3	0	0	3
7	20CS4T4	Operating Systems	3	1	0	4
8	20CS4L2	Database Management Systems Laboratory	0	0	3	1.5
9	20CS4L3	Operating Systems Laboratory	0	0	3	1.5
10	20CS5LT2	Internet of Things	2	0	4	4
11.	20IT5LT3	Internet Programming	2	0	4	4
12	20CSCLT1	Data Communication & Networks	2	0	4	4
13	20IT6T1	Big Data Analytics	3	1	0	4
14	20IT6LT1	Mobile Application Development	2	0	4	4
15	20IT6LT2	Graphics and Multimedia	2	0	4	4

16	20IT7T1	Block Chain Fundamentals	3	1	0	4
17	20IT7LT1	Information Security	2	0	4	4
18	20IT7LT2	Advanced Java Programming	2	0	4	4

PROFESSIONAL ELECTIVES (PE)

Semester – V (Elective I)						
Sl. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	20ECCE1	Digital Image Processing	3	0	0	3
2	20ECCE2	Wireless Adhoc and Sensor Networks	3	0	0	3
3	20IT5E3	IoT Architecture and Protocol	3	0	0	3
4	20IT5E4	Distributed Computing	3	0	0	3

Semester – VI (Elective II)						
Sl. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	20IT6E1	Industrial and Medical IoT	3	0	0	3
2	20IT6E2	Cyber Security	3	0	0	3
3	20IT6E3	Information Ethics	3	0	0	3
4	20IT6E4	Data Visualization	3	0	0	3

Semester – VI (Elective III)						
Sl. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	20IT6E5	Wearable Computing	3	0	0	3
2	20IT6E6	Information Security Analysis and Audit	3	0	0	3
3	20CS6E7	Software Project Management	3	0	0	3
4	20IT6E8	Virtual Reality	3	0	0	3

Semester – VII (Elective IV)						
Sl. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	20IT7E1	Cognitive IoT	3	0	0	3
2	20IT7E2	Information Security Management	3	0	0	3
3	20IT7E3	Digital Marketing	3	0	0	3
4	20IT7E4	Software Quality Assurance	3	0	0	3

Semester – VII (Elective V)						
Sl. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	20IT7E5	Privacy and Security in IoT	3	0	0	3
2	20IT7E6	Cryptography and Network Security	3	0	0	3
3	20IT7E7	Computer Vision	3	0	0	3
4	20IT7E8	NPTEL Courses	3	0	0	3
5	HX8001	Professional Readiness for Innovation, Employability and Entrepreneurship	0	0	6	3

OPEN ELECTIVES (OE)

Sl. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1.	20CSO01	Object Oriented Programming Using Java	3	0	0	3
2.	20CSO02	Computer Architecture	3	0	0	3
3.	20CSO03	Data Structures	3	0	0	3
4.	20CSO04	Operating Systems	3	0	0	3
5	20CSCT5	Python Programming	3	0	0	3
6	20CSO06	Cloud Computing	3	0	0	3
7	20CSO07	Artificial Intelligence	3	0	0	3
8	20IT6T1	Big Data Analytics	3	0	0	3
9	20CSO09	Internet of Things	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl. No.	Course Code	Course Title	L	T	P	C
1	20PT5T1	Career Guidance - I	2	1	0	0
2	20PT6T1	Career Guidance - I	2	1	0	0
4	20IT8L2	Internship in Industry	4 Weeks			3
5	20IT8L1	Project Work	0	0	20	10

MANDATORY COURSES (MC)

Sl.No.	Course Code	Course Title	L	T	P	C
1.		Universal Human Values 1 - Induction Programme	0	0	0	0
2.	20CY2T2	Environmental Sciences	3	0	0	0
3.	20MCCT1	Constitution of India	3	0	0	0

VALUE ADDED COURSES (VAC)

S.No.	Course Code	Course Title	Credit
1.	20CSV01	J2EE	
2.	20CSV02	Php, Mysql	
3.	20CSV03	Android Application Development	
4.	20CSV04	3d Studio Max, Maya	
5.	20CSV05	Hardware And Network Trouble Shooting	
6.	20CSV06	Ethical Hacking	
7.	20CSV07	Block Chain Technology	

CURRICULUM BREAKDOWN STRUCTURE

Subject	AICTE suggested breakdown of credits	Total number of credits	Curriculum Content (% of total number of credits of the program)
Humanities and Social Sciences including Management (HS)	**12**	**14**	**8.6**
Basic Sciences (BS)	**24**	**19.5**	**12**
Engineering Sciences (ES)	**29**	**22.5**	**13.8**
Professional Core (PC)	**49**	**63**	**38.8**
Program Electives (PE)	**18**	**15**	**9.2**
Open Electives (OE)	**12**	**12**	**7.4**
Employability Enhancement Courses (EEC) – Practical Courses and Project Work	**15**	**16**	**9.8**
Mandatory Courses (MC)	**0**	**0**	**0**
Total	**159**	**162**	**100.00**

CREDIT SUMMARY

Sl. No.	Subject Area	Credits per Semester								Total Credits	AICTE Suggested Credits
		I	II	III	IV	V	VI	VII	VIII		
1	**HS**	4	3		4	3				**14**	12
2	**BS**	11.5	4	4						**19.5**	24
3	**ES**	4.5	10.5	4.5	3					**22.5**	29
4	**PC**			13	14	12	12	12		**63**	49
5	**PE**					3	6	6		**15**	18
6	**OE**				3	3	3	3		**12**	12
7	**EEC**					-	-	3	13	**16**	15
8	**MC**	-	-	-	-		-				0
TOTAL		**20**	**17.5**	**21.5**	**24**	**21**	**21**	**24**	**13**	**162**	**159**

HS – Humanities and Social Sciences including Management
BS – Basic Sciences
ES – Engineering Sciences
PC – Professional Core
PE – Professional Electives
OE – Open Electives
EEC – Employability Enhancement Courses
MC – Mandatory Courses

SEMESTER I

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20MA1T1	Engineering Mathematics I	BS	50	50	3	1	0	4
2	20CY1T2	Engineering Chemistry	BS	50	50	3	0	0	3
3	20EN1T3	Communicative English I	HS	50	50	3	1	0	4
4	20PH1T4	Engineering Physics	BS	50	50	3	0	0	3
5	20CS1T5	Fundamental of Computing and Programming	ES	50	50	3	0	0	3
LABORATORY COURSES									
6	20GE1L1	Physics and Chemistry Laboratory	BS	50	50	0	0	3	1.5
7	20CS1L2	Computer Practices Laboratory	ES	50	50	0	0	3	1.5
MANDATORY COURSE									
8		Universal Human Values 1 - Induction Programme	MC	-	-	-	-	-	-
Total						**15**	**2**	**6**	**20**

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20MA1T1	ENGINEERING MATHEMATICS I	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify Eigen values and Eigenvectors and apply orthogonal diagonalization to convert quadratic form to canonical form.	K3	1
CO2	Apply differentiation and integration technique to solve algebraic and transcendental function	K3	2
CO3	Evaluate the total derivative of the function, expand the given as series and locate the maximum and minimum for multivariate function	K5	3
CO4	Solve first order Ordinary Differential Equations and apply them to certain physical situations	K3	4
CO5	Choose appropriate integral techniques to find area and volume of the given region	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3				1	3	3		3		
CO2	3	3		3				1	3	3		3		
CO3	3	3		3				1	3	3		3		
CO4	3	3		3				1	3	3		3	2	
CO5	3	3		3				1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments and Tutorials
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**MATRICES**	**9 + 3**
Eigen values and Eigen vectors of a real matrix – properties of Eigen values and Eigen vectors (without proof) – Cayley-Hamilton theorem (statement and applications) – orthogonal transformation of a symmetric matrix to diagonal form (concept only) – Reduction of quadratic form to canonical form by an orthogonal transformation		
Topic - 2	**DIFFERENTIATION AND INTEGRATION**	**9 + 3**
Basic differentiation formula for algebraic and transcendental functions – derivatives – differentiability rules and properties (without proof) – basic integral formula for algebraic and transcendental functions – integration by parts – partial fraction methods.		
Topic - 3	**FUNCTIONS OF SEVERAL VARIABLES**	**9 + 3**
Total derivatives – Taylor's series expansion – maxima and minima – Lagrange's multipliers method – Jacobian's method		
Topic - 4	**FIRST ORDER ORDINARY DIFFERENTIAL EQUATION**	**9 + 3**
Leibnitz's equations – Bernoulli's equation – equation of first order and higher degree – Clairaut's form – Linear first order differential equations and its applications.		
Topic - 5	**MULTIPLE INTEGRALS**	**9 + 3**
Double integrals: Double integration in Cartesian co-ordinates – change of order of integration – area as a double integration in Cartesian – volume as a triple integral in Cartesian co-ordinates (simple problems)		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House, New Delhi, Reprint 2009.
2	Ramana B.V., "Higher Engineering Mathematics", Tata Mcgraw Hill Publishing Company, New Delhi, 2008.
3	Kreyszig E., "Advanced Engineering Mathematics", 9th Edition, John Wiley Sons, 2012.
4	Glyn James., "Advanced Modern Engineering Mathematics", Pearson Education Limited, 2007.
5	N P Bali, Manish Goyal, "A Text Book of Engineering Mathematics", 3rd Edition, Laxmi Publication Private Limited, 2009.

OTHER REFERENCES	
1	https://www.slideshare.net/mailrenuka/matrices-and-application-of-matrices
2	https://www.slideshare.net/mailrenuka/matrices-and-application-of-matrices
3	https://youtu.be/wtuq1oSButE
4	https://www.slideshare.net/abhinavsomani3/applications-of-maths-in-our-daily-life-41607055

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20CY1T2	ENGINEERING CHEMISTRY	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Explain the properties & working techniques along with potential applications.	K2	1
CO2	Choose the appropriate method for specific application in engineering technology.	K3	2
CO3	Analyse new solutions to problems in materials and energy usage in daily life	K4	3
CO4	Identify the structure of unknown/new compounds with their properties.	K3	4
CO5	Categorize the important features of various materials and methods for burgeoning society.	K4	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2					1	3	3		3		
CO2	3	2						1	3	3		3		
CO3	3	2						1	3	3		3		
CO4	3		2					1	3	3		3	2	
CO5	3	2	2					1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**WATER CHEMISTRY**	**9**
Hardness of water – types – units –boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, carbonate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water – Reverse Osmosis.		
Topic - 2	**FUELS AND COMBUSTION**	**9**
Fuels: Introduction - classification of fuels – Combustion- coal – Analysis of coal - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol.		
Topic - 3	**ENERGY STORAGE DEVICES**	**9**
Batteries - Types of batteries – primary battery - dry cell. Secondary battery - lead acid battery, Nickel- Cadmium battery, fuel cells – Hydrogen -Oxygen fuel cell. - Solar energy conversion - solar cells – Application.		
Topic - 4	**SPECTROSCOPY**	**9**
Introduction – Laws of spectroscopy - Block diagram, Instrumentation, Working and application of Visible spectroscopy and Ultra Violet spectroscopy – Infrared spectroscopy – Flame photometry – Atomic adsorption spectroscopy.		
Topic - 5	**ENGINEERING MATERIALS**	**9**
Polymer – Types of polymerization – Preparation, properties, uses of Nylon(6,6), Poly Vinyl Chloride (PVC). Plastics – Types - Rubbers – SBR – Nanomaterial – Synthesis and its applications of Nanomaterial. Abrasives – Classification, Properties- Manufacture of SiC.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	S.S Dara and S.S. Umare ‘Engineering Chemistry’, S.Chand Publication, 2013
2	Jain & Jain ‘Engineering chemistry’ Dhanpat Rai Publishing Company, 2012
3	Shikha Agarwal , Engineering Chemistry, Cambridge University Press, 2015 edition
4	Manas Senapati, Advanced Engineering Chemistry, Firewall Media, 2006

OTHER REFERENCES	
1	https://www.freebookcentre.net/chemistry-books-download
2	https://nptel.ac.in/course.html
3	https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/polymers.htm
4	https://edu.rsc.org/resources/collections/analytical-chemistry-introductions

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20EN1T3	COMMUNICATIVE ENGLISH I	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Apply the rules of grammar to parts of speech, tenses, voices, degrees of comparison, compound nouns and articles	K3	1
CO2	Interpret graphical representation for composing passages and paraphrase technical texts	K4	2
CO3	Analyze different spoken discourses like, short talks, comprehend different dialogues, practice conversation for speaking skills	K4	3
CO4	Examine grammatical errors using correct vocabulary and generating ideas logically on a topic	K5	4
CO5	Develop language and vocabulary effectively for our real-life contexts	K6	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO 1						3			2	3		3		
CO 2						2			2	3		2		
CO 3						3			2	2		1		
CO 4						2			2	3		2	2	
CO 5						3			1	3		2		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Grammar Quizzes
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**GRAMMAR AND VOCABULARY**	**9 + 3**
Word formation with Prefix and Suffix – Parts of Speech – Tenses - Voices – Degrees of comparison –Compound Nouns - Basic Vocabulary – Homonyms and Homophones – Articles- Idioms – Phrasal verbs – Subject-Verb Agreement.		
Topic - 2	**LISTENING**	**9 + 3**
Introduction to Listening – Listening Comprehension – Extensive and Intensive listening – Pronunciation – Intonation – Stress – Pause – Rhythm – Short and Long conversations.		
Topic - 3	**SPEAKING**	**9 + 3**
An introduction to Speech sounds – Verbal and Non-verbal Communication – Describing places, people,Technical Processes – Telephonic skills – Different types of Interview – Group Discussions – Debates.		
Topic - 4	**READING**	**9 + 3**
Skimming and Scanning – Reading Newspaper articles – Reading different types of texts – SpeedReading – Reading to identify Stylistic Features (Syntax, Lexis, Sentence Structures) – Comprehension.		
Topic - 5	**WRITING**	**9 + 3**
Introduction to aspects of technical writing – Letter writing – Formal Letters – Job application letter with CV and Resume - Official letters- Business letters- Circular letters- Employment letters – Punctuation – Writing reviews on books and movies – recommendations – Creative writing – email writing.		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Board of Editors, Using English, Orient Black Swan, 2015.
2	Practical English Usage, Michael Swan, OUP 1995.
3	Communicative English, J.Anbazhagan Vijay, Global Publishers – Chennai 2018.
4	Effective Communication, Adair, John. London: Pan Macmillan Ltd., 2003.
5	Brilliant Communication Skills, Hasson, Gill. Great Britain: Pearson Education, 2012.

OTHER REFERENCES	
1	http://networketiquette.net/
2	http://www.englishdaily626.com/c-errors.php
3	http://www.dailywritingtips.com/

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20PH1T4	ENGINEERING PHYSICS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Classify the extensive properties of solid materials to use in current field.	K2	1
CO2	Identify and develop the knowledge of atoms in solid crystals to apply recent engineering fields.	K3	2
CO3	Describe the fundamentals of lasers, laser systems, their characteristics and diversified applications including industry and medicine.	K4	3
CO4	Demonstrate a mastery of the core knowledge base in thermal physics.	K3	4
CO5	Evaluate the nano materials and its fabrication with behaviour by using advanced technical methods.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			1	3	2	3	3	3	3	3		
CO2	2	1				3	2	3	3	3	3	3		
CO3	3	2	2			3	2	3	3	3	3	3		
CO4	2					3	2	3	3	3	3	3		
CO5	3	2				3	2	3	3	3	3	3	3	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Mini Project
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**PROPERTIES OF MATTER**	**9**
Hooke's Law - Stress-Strain Diagram - Elastic moduli - Poisson's Ratio - Expression for bending moment of beam and depression of Cantilever - Expression for Young's modulus by Non-uniform bending and its experimental determination.		
Topic - 2	**CRYSTAL PHYSICS**	**9**
Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - growth of single crystals: solution and melt growth techniques.		
Topic - 3	**LASER TECHNOLOGY**	**9**
Introduction – principle of spontaneous emission and stimulated emission, population inversion, pumping mechanism. Laser characteristics - Einstein's A and B coefficients derivation. Two, three and four level systems. Threshold gain coefficient- Component of laser. Solid state laser (Nd:YAG). Diode lasers –Application of laser in science and engineering.		
Topic - 4	**THERMAL PHYSICS**	**9**
Transfer of heat energy - thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity - Lee's disc method - theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.		
Topic - 5	**NANO TECHNOLOGY**	**9**
Introduction to Nano materials- Moore's law- Properties of Nano materials- Quantum well, wire and dot- Fullerene, Carbon Nanotubes- Application of Nanotechnology in industry.		

THEORY	**45**		**TUTORIAL**	**00**		**PRACTICAL**	**00**		**TOTAL**	**45**

BOOK REFERENCES	
1	Serway and Jewett, "Physics for Scientists and Engineers with Modern Physics", 6th Edition, Thomson Brooks Cole, 2008
2	Charles P. Poole and Frank J.Owens, "Introduction to Nanotechnology", 2nd Edition, Wiley, Delhi, 2008.
3	S.O. Pillai, "Solid state Physics", 6th Edition, New Age International Publishers, 2008.

OTHER REFERENCES	
1	https://nptel.ac.in/courses/115/105/115105099/
2	https://nptel.ac.in/courses/115/106/115106061/
3	https://www.youtube.com/watch?v=_JOchLyNO_w
4	https://www.journals.elsevier.com › Journals
5	https://nptel.ac.in/courses/118/104/118104008/

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20CS1T5	FUNDAMENTALS OF COMPUTING AND PROGRAMMING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand the word processing tools with text documents	K2	1
CO2	Organize spreadsheet manipulation tools with sheets also describe the presentation and sliding with layouts	K3	2
CO3	Develop C program using managing input and output operations.	K3	3
CO4	Discover array and string implementation in C	K4	4
CO5	Examine the function and structure concepts in C	K4	5

PRE-REQUISITE	C PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3		3	1	3	3		3		
CO2	3		2		2			1	3	3		3		
CO3	3		2		3			1	3	3		3		
CO4	3							1	3	3		3		
CO5	3				2			1	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO MS-WORD AND MS-EXCEL**	**9**
Introduction to word – Creating, editing, saving and printing text documents - Font and paragraph formatting - Simple character formatting -Inserting tables, smart art, page breaks -Using lists and styles-Working with images -Using Spelling and Grammar check -Understanding document properties Introduction to Spreadsheet basics - Creating, editing, saving and printing spreadsheets -Working with functions & formulas -Modifying worksheets with colour & auto formats -Graphically representing data : Charts & Graphs - Data Menu, Subtotal, Filtering Data -Formatting worksheets -Securing & Protecting spreadsheets		
Topic - 2	**MS-POWERPOINT AND INTERNET**	**9**
Introduction to PowerPoint- Opening, viewing, creating, and printing slides -Applying auto layouts - Adding custom animation -Using slide transitions -Graphically representing data : Charts & Graphs - Creating Professional Slide for Presentation. Internet - Understanding how to search/Google -bookmarking and Going to a specific website -Copy and paste Internet content into your word file and emails -Understanding social media platforms such as Facebook & Many more -learn with best practices		
Topic - 3	**C PROGRAMMING BASICS**	**9**
Problem formulation – Problem Solving - Introduction to ' C' programming –fundamentals – structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.		
Topic - 4	**ARRAYS AND STRINGS**	**9**
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.		
Topic - 5	**FUNCTIONS, STRUCTURES AND UNIONS**	**9**
Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion - Structure – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Microsoft Office 2010 In Depth 1st Edition by Joe Habraken (Author) ,2010
2	Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-
3	"Computer basics absolute beginners"9thEdition, Michale Miller,2019

OTHER REFERENCES	
1	https://youtu.be/ZXAPCy2c33o
2	https://courses.lumenlearning.com/wm-compapp/chapter/internet-and-powerpoint/
3	https://www.geeksforgeeks.org/c-language-set-1-introduction/
4	https://www.studytonight.com/c/string-and-character-array.php
5	https://www.geeksforgeeks.org/difference-structure-union-c/

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20GE1L1	PHYSICS & CHEMISTRY LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Physics & Chemistry laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
PHYSICS LABORATORY (Any Five Experiments)	
1	Torsional pendulum - determination of moment of inertia and rigidity modulus
2	Determination of young's modulus by non- uniform bending
3	(a) Determination of Wavelength, and particle size using Laser (b) Determination of acceptance angle in an optical fiber.
4	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
5	Air wedge – determination of thickness of a thin wire.
6	Determination of band gap of a semiconductor.
LIST OF EXPERIMENTS	
CHEMISTRY LABORATORY (Any Five Experiments)	
1	Determination of total, temporary and permanent hardness of water by EDTA method.
2	Estimate the dissolved oxygen content of the given water sample by Winkler's method.
3	Determine the chloride content of the given potassium chloride sample using standardized silver nitrate solution.
4	Determination of iron content of the given solution using a potentiometer
5	Determination of strength of acid using conductivity meter.
6	Using conductance measurements, determine the strength of acids in a mixture.

THEORY	0		TUTORIAL	0		PRACTICAL	30		TOTAL	30

BOOK REFERENCES	
1	C. Ramesh Kumar & Y. Devakumari, "Physics Laboratory Manual", Al-Ameen Publications, 2020.
2	N. Jafarulla & C. Krishna Moorthy C "Chemistry Laboratory Manual", Al-Ameen Publications, 2020.

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20CS1L2	COMPUTER PRACTICES LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Computer Practices Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Study Experiment a) Hardware specification and PC Assembly b) Getting connected to internet
2	Word processing a) Documentation creation, Text Manipulation with scientific notation b) Table Creation, Table Formatting and Conversion c) Mail Merge d) Flow Chart Preparation.
3	Spread Sheet a) Charts- Bar Chart, Pie Chart, Line Chart, X,Y-Chart b) Object Inclusion, Picture and Graphics c) Protecting the Document
4	Power Point Presentation and Access a) Creation of Presentation b) Generation of Report Using Access
5	C Programming a) Simple C Program with Data Types, Expressions and Comment Lines b) Programming with Conditional Statements c) Programming with Branching and Looping Statements d) Programming with Arrays and String e) Programming with Function and Structure

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**45**		**TOTAL**	**45**

BOOK REFERENCES	
1	Computer Practices Laboratory manual, Al - Ameen Publications 2020
2	Microsoft Office 2008 In Depth 2nd Edition by Joe (Author) , 2010

OTHER REFERENCES	
1	https://youtu.be/ftyWKjT20S4
2	https://nptel.ac.in/about_nptel.html
3	https://nptel.ac.in/courses/106/106/106106092/

SEMESTER II

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20MA2T1	Engineering Mathematics II	BS	50	50	3	1	0	4
2	20EN2T3	Communicative English II	HS	50	50	3	0	0	3
3	20EE2T4	Basics of Electrical Engineering	ES	50	50	3	0	0	3
4	20CSCT5	Python Programming	ES	50	50	3	0	0	3
LABORATORY COURSES									
5	20EM2L1	Engineering Practices Laboratory	ES	50	50	0	0	3	1.5
6	20ME2L2	Engineering Drawing Laboratory	ES	50	50	0	0	3	1.5
7	20CS2L3	Python Programming Laboratory	ES	50	50	0	0	3	1.5
MANDATORY COURSE									
8	20CY2T2	Environmental Sciences	MC	100	-	3	0	0	0
Total						**15**	**1**	**9**	**17.5**

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., Common to all	20MA2T1	ENGINEERING MATHEMATICS II	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Solve higher order differential equations and apply them to certain physical situations	K3	1
CO2	Apply various integral theorems for solving engineering problems involving cubes and parallelepipeds.	K3	2
CO3	Solve linear differential equations using Laplace transform techniques.	K3	3
CO4	Construct analytic function of complex variables and transform functions from z- plane to w- plane and vice-versa using conformal mappings. .	K3	4
CO5	Apply the techniques of complex integration to evaluate real and complex integrals over suitable closed paths or contours	K3	5

PRE-REQUISITE	ENGINEERING MATHEMATICS I

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3				1	3	3		3		
CO2	3	3		3				1	3	3		3		
CO3	3	3		3				1	3	3		3		
CO4	3	3		3				1	3	3		3		
CO5	3	3		3				1	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments and Tutorials
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**SECOND AND HIGHER ORDER ORDINARY DIFFERENTIAL EQUATIONS**	**9 + 3**
Second order linear differential equations with constant co-efficient – Cauchy equation – Euler equation– Cauchy –Legendre equation– Method of variation of parameters– Solution of simultaneous equation with constant coefficients		
Topic - 2	**VECTOR CALCULUS**	**9 + 3**
Introduction– gradient–directional derivative–divergence and curl–angel between the surfaces– solenoidal and irrotational vector fields–Green's theorem in a plane–Gauss divergence theorem– Stoke's theorem (without proof).		
Topic - 3	**LAPLACE TRANSFORMS**	**9 + 3**
Condition for existence– Transform of elementary function– Basic properties(without proof)– Derivatives and integrals of transforms– Transform of unit step function– Initial and final value theorem(statement only)– Transform of a periodic function– Inverse Laplace transform– Partial fractions method–convolution theorem(statement only)– Solution of linear ODE of second order with constant co-efficients.		
Topic - 4	**ANALYTIC FUNCTIONS**	**9 + 3**
Analytic function – Necessary and sufficient condition – Cauchy Rieman equation (without proof) – Properties of analytic function (statement only) – Harmonic function – Constructions of analytic function – Bilinear transformation – Conformal mappings $w = z + a$, $w = az$, $w = \frac{1}{z}$		
Topic - 5	**COMPLEX INTEGRATION**	**9 + 3**
Cauchy's integral theorem (without proof) –Cauchy integral formula –Taylor's and Laurent's series (without proof) – Singularities –Cauchy's residue theorem – Contour Integration: Circular and Semi circular contour (excluding polar on real axis).		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Grewal B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publications New Delhi, 2011
2	JainR.K and Iyengar S.R.K, "Advanced Engineering Mathematics",4th Edition, Narosa Publishing House, New Delhi, Reprint 2014.
3	Ramana B.V., "Higher Engineering Mathematics", Tata Mcgraw Hill Publishing Company, New Delhi, 2011.
4	Kreyszig E., "Advanced Engineering Mathematics", 10th Edition, John Wiley Sons, 2010..

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., Common to all (Except Civil)	20EN2T3	COMMUNICATIVE ENGLISH II	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Initiate and sustain a discussion maintaining appropriate group behaviour, for a given communication scenario.	K5	1
CO2	Speak effectively and express opinions clearly for a given communicative context.	K3	2
CO3	Read different technical and professional texts, infer implied meanings and critically analyse evaluate the ideas presented.	K4	3
CO4	Use functional grammar for improving employment oriented skills. Use appropriate vocabulary and grammatical forms to complete a passage.	K3	4
CO5	Comprehend different spoken experts critically and infer spoken and implied meaning.	K6	5

PRE-REQUISITE	COMMUNICATIVE ENGLISH I

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3			3	3		3		
CO2						2			3	3		3		
CO3						3			3	3		3		
CO4						2			3	3		3	2	
CO5						3			3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Grammar Quizzes
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1		**9**

Listening: Listening practice – different types of conversation and answering questions – gap exercises **Speaking:** Introduce one self and others – Opening a conversation **Reading:** Reading a novel, itinerary, Magazine and News papers **Writing:** Formal Letters – Job application letter with CV and Resume **Grammar:** Kinds of Sentences – Sentence Pattern (Parts/ Patterns/ Column Analysis).

Topic - 2		**9**

Listening: Short texts – Listening to situation based dialogues – Listening to talks on engineering - **Speaking:** Sharing information of a personal kind – greeting – taking leave– **Reading:** Comprehension Questions (multiple choice questions and short questions) – short narrative stories - **Writing:** Paragraph Writing – Filling Forms – Basics of Business writing – Placing Orders, Letter of Complaint - **Grammar:** Asking Questions in the Simple Present – Using reference words, Yes/No type questions.

Topic - 3		**9**

Listening: Listening to academic lectures and live speech – advertisements and announcements – **Speaking:** Giving and Justifying opinions – apologizing – Introduction to Presentation – **Reading:** Reading Blogs – Website articles – Paragraphing – **Writing:** Tweets – Texting and SMS language – Use of Sequence Words - **Grammar:** Using Past Tense to make correct sentences – WH questions.

Topic - 4		**9**

Listening: Listening to a telephone conversation – Documentaries and making notes – **Speaking:** Giving Instructions – Role play – Asking about routine actions – **Reading:** Reading detailed comprehension - **Writing:** Writing Reports – Preparing Checklist - **Grammar:** Make sentences from Future Tense and their Usages (Compare the sentences with Degrees of Comparison).

Topic - 5		**9**

Listening: Viewing a model group discussion and reviewing the performance of each participant – Casual Conversation - **Speaking:** Participating in a Group Discussion – Speeches for special Occasions– **Reading:** Making notes from long passage or any form of written materials – providing a suitable title – **Writing:** Brainstorming **–** Writing short essays - **Grammar:** Numerical Adjectives – Misspelled Words – Direct and Indirect speech – Spot the Errors.

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Dr. Elango et al. "Resonance: English for Engineers and Technologist", Foundation, Chennai, 2013.
2	Anderson, Paul V., "Technical Communication: A Reader-Centered Approach", Cengage.
3	Sharma, Sangeetha and Binod Mishra**,** "Communication Skills for Engineers and Scientists", PHI Learning , New Delhi, 2009.
4	"Exercises in Spoken English Part I –III". EFLU, Hyderabad, OUP, 2014.
5	Raman, Meenakshi, & Sangeeta Sharma. Technical Communication: Principles and Practice, Second Edition. New Delhi: Oxford University Press, 2011.

OTHER REFERENCES	
1	http://www.owlnet.rice.edu/
2	http://zzyx.ucsc.edu/archer/intro.html
3	http://www.indiabix.com/group-discussion/topics-with-answers/

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. MECH, CSE & IT	20EE2T4	BASICS OF ELECTRICAL ENGINEERING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate and articulate the basic concepts related electrical machines.	K2	1
CO2	Apply the laws of electromagnetic & electric circuits in electrical machines.	K3	2
CO3	Compare electrical machines to rate their performance.	K4	3
CO4	Analyze electrical machines to infer their limitations.	K4	4
CO5	Evaluate a machines based on a set of criteria / applications and recommend a suitable electrical systems.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2			1	3	3		3		2
CO2	3	3	2	2	3	3		1	3	3		3		2
CO3	3	3	2		2			1	3	3		3		
CO4	3	2	3			2		1	3	3		3		
CO5	3	2	2					1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**ELECTRICAL CIRCUITS & MEASURMENTS**	**9**
Ohm's Law – Kirchoff's Laws — Introduction to AC Circuits – Operating Principles of Moving Coil and Moving Iron Instruments, Dynamometer type Wattmeter and Energy meters		
Topic - 2	**DC MACHINES**	**9**
Construction, Principle of Operation and Characteristics of DC Generators, DC Motors, Single Phase Transformer.		
Topic - 3	**AC MACHINES**	**9**
Construction, Principle of Operation of AC Generators (Sailent& Non Sailent), Synchronous motor, Single and three phase induction Motors.		
Topic - 4	**STARTING METHODS**	**9**
Types of DC Motor starters (Two point, Three point & Four point) –Soft starter - Three phase squirrel cage and slip ring induction motors. (DOL Starter, Auto Transformer Starter, Rotor resistance Starter and Star/Delta Starter)		
Topic - 5	**CONVENTIONAL AND SOLID STATE SPEED CONTROL OF DC. & AC DRIVES**	**9**
Armature and field control, Ward Leonard Scheme, Single phase rectifier controllers (half and Full), Slip power recovery scheme, Single phase voltage regulator.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	A.K.Shawney, "A Course in Electrical and Electronics Measurements & Instrumentation", Dhanpat Rai & Co. 2010.
2	Bhattacharya, "Electrical Machines", Tata McGraw Hill, 2013.
3	Bakshi, "Electrical Machines –II", Technical Publications , Pune, 2015.
4	Dubey, "Fundamental of Electrical Drives", Narosa Publications, New Delhi, 2011.

OTHER REFERENCES	
1	https://youtu.be/u1gAh0cznp4
2	https://youtu.be/zs4MnEx7wTQ
3	https://youtu.be/shJAV59NS6k
4	https://youtu.be/j_F4limaHYI
5	https://youtu.be/AQqyGNOP_3o

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., Common to CSE/IT	20CSCT5	PYTHON PROGRAMMING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Classify and make use of python programming elements to solve and debug simple logical problems.	K2	1
CO2	Experiment with the various control statements in Python.	K3	2
CO3	Develop python programs using functions and strings.	K3	3
CO4	Experiment with the usage of pointers and functions.	K3	4
CO5	Analyze a problem and use appropriate packages and modules to solve it.	K4	5

PRE-REQUISITE	C PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3			2	3	2	3	3	3	3	3		
CO2			2			3	2	3	3	3	3	3		
CO3			2			3	2	3	3	3	3	3		2
CO4			2		2	3	2	3	3	3	3	3	2	2
CO5	3	3	2			3	2	3	3	3	3	3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Mini Project
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**BASICS OF PYTHON PROGRAMMING**	**9**
Introduction - Python Interpreter - Interactive and script mode -Values and types, operators, expressions, statements, precedence of operators, Multiple assignments, comments.		
Topic - 2	**CONTROL STATEMENTS AND FUNCTIONS IN PYTHON**	**9**
Conditional (if), alternative (if-else), chained conditional (if-elif-else) – Iteration - while, for, break, continue, pass – Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Lambda functions.		
Topic - 3	**DATA STRUCTURES: STRINGS,LISTSAND SETS**	**9**
Strings - String slices, immutability, string methods and operations –Lists - creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions - list processing - list comprehension, searching and sorting, Sets - creating sets, set operations		
Topic - 4	**DATA STRUCTURE STUPLES, DICTIONARIES**	**9**
Tuples - Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value – Dictionaries - operations and methods, Nested Dictionaries.		
Topic - 5	**FILES,MODULES,PACKAGES**	**9**
Files and Exception - Text files, reading and writing files, format Operator – Modules - Python Modules - Creating own Python Modules - packages, Introduction to exception handling.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Ashok NamdevKamthane,Amit Ashok Kamthane, "Programming andProblem Solving with Python" , Mc-Graw Hill Education,2018.
2	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff / O'Reilly Publishers,2016.
3	Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt.Ltd.,2016.
4	Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,2015.
5	Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning,2012.

OTHER REFERENCES	
1	https://www.coursera.org/specializations/python
2	https://www.youtube.com/watch?v=rfscVS0vtbw
3	https://nptel.ac.in/courses/106/106/106106212/

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., (Common to all)	20EM2L1	ENGINEERING PRACTICES LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Engineering Practices Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	**GROUP A (CIVIL & MECHANICAL)** **I. CIVIL ENGINEERING PRACTICE** **Buildings:** a) Study of plumbing and carpentry components of residential and industrial buildings safety aspects. **Plumbing Works:** a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings. b) Preparation of plumbing line sketches for water supply and sewage works. c) Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components. d) Demonstration of plumbing requirements of high-rise buildings. **Carpentry using manual and power tools:** a) Study of the joints in roofs, doors, windows and furniture. b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting.
2	**II.MECHANICAL ENGINEERING PRACTICE** **Welding:** a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding. b) Gas welding practice **Basic Machining:** a) Simple Turning and Taper turning b) Drilling Practice **Sheet Metal Work:** a) Forming & Bending b) Model making – Trays and funnels. c) Different type of joints. **Machine Study practice:** a) Study of centrifugal pump b) Study of air conditioner
3	**GROUP B (ELECTRICAL AND ELECTRONICS)** **III.ELECTRICAL ENGINEERING PRACTICE** 1. Testing and connection of Fluorescent lamp wiring. 2. Stair case wiring. 3. Measurement of energy using single phase energy meter. 4. Assembly of Residential house wiring. 5. Measurement of earth resistance of an electrical equipment using meggar.
4	**IV.ELECTRONICS ENGINEERING PRACTICE** 1. Resistor colour coding & Measurement of AC signal parameters (Peak-Peak, RMS period, Frequency) using CRO. 2. Study of logic gates AND, OR, EX-OR and NOT. 3. Measurement of ripple factor of HWR and FWR. 4. Soldering practice for Components, Devices and Circuits. **5.** Generation of Clock Signal.

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**45**		**TOTAL**	**45**

BOOK REFERENCES	
1	"Engineering Practices Laboratory", Al-Ameen Publications, 2020.

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., (Common to all)	20ME2L2	ENGINEERING DRAWING LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		**RBT Level**
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Engineering Drwaing Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Drawing three problems based on projection of lines using Drawing sheet
2	Drawing three problems based on projection of planes using Drawing sheet
3	Drawing three problems based on projection of solids using Drawing sheet
4	Drawing three problems based on Orthographic projection using Software Package
5	Drawing three problems based on Isometric projection using Software Package
6	Detailed Study Of Drawing sheet, Drawing Board, Drawing Instruments.
7	Detailed Study Of Dimensioning, Arrow Head , Lettering

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**45**		**TOTAL**	**45**

BOOK REFERENCES	
1	R.K. Dhawan, "A text book of Engineering Drawing" ,S.Chand Publishers, Delhi,2010.
2	Dhananjay. A.Jolhe, " Engineering Drawing with an introduction to AutoCAD", Tata McGrawHill Publishing Company Ltd., Delhi,2008.
3	BasantAgarwal and Agarwal.C.M., "Engineering Drawing"Tata McGrawHill Publishing Company Ltd., Delhi,2008.

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., Common to CSE/IT	20CS2L3	PYTHON PROGRAMMING LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Python Programming Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	C PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Implement simple python programs using interactive and script mode.
2	Develop python programs using id( ) and type( )functions
3	Implement range ( ) function in python
4	Implement various control statements in python.
5	Develop python programs to perform various string operations like concatenation, slicing, indexing.
6	Demonstrate string functions using python.
7	Implement user defined functions using python.
8	Develop python programs to perform operations on list
9	Implement dictionary and set in python
10	Develop programs to work with Tuples.
11	Create programs to solve problems using various data structures in python.
12	Implement python program to perform file operations.
13	Implement python programs using modules and packages

THEORY	0		TUTORIAL	0		PRACTICAL	45		TOTAL	45

BOOK REFERENCES	
1	"Python Programming Laboratory Manual", Al-Ameen Publications, 2020
2.	Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 2018.
3.	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff / O'Reilly Publishers, 2016.
4.	Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt.Ltd., 2016.
5.	Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,2015.

OTHER REFERENCES	
1	https://www.coursera.org/specializations/python

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., Common to all	20CY2T2	ENVIRONMENTAL SCIENCES	3	0	0	0

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate the importance of interdisciplinary nature of environment and health risk assessment.	K2	1
CO2	Discuss the ecosystem and their importance in the environment and conservation of biodiversity.	K2	2
CO3	Design the rain water harvesting system in their living area.	K6	3
CO4	Analyze the impact of pollution and hazardous waste in a global and societal context.	K4	4
CO5	Understand contemporary issues that result in environmental degradation that would attempt to provide solutions to overcome the problems.	K3	5

PRE-REQUISITE	Engineering Chemistry

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1					2	1	3	3		3		
CO2	2	2					1	1	3	3		3		
CO3	3	1	1					1	3	3		3		
CO4	3	2	1					1	3	3		3		
CO5	3	1					2	1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**ENVIRONMENT AND ECOSYSTEMS**	**9**
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs – Introduction, types, characteristic features, structure and function of the forest ecosystem aquatic ecosystems (ponds, river and marine). Activity: Study of the ecosystem structure in Cauvery River.		
Topic - 2	**BIODIVERSITY**	**9**
Introduction to biodiversity definition: genetic, species and ecosystem diversity –value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity– endangered and endemic species of India – In-situ and ex- situ conservation of biodiversity. Activity: Study of common plants, insects, birds.		
Topic - 3	**ENVIRONMENTAL POLLUTION**	**9**
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Thermal pollution (d) Noise pollution – solid waste management: causes, effects and control measures of municipal solid wastes – Hazardous and biomedical waste management -pollution case studies. Activity: Study of air and water pollution in industry.		
Topic - 4	**NATURAL RESOURCES**	**9**
Forest resources: over-exploitation, deforestation, – Water resources: Rain water harvesting-watershed management - utilization of surface and ground water, conflicts over water, dams-benefits and problems Food resources: effects of modern agriculture, fertilizer-pesticide problems - Principles of Green Chemistry- Case studies Activity: Tree plantation and maintenance within the campus.		
Topic - 5	**SUSTAINABILITY AND POPULATION**	**9**
From unsustainable to sustainable development – environmental Impact Assessment (EIA) –environmental ethics: Issues and possible solutions – climate change, acid rain, ozone layer depletion, and case studies – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act - environment and human health – value education – HIV / AIDS – women and child welfare. Activity: Small group meetings about environment and human health in local area peoples and making poster and short films about HIV / AIDS – women and child welfare.		

THEORY	**45**		**TUTORIAL**	**00**		**PRACTICAL**	**00**		**TOTAL**	**45**

BOOK REFERENCES	
1	Erach Bharucha,"Textbook of Environmental Studies", Universities Press(I) Pvt, Ltd, Hydrabad 2015
2	Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.
3	Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill Education, 2014.

OTHER REFERENCES	
1	https://www.onlinebiologynotes.com/food-chain-food-web-and-ecological-pyramids/
2	https://vikaspedia.in/energy/environment/biodiversity-1/conservation-of-biodiversity
3	https://www.sciencedirect.com/topics/earth-and-planetary-sciences/ozone-layer-depletion

SEMESTER III

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20MA3T1	Probability and Queuing Theory	BS	50	50	3	1	0	4
2	20CS3T2	Data Structures & Algorithms	PC	50	50	3	1	0	4
3	20EC3T3	Digital Principles and System Design	ES	50	50	3	0	0	3
4	20CS3T4	Computer Architecture	PC	50	50	3	0	0	3
5	20CS3T5	Object Oriented Programming with Java	PC	50	50	3	0	0	3
LABORATORY COURSES									
6	20CS3L1	Data Structures Laboratory	PC	50	50	0	0	3	1.5
7	20CS3L2	Object Oriented Programming with Java Laboratory	PC	50	50	0	0	3	1.5
8	20EC3L3	Digital Systems Laboratory	ES	50	50	0	0	3	1.5
MANDATORY COURSE									
9	20MCCT1	Constitution of India	MC	100	-	3	0	0	0
Total						**18**	**2**	**9**	**21.5**

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E.CSE, B.Tech. IT & AIDS	20MA3T1	PROBABILITY AND QUEUEING THEORY	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Classify different types of random processes and use it to find whether it is SSS or WSS.	K2	3
CO2	Relate and apply the concept of probability and random variables and predict probabilities of events in models following normal distribution.	K3	1
CO3	Analyse the situation and select an appropriate queuing model techniques for solving problems based on Little's formula.	K4	4
CO4	Compute correlation between variables, and predict unknown values using regression.	K3	2
CO5	Choose the appropriate methods in a queue discipline to develop a relationship between the queue length and service time distribution Laplace transforms for M/G/1 queue.	K5	5

PRE-REQUISITE	ENGINEERING MATHEMATICS I & ENGINEERING MATHEMATICS II

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO
CO	3	3		3				1	3	3		3		
CO	3	3		3				1	3	3		3		
CO	3	3		3				1	3	3		3		
CO	3	3		3				1	3	3		3		
CO	3	3		3				1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments and Tutorials
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**PROBABILITY AND RANDOM VARIABLES**	**9+3**
Basic concepts of probability – Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Exponential and Normal distributions.		
Topic - 2	**TWO – DIMENSIONAL RANDOM VARIABLES**	**9+3**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (statement only).		
Topic - 3	**RANDOM PROCESSES**	**9+3**
Classification – Stationary process – Markov process – Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions		
Topic - 4	**QUEUEING MODELS**	**9+3**
Markovian queues – Birth and death processes – Single and multiple server queuing models – Little‘s formula		
Topic - 5	**ADVANCED QUEUEING MODELS**	**9+3**
Finite source models – M/G/1 queue – Pollaczek khinchin formula – M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Miller. S.L. and Childers. D.G., —“Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2013.
2	Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2011.
3	Oliver . C. Lbe., “Fundamentals of applied probability and random processes” Academic Press, 2007.
4	Taha, H.A., “Operations Research”, 8th Edition, Pearson India Education Services, Delhi, 2009.
5	Donald Gros, John F. Shortle, James M .Thomson, Carl M. Haris.,”Fundamentals of Queueing theory”,4th Edition, Wiley India Pvt Ltd,2013.

OTHER REFERENCES	
1	https://www.cuemath.com/learn/mathematics/probability-in-real-life/
2	https://sciencing.com/examples-of-real-life-probability-12746354.html
3	http://www.iraj.in/journal/journal_file/journal_pdf/14-358-149822091462-64.pdf
4	https://www.cuemath.com/learn/mathematics/probability-in-real-life/
5	https://sciencing.com/examples-of-real-life-probability-12746354.html

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. / B.Tech., CSE / IT	20CS3T2	DATA STRUCTURES & ALGORITHMS	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand the concept of Analysis of Algorithms and analyze various searching algorithms.	K2	1
CO2	Apply the different linear data structures like stack and queue to various computing problems	K3	2
CO3	Understand the uses of various linked list and analyse their performance.	K2	3
CO4	Examine the performance of various trees and analyse their complexities.	K4	4
CO5	List graph structure and understand various operations on graphs and their applicability	K4	5

PRE-REQUISITE	FUNDAMENTALS OF COMPUTING AND PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3						1	3	3		3		2
CO2	2	2						1	3	3	2	2		2
CO3	3	3		3				1	3	3		3	2	
CO4	2	3		3				1	3	3		3		
CO5	2							1	3	3	3	3	3	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments and Tutorials
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**9+3**

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time- Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Topic - 2	**STACKS AND QUEUES**	**9+3**

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Topic - 3	**LINKED LIST**	**9+3**

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis

Topic - 4	**TREES**	**9+3**

Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with Complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Topic - 5	**GRAPHS**	**9+3**

Definitions, Topological Sort, Shortest–path Algorithm, Unweighted Shortest paths ,Dijkstra's Algorithm Minimum Spanning Tree, Prim's Algorithm, Kruskal Algorithm, Application of Depth – First Search, Undirected graphs, Bio connectivity.

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	"Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
2	M.A.Weiss, "Data Structures and Algorithm Analysis in C++", FourthEdition, Pearson Education Asia, 2013.4. Deshpande M. V., "Electrical Machines", Prentice Hall India, New Delhi, 2011.
3	"How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.
4	"Data Structures and algorithms in C++"Michael T. Goodrich, Roberto Tamassia, David M.Mount, 2nd edition, Wiley India 2011.

OTHER REFERENCES	
1	https://youtu.be/BBpAmxU_NQo
2	https://www.tutorialspoint.com/stack-adt-in-data-structures
3	http://www.btechsmartclass.com/data_structures/stack-adt.html
4	https://youtu.be/TXkDpqjDMHA
5	https://www.bio-connect.nl/

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. / B.Tech., CSE / IT	20EC3T3	DIGITAL PRINCIPLES AND SYSTEM DESIGN	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate and understand the basic concepts of digital systems	K3	1
CO2	Apply and verify the Boolean expression for combinational circuits.	K3	2
CO3	Apply and verify the Boolean expression for sequential circuits	K3	3
CO4	Design and verify the asynchronous sequential circuits.	K6	4
CO5	Describe various programmable logic devices.	K2	5

PRE-REQUISITE	BASICS OF ELECTRONICS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2		2	2		2	2	3	3		3		
CO 2	3		2				2	2	3	3		3		
CO 3	3	2			2		2	2	3	3		3	2	
CO 4	3	2				2	2	2	3	3		3		
CO 5	3	2	2	2			2	2	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**BASIC CONCEPTS OF DIGITAL SYSTEMS**	**9**
Review of Number systems, Number Representation, Binary Arithmetic and Logic gates, Boolean algebra, Boolean postulates and laws - De-Morgan's Theorem - Principle of Duality, Simplification using Boolean algebra, Canonical forms - Sum of product and Product of sum - Minimization using Karnaugh map and Tabulation method.		
Topic - 2	**COMBINATIONAL CIRCUITS**	**9**
Realization of combinational logic using gates , Design of combinational circuits : Adder , Subtractor, Parallel adder / Subtractor, Carry look ahead adder, Magnitude Comparator, Parity generator and checker, Encoder, Decoder, Multiplexer, Demultiplexer - Function realization using Multiplexer, Decoder – Code Converters.		
Topic - 3	**SYNCHRONOUS SEQUENTIAL CIRCUITS**	**9**
Flip-flops - SR, JK, D and T- Master-Slave – Triggering - Analysis of clocked sequential circuits – State reduction and assignment - Excitation table – Design procedure - Shift registers - Universal shift registers –Ripple counters - Synchronous counters – Ring counter – Johnson Counter.		
Topic - 4	**ASYNCHRONOUS SEQUENTIAL CIRCUITS**	**9**
Algorithmic State Machines (ASM) - Asynchronous sequential logic - Analysis procedure – Circuits with latches – Design procedure – Reduction of State and Flow tables – Race free state assignments – Hazards.		
Topic - 5	**LOGIC FAMILIES AND PROGRAMMABLE DEVICES**	**9**
Introduction to Logic families – ECL, TTL &CMOS - Programmable Logic Devices – Programmable Logic Array(PLA) - Programmable Array Logic (PAL) – Implementation of combinational logic circuits using PLA, PAL.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 4th Edition, 2016.
2	Donald D.Givone, "Digital Principles and Design", Tata Mc-Graw Hill Publishing company limited, New Delhi, 2003.
3	Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education, NewDelhi, 2009.
4	Leach D, Malvino A P &Saha, "Digital Principles and Applications" 8th Edition, Tata McGraw Hill Publishing Company, 2014.
5	John.M Yarbrough, "Digital Logic Applications and Design", Thomson – Vikas Publishing House, New Delhi, 2002.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=aWp8ILQgudI
2	https://www.youtube.com/watch?v=_yHo2qq82P0
3	https://www.youtube.com/watch?v=Mt3AToASuFo
4	https://www.youtube.com/watch?v=L80k-alK58g
5	https://www.youtube.com/watch?v=jrQ1YYgiOTo

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. / B.Tech., Common to CSE/IT	20CS3T4	COMPUTER ARCHITECTURE	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify the different addressing modes used in a processor.	K3	1
CO2	Illustrate the arithmetic operations.	K2	2
CO3	Classify the control units present in a processor.	K2	3
CO4	Analyze the various performance enhancement techniques of Cache memories.	K4	4
CO5	Classify the hazards and input/output accessing.	K2	5

PRE-REQUISITE	FUNDAMENTALS OF COMPUTING PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2					2	2	3	3		3		
CO2	3		2				2	2	3	3		3	2	
CO3	3						2	2	3	3		3		
CO4	3	3					2	2	3	3		3		
CO5		3	2				2	2	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**BASIC STRUCTUTRE OF COMPUTERS**	**9**
Functional Units - Basic Operational Concepts - Bus Structures - Performance - Memory Locations and Addresses - Memory Operations - Instruction and Instruction Sequencing – Addressing Modes - Basic I/O Operations.		
Topic - 2	**ARITHMETIC UNIT**	**9**
Addition and Subtraction of Signed Numbers - Design of Fast Adders - Multiplication of Positive Numbers - Signed Operand Multiplication - Fast Multiplication - Integer Division - Floating Point Numbers and Operations.		
Topic - 3	**BASIC PROCESSING UNIT**	**9**
Fundamental Concepts - Execution of a Complete Instruction - Multiple Bus Organization - Hardwired Control – Micro programmed Control – Microinstructions- Microprogram Sequencing- Wide Branch Addressing		
Topic - 4	**MEMORY SYSTEM**	**9**
Basic Concepts - Speed, Size and Cost - Cache Memories - Performance Considerations - Virtual Memories - memory management requirements		
Topic - 5	**PIPELINING AND I/O ORGANIZATION**	**9**
Basic Concepts - Data Hazards - Instruction Hazards – Influence on instruction sets - Data path and control considerations - Superscalar operation – Accessing I/O devices- Interrupts – Enabling and disabling interrupts- Handling multiple devices - Direct Memory Access. Case study - ARM interrupt structure		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization”, 5th Edition, McGraw-Hill,2014.
2	John P.Hayes, “Computer Architecture and Organization”, 3rd Edition, McGraw Hill, 2010.
3	David A.Patterson and John L.Hennessy, “Computer Organization and Design: The hardware software interface”, 5th Edition, Morgan Kaufmann, 2014.
4	“Computer Architecture : A Quantitative Approach “ John L. Hennessy, David A. Patterson Morgan Kaufmann Publishers, 2013

OTHER REFERENCES	
1	https://onlinecourses.nptel.ac.in/noc18_cs29
2	www.coursera.org

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E.CSE, B.Tech. IT & AIDS	20CS3T5	OBJECT ORIENTED PROGRAMMING WITH JAVA	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Analyze a problem and identify classes, objects and the relationships among them	K3	1
CO2	Develop applications using various types of Inheritance and Interfaces	K3	2
CO3	Develop applications or programs using exception handling and multithreading.	K3	3
CO4	Analyze an application and make use of object oriented concepts for its implementation	K4	4
CO5	Develop programs using collections, files and streams in java	K3	5

PRE-REQUISITE	PYTHON PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3	2	3	3	3	3	3	2	2
CO2			2			3	2	3	3	3	3	3		3
CO3		2				3	2	3	3	3	3	3		
CO4	3	3			2	3	2	3	3	3	3	3	2	2
CO5			2			3	2	3	3	3	3	3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Mini Project
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO OBJECT ORIENTED PROGRAMMING AND JAVA**	**9**
Introduction to OOP– Java Fundamentals - Data Types, Variables, and Arrays Operators - Control Statements – Classes – Methods –Constructors- Garbage Collection.		
Topic - 2	**INHERITANCE AND EXCEPTION HANDLING**	**9**
Inheritance – Packages and Interfaces - Exception Handling Fundamentals – Java's Built - in Exceptions -Creating new Exception subclasses.		
Topic - 3	**POLYMORPHISM AND MULTITHREADING IN JAVA**	**9**
Polymorphism- Abstract classes and methods-Overloading-Overriding-final methods and classes – Multithreaded programming –The Thread class and the Runnable Interface- Creating multiple threads-Synchronization-Auto boxing and Annotations (Metadata).		
Topic - 4	**STRING HANDLING AND COLLECTION FRAMEWORK**	**9**
String Constructors-String Operations-Generic classes and methods-The Collection Framework-Collections-List-Array List, Linked List, Set-HashzSet, Linked HashSet, Queue-Priority Queue, Map-Hash Map, Sorted Map, Tree Map.		
Topic - 5	**FILES AND STREAMS IN JAVA**	**9**
Files and streams – Byte Stream-I/O Stream, File I/O Stream, Byte Array I/O Stream - Character Stream - File Reader and Writer, Char Array Reader and Writer - Serialization.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	HerbertSchildt, "Java the Complete Reference", Ninth edition Tata McGrawHills, 2014.
2	Paul Deitel and Harvey Deitel, —"Java How to Program (Early Objects)", TenthEdition, Pearson Prentice Hall2014.
3	Timothy Budd, —"An Introduction to Object-Oriented Programming", ThirdEdition, Pearson Education,2008.
4	E.Balaguruswamy,"Programming with Java", Sixth Edition, TMH,2019.
5	Dr.G.TThambi, "Object-Oriented Programming with java", First Edition, Kogent Learning Solutins, 2009.

OTHER REFERENCES	
1	https://www.w3schools.com
2	https://www.javatpoint.com/java-oops-concepts
3	https://www.youtube.com/watch?v=l-yoxklZwfM
4	https://www.youtube.com/playlist?list=PL9ooVrP1hQOHb4bxoHauWVwNg4FweDItZ
5	https://www.geeksforgeeks.org/object-oriented-programming-oops-concept-in-java/

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. / B.Tech., Common to CSE / IT	20CS3L1	DATA STRUCTURES LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		**RBT Level**
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Data Structures Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	PYTHON PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Implementing sorting algorithms – selection sort, insertion sort, quick sort
2	Implementing Set operations using Linked List
3	Implementing stack using array and Linked List
4	Implementing stack applications (Balancing Parenthesis, Infix to post fix conversion)
5	Implementing queue applications (Job scheduling- FIFO, Round Robin)
6	Implementing priority queue
7	Implementing Binary Search trees
8	Implementing AVL trees
9	Implementing BFS and DFS algorithms

THEORY	0		TUTORIAL	0		PRACTICAL	45		TOTAL	45

BOOK REFERENCES	
1	Data Structures Laboratory- I Manual, Al-Ameen Publications, 2020
2.	"Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
3.	M.A.Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education Asia,2013.4. Deshpande M. V., "Electrical Machines", Prentice Hall India, New Delhi, 2011.
4.	"How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.
5.	"Data Structures and algorithms in C++"Michael T. Goodrich, Roberto Tamassia, David M.Mount, 2nd edition , Wiley India 2011.

OTHER REFERENCES	
1	http://enggedu.com/data_structure_lab_exercise_programs/index.php
2	https://www.slideshare.net/ayeshasaifbhatti/ds-lab-handouts
3	https://mrcet.com/pdf/Lab%20Manuals/CSE/DATA%20STRUCTURES%20LAB.pdf

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E.CSE, B.Tech. IT & AIDS	20CS3L2	OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Object Oriented Programming With Java Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	C PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Write a program to find the factorial of a given number.
2	Write a program to print numbers in sorting order.
3	Create a class Odometer that displays the number of kilometers a vehicle run. Give samples as trip information like number of kilometers travelled, fuel consumption per litre. The task is to find the mileage of the vehicle running at different samples of trip information.
4	Create a class Day that represents day, month and year of the calendar day. The class Day should be able to accept the date, update the date, delete the date from a calendar list of activities. Create a class Time that represents hours, minutes, seconds of a clock. The class Time should accept the time, update the time, delete the time from a list of events created for a day using the Day Class.
5	Write a program on illustration of use of packages
6	Write a program to implement interfaces.
7	Write a program that implements a stack ADT that converts infix expression into postfix expression.
8	Write a program to read a file and displays the file on the screen within line number before each line.
9	Write a program to copy contents of a file into another file using File streams.
10	Write a program for handling Array Index Out of Bounds Exception and Divide-by- zero Exception.
11	Write a program for custom exception creation.
12	Write a program on multi-threading showing how CPU time is shared among all the threads.
13	Write a program for Producer-Consumer problem using threads.
14	Write an applet to handle the mouse events and keyboard events.
15	Write a program to develop a simple calculator. Using Grid layout arrange buttons for the digits and +,-,* % operations. The computation should be performed with a button click “Compute”. Display the result on a text field.

THEORY	0		TUTORIAL	0		PRACTICAL	45		TOTAL	45

BOOK REFERENCES	
1	Object Oriented Programming with Java Laboratory Manual,Al-AmeenPublications,2020
2.	Herbert Schildt, “Java the Complete Reference”, Ninth edition Tata McGraw Hills, 2014.
3.	Paul Deitel and Harvey Deitel, —”Java How to Program (Early Objects)”, Tenth Edition, Pearson Prentice Hall2014.
4.	Timothy Budd, —”An Introduction to Object-Oriented Programming”, Third Edition, Pearson Education, 2008.
5.	E.Balaguruswamy, “Programming with Java”, Sixth Edition, TMH,2019.

OTHER REFERENCES	
1	https://www.w3resource.com/java-exercises/
2	https://www.csie.ntu.edu.tw/~d00922011/java/320/java.html

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. / B.Tech., Common to CSE & IT	20EC3L3	DIGITAL SYSTEMS LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Digital Systems Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	BASICS OF ELECTRONICS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Verification of Boolean Theorems using basic gates.
2	Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters.
3	Design and implement Half/Full Adder and Subtractor.
4	Design and implement combinational circuits using MSI devices:
5	Bit binary adder / subtractor
6	Parity generator /checker
7	Magnitude Comparator
8	Application using multiplexers
9	Design and implement shift-registers.
10	Design and implement synchronous counters.
11	Design and implement a synchronous counters.
12	Coding combinational circuits using HDL.
13	Coding sequential circuits using HDL.
14	Design and implementation of a simple digital system (Mini Project).

THEORY	0		TUTORIAL	0		PRACTICAL	45		TOTAL	45

BOOK REFERENCES	
1	"Digital Systems Laboratory Manual",Al-AmeenPublications,2020
2	M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 4th Edition, 2016.
3	Donald D.Givone, "Digital Principles and Design", Tata Mc-Graw Hill Publishing company limited, New Delhi, 2003.
4	Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education, New Delhi, 2009.
5	Leach D, Malvino A P &Saha, "Digital Principles and Applications" 8th Edition, Tata McGraw Hill Publishing Company, 2014.
6	John.M Yarbrough, "Digital Logic Applications and Design", Thomson – Vikas Publishing House, New Delhi, 2002.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=bn2nNsuMZGk
2	https://www.youtube.com/watch?v=lwt5mXyZoY8&list=PLe_7x5eaUqtVgVnAccC-emHekNNzVbHq_
3	https://www.youtube.com/watch?v=fPxxv7qahY4
4	https://www.youtube.com/watch?v=xAE1qUg0X98
5	https://www.youtube.com/watch?v=72hVxURaQVY

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. / B.Tech. CSE/IT	20MCCT1	CONSTITUTION OF INDIA	3	0	0	0

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand and abide the rules of the Indian constitution.	K2	1
CO2	Understand the functions of Central government.	K2	2
CO3	Understand the function of state government.	K2	3
CO4	Understand the various constitutional functions and laws.	K2	4
CO5	Understand the different culture among the people of India	K2	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1						2	2	2	3	3		3		1
CO 2						1	2	2	3	3		3		1
CO 3						1	2	2	3	3		3		1
CO 4						1	2	2	3	3		3		1
CO 5						1	2	2	3	3		3		1

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**9**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Role of the Election Commission.

Topic - 2	**STRUCTURE AND FUNCTION OF CENTRAL AND STATE GOVERNMENT**	**9**

Union Government – Structures of the Union Government and Functions – President – Vice President– Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review. State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

Topic - 3	**CONSTITUTION FUNCTIONS OF INDIA AND INDIAN SOCIETY**	**9**

Indian Federal System – Central – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India. Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections

Topic - 4	**POLICIES AND ACTS – GENERAL**	**9**

Insurance and Bonding – Laws Governing Sale, Purchase and use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax , Excise and Custom duties and their Influence on Construction Cost – Legal Requirements for Planning – Property Law– Agency Law – Local Government Laws for Approval.

Topic - 5	**POLICIES AND ACTS ON INFRASTRUCTURE DEVELOPMENT**	**9**

A Historical Review of the Government Policies on Infrastructure – Current Public Policies on Transportations – Power and telecom Sector – Plans for Infrastructure Development – Legal framework for Regulating Private Participation in Roads and Highways – Ports and Airport and Telecom.

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi,2018.
2	R.C.Agarwal, "Indian Political System", S.Chand and Company, New Delhi, 2004
3	Maciver and Page, "Society: An Introduction Analysis", Mac Milan India Ltd., New Delhi,2007
4	K.L.Sharma, "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi,2006.

OTHER REFERENCES	
1	https://nptel.ac.in/courses/106/105/106105034/
2	https://www.youtube.com/watch?v=6XTYoZymbwE
3	https://www.youtube.com/watch?v=MP6VlAE_7WY

SEMESTER IV

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20EC4T1	Microprocessor and Microcontroller	ES	50	50	3	0	0	3
2	20CS4T2	User Interface Design	PC	50	50	3	1	0	4
3	20CS4T3	Database Management Systems	PC	50	50	3	0	0	3
4	20CS4T4	Operating Systems	PC	50	50	3	1	0	4
5	20__OE_	Open Elective - I	OE	50	50	3	0	0	3
LABORATORY COURSES									
6	20ENCL1	Communication Skills Laboratory	HS	50	50	0	0	2	1
7	20CS4L2	Database Management Systems Laboratory	PC	50	50	0	0	3	1.5
8	20CS4L3	Operating Systems Laboratory	PC	50	50	0	0	3	1.5
MANDATORY COURSE									
9	20HS4T1	Universal Human Values 2: Understanding Harmony	HS	100	-	2	1	0	3
Total						**17**	**3**	**8**	**24**

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. / B.Tech., Common to CSE/IT	20EC4T1	MICROPROCESSOR AND MICROCONTROLLER	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Describe the basic concept of 8085 microprocessor architecture and instruction sets of 8085	K2	1
CO2	Describe the basic concept of 8086 microprocessor and minimum/maximum modes of 8086	K2	2
CO3	Examine the different Peripherals Interfaced with the 8085 processor	K3	3
CO4	Describe the basic concept of architecture of 8051 microcontroller	K2	4
CO5	Demonstrate the various interfacing of 8051 interfacing	K3	5

PRE-REQUISITE	DIGITAL PRINCIPLES AND SYSTEM DESIGN

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			2				1	3	3		3	2	
CO2	3			2				1	3	3		3	2	
CO3		2	3	2				1	3	3	2	3	2	
CO4	3		3	3				1	3	3		3	2	
CO5		2	3	3	2	2	2	1	3	3	2	3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**8 BIT MICROPROCESSOR**	**9**
8085 architecture- Timing diagrams – ROM/ RAM Interfacing – Decoding of memory addresses Interrupts – Vector interrupts – ISS - instruction set- Programming with 8085.		
Topic - 2	**16 BIT MICROPROCESSOR**	**9**
Architecture of 8086 – 8086 in MIN/ MAX mode – Addressing modes- Instruction set - Programming with 8086.		
Topic - 3	**PERIPHERALS AND INTERFACING WITH 8085**	**9**
Serial and parallel I/O (8251 and 8255) – Programmable DMA controller (8257) Programmable interrupt controller (8259) – Keyboard and Display controller (8279) - Timer (8253) - ADC/ DAC interfacing.		
Topic - 4	**MICROCONTROLLER**	**9**
INTEL 8051 Architecture – 8051 Microcontroller hardware-Ports and Circuits-External memory Counter and timers – Serial data I/O – Interrupts – Instruction set - Programming examples - Applications of 8051.		
Topic - 5	**MICROPROCESSOR BASED APPLICATIONS**	**9**
Temperature controller - Stepper motor control – Traffic light control– Robotics and Embedded Control- Washing machine Control - Mining Problem - Turbine motor.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Ramesh S.Gaonkar, " Microprocessor - Architecture, Programming and Applications with the 8085 ",Prentice Hall, fifth edition,2002.
2	Krishna Kant , "Microprocessors and Microcontrollers ", PHI ,2014.
3	Douglas V.Hall, "Microprocessors and Interfacing: Programming and Hardware ", Tata McGraw Hill, second edition,2010.
4	Barrey B.Brey, "The INTEL Microprocessor 8086/8088, 80186,286,386,486, Pentium and Pentium Pro processor – Architecture, Programming and Interfacing ", Pearson Education Asia ,Eigth edition,2009.
5	Myke Predko" Programming and Customizing the 8051 Microcontroller ", Tata McGraw- Hill Edition ,1999.

OTHER REFERENCES	
1	https://youtu.be/1m-jgtGetl4
2	https://youtu.be/QP-4FlwNTvw
3	https://youtu.be/5fESTph5gA8
4	https://youtu.be/mZItfJIEFMk
5	https://youtu.be/t3thKRqMK2M

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E./B.TECH CSE/IT	20CS4T2	USER INTERFACE DESIGN	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Explain the characteristics of graphical and web user interface in designing a user interface for an application	K2	1
CO2	Develop an effective user interface considering human characteristics, interaction speeds and business functions in relevance to design standards and guidelines	K3	2
CO3	Develop system menus, navigation schemes, windows, buttons, text boxes, selection controls and presentation controls for a user interface.	K3	3
CO4	Demonstrate the use of multimedia system components in creating text, graphics, icons, images and video for web pages.	K2	4
CO5	Develop test cases and evaluate the working system of windows layout for a mobile user interface.	K3	5

PRE-REQUISITE	OBJECT ORIENTED PROGRAMMING WITH JAVA

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	3	2	2	2	3	3	2	3	3	3
CO2	3	3	2	-	2	-	2	2	3	3	2	3	-	2
CO3	3	-	3	-	3	-	2	2	3	3	-	3	-	2
CO4	3	3		-	-	-	2	2	3	3	-	3	-	2
CO5	3	2	2	-	-	-	2	2	3	3	-	3	-	3

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar and Tutorials
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO USER INTERFACE**	**9+3**
Defining the User Interface – Importance and Benefits of Good Design - Graphical User Interface – Direct Manipulation - Characteristics of Graphical User Interface- Characteristics of Web User Interface Principles of User Interface Design.		
Topic - 2	**HUMAN COMPUTER INTERACTION**	**9+3**
Human Characteristics in Design-Human Considerations in Design-Human Interaction Speeds. Business Functions: Business Definition and Requirement Analysis-Determining Basic Business Functions-Design Standards or Style Guides		
Topic - 3	**MENUS AND WINDOWS**	**9+3**
Menus: Structures and Functions-Content, Formatting, Phrasing the menu, Selection and Navigation of menus-Graphical Menus. Windows: Characteristics- Components-Presentation Styles- Types Organizations – Web Systems-Characteristics of Device-Based-Controls - Screen based controls: Buttons Text Boxes-Selection Controls-Presentation Controls. Case Study: Improper and proper presentation of Command buttons, Menu bars and pull-down.		
Topic - 4	**MULTIMEDIA**	**9+3**
Text for web pages- Effective Feedback– Guidance and Assistance– Internationalization– Accessibility-Icons and Multimedia-Choosing colors for textual and statistical graphics screens-Choosing colors for web pages. Case Study: Voice UI.		
Topic - 5	**WINDOWS LAYOUT– TEST**	**9+3**
Organizing and Laying out Screens-Prototypes – Kinds of Tests-Developing and Conducting a Test Analyze, Modify and Retest-Evaluate the Working System. Case Study: Mobile UI.		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Wilbert O. Galitz , “The Essential Guide to User Interface Design - An Introduction to GUI Design Principles and Techniques”, Second Edition, John Wiley & Sons, Inc.,2018.
2	Soren Lauesen, “User Interface Design: A Software Engineering Perspective”, Pearson/AddisonWesley, 2005.
3	Alan Cooper, “The Essential Of User Interface Design”, Wiley – Dream Tech Ltd.,2002
4	Avram Joel Spolsky, “User Interface Design for Programmers”, Apress, 2001

OTHER REFERENCES	
1	https://en.wikipedia.org/wiki/User_interface_design
2	https://www.tutorialspoint.com/software_engineering/software_user_interface_design.htm

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E./B.TECH CSE/IT	20CS4T3	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		**RBT Level**	**Topics Covered**
CO1	Compare File Processing System with Database Systems in terms of performance, scalability and data storage for efficient access of data.	K4	1
CO2	Develop a Database schema using E-R model, Relational model and apply relational algebra operations like selection, projection, join and Cartesian product to solve the given problem.	K3	2
CO3	Develop SQL queries using aggregate functions, nested sub queries, joins and views for the given problem.	K3	3
CO4	Apply Suitable normalization and query optimization techniques to normalize the given relation and to optimize the query for efficient access of data.	K3	4
CO5	Simplify serialization and concurrency control mechanisms to avoid deadlock problem in transaction processing.	K4	5

PRE-REQUISITE	DATA STRUCTURE AND ALGORITHMS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-		3	2	3	3	3	3	3		2
CO2	3	3	2	2		3	2	3	3	3	3	3		2
CO3	3	2	3	2		3	2	3	3	3	3	3	2	
CO4	3	3	2	2		3	2	3	3	3	3	3		
CO5	3	2				3	2	3	3	3	3	3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Mini project
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**DATABASE SYSTEM**	**9**
Overview of File Processing System – Purpose of Database System – view of data – Data Models-Database Languages – Database System Architecture – Database users and Administrator.		
Topic - 2	**DATA BASE DESIGN**	**9**
Database design & E-R Model: Entity-Relationship model (E-R Model)-E-R Diagram-Constraints-Extended E-R features. Introduction to Relational Model: Database schema-Keys-Schema Diagrams-Relational Query Languages –Relational Operations.		
Topic - 3	**SQL**	**9**
SQL Standards-Data types- Structure of SQL queries-Additional basic operations –set operation-null values-aggregate function- nested sub queries-modification of the database. Intermediate SQL: Joins-Views -Transactions-Integrity constraints-Authorization-Advanced SQL		
Topic - 4	**NORMALIZATION AND QUERY OPTIMIZATION**	**9**
Relational database design: Functional Dependencies - Normalization and its normal forms-Denormalization -Data Storage : RAID - Tertiary Storage - File organization - Organization of records in files. Query processing-Query optimization.		
Topic - 5	**TRANSACTION MANAGEMENT**	**9**
Transaction concepts - Transaction recovery - Properties of Transaction-Serializability - Concurrency Control - Locking Mechanisms - Two Phase Commit Protocol - Dead lock .Case study: Database connectivity using SQL.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Abraham silberschatz,Henry F.Korth,S.Sundharshan,"Database system concepts",sixthedition,Tata McGraw hill,2011
2	C.J.Date,A.Kannan,S.Swamynathan, "An Introduction to Database System",EighthEdition,pearson Education,2006
3	RamezElmasri and Shamkant B.Navathe, "Fundamentals of Database Systems", Fourth Edition, Pearson Addisionwesley, 2007
4	Atul Kahate,"Introdution to database Management system", Pearson Education, New Delhi,2006

OTHER REFERENCES	
1	https://onlinecourses.nptel.ac.in/noc17_cs33/course
2	http://www.db-book.com
3	http://nptel.ac.in/courses/IIT-MADRAS/Intro_to_Database_Systems_Design
4	http://www.iitg.ernet.in/awekar/teaching/cs344fall11/
5	www.w3schools.com/sql/

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. / B.Tech., CSE/IT	20CS4T4	OPERATING SYSYEMS	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Apply the concepts of CPU scheduling and Process synchronization.	K3	1
CO2	Experiment with creation of different virtual machines in a hypervisor	K3	2
CO3	Simplify the principles of memory management	K4	3
CO4	Identify appropriate file system and disk organizations for a variety of computing scenario	K3	4
CO5	Examine the features of various open source operating systems.	K4	5

PRE-REQUISITE	OBJECT ORIENTED PROGRAMMING WITH JAVA

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2						1	3	3		3	2	
CO2		3			3			1	3	3		3		
CO3	3				2			1	3	3		3		2
CO4	3	3						1	3	3		3		
CO5	3	3						1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments and Tutorials
	3	Group Presentation & Cooperative Learning Report
	4	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION AND PROCESS CONCEPT**	**9+3**

Operating System Structure – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – System Structures: Operating System Services – User and Operating System Interface – System Calls – Types of System Calls System Programs. Process Scheduling – Operations on Processes – Inter-process Communication.
Case Study: Kernel data structures for various open source operating systems.

Topic - 2	**MULTITHREADED PROGRAMMING AND PROCESS SCHEDULING**	**9+3**

Overview of threads – Multi core programming-Multithreading Models – Threading Issues Basic Concepts of process scheduling – Scheduling Criteria – Scheduling Algorithms – Multiple- Processor Scheduling – Synchronization – The Critical-Section Problem – Peterson's Solution Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors.
Case Study: Linux Scheduling

Topic - 3	**DEADLOCK AND MEMORY MANAGEMENT STRATEGIES**	**9+3**

System Model – Deadlock Characterization – Methods for Handling Deadlock – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock. Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table- Segmentation

Topic - 4	**VIRTUAL MEMORY MANAGEMENT AND FILE SYSTEM**	**9+3**

Demand Paging – Copy on Write – Page Replacement – Allocation of Frames – Thrashing File Concept – Access Methods – Directory Structure – File Sharing –Protection

Topic - 5	**IMPLEMENTING FILE SYSTEMS AND SECONDARY STORAGE STRUCTURE**	**9+3**

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management. Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management. Case Study: Linux File system

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Abraham Silberschatz, Peter Baer Galvinand Greg Gagne, " Operating System Concepts", John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition,2016.
2	Andrew S. Tanenbaum, "Modern Operating Systems", Third Edition Prentice Hall of IndiaPvt. Ltd,2010.
3	Harvey M. Deitel, "Operating Systems", Pearson Education Pvt. Ltd, Second Edition, 2002.
4	William Stallings, "Operating System", Pearson Education, Sixth Edition,2012.

OTHER REFERENCES	
1	https://nptel.ac.in/courses
2	https://www.w3schools.in › intro
3	https://www.smartzworld.com/notes/operating system
4	https://www.ncertbooks.guru/operating-system-pdf/
5	https://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdf

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. / B.Tech., Common to CSE & IT	20CS3L2	COMMUNICATION SKILLS LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Communication Skills Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Laboratory Practice Sessions
2	Conversation Practice Sessions (To be done as real life interactions)
3	Group Discussion Sessions
4	Interview Sessions
5	Presentation

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**45**		**TOTAL**	**45**

BOOK REFERENCES	
1	Baul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005.
2.	Arthur Brookes and Peter Grundy, 'Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003.
3.	George, Livingston. 'Using Communication Skills Lab in Enhancing Speaking Skills of Engineering Students' 2018.
4.	NiraKonar: English Language Laboratory: A Comprehensive Manual, PHI Learning, 2011.
5.	Pandey, Dr.Meenu. 'A Practical Book of Communication Skills', NIRALI Prakashan advancement of knowledge, second edition 2018.

OTHER REFERENCES	
1	Khan Academy Videos on English Speaking and Writing
2	https://learningenglish.britishcouncil.org/en/listening
3	Adrian Duff et.al. (ed.): Cambridge Skills for Fluency
4	Mark Hancock: English Pronunciation in Use
5	Audio Cassettes/CD'S OUP 2004

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. / B.Tech., Common to CSE/IT	20CS4L2	DATABASE MANAGEMENT SYSTEMS LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Database Management Systems Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	DATA STRUCTURES LABORATORY

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Working basic SQL commands (DDL and DML).
2	Demonstrate Transaction control commands and aggregate functions .
3	Implementing Join operation and Nested Queries.
4	Implementing SQL queries on Integrity constraints and Views.
5	Design a database using first and second normal form.
6	Apply the concepts of High level programming language extensions (Control structures and Exceptions).
7	Create Cursors and Triggers.
8	Demonstrate Procedures and Function in PL/SQL block.
9	Database Design and implementation with any one front end tool (Mini Project).
	Sample list of Projects:
1	Airline Reservation systems.
2	Food Ordering System.
3	Accident Management System.
4	Grade Report System.
5	Smart Health Consulting system etc.

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**45**		**TOTAL**	**45**

BOOK REFERENCES	
1	Database Management Systems Laboratory Manual, Al-Ameen Publications, 2020.
2.	Abraham Silberschatz, Henry Korth, and S. Sudarshan, “Database System Concepts”, Sixth Edition, McGraw-Hill.2016.
3.	R. Elmasri and S. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education, 2011.
4.	Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3nd Edition, McGraw Hill, 2003.
5.	Thomas M. Connolly and Carolyn E. Begg, “Database Systems - A Practical Approach to Design, Implementation and Management”, Fifth edition, Pearson Education, 2010.

OTHER REFERENCES	
1	www.w3schools.com
2	www.w3resource.com
3	https://www.scribd.com/document/474661494/CA-01-DBMS-LAB-Reference-manual
4	https://dbmslabnmit.wordpress.com/

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. / B.Tech., CSE/IT	20CS4L3	OPERATING SYSTEMS LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		**RBT Level**
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Operating Systems Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	OBJECT ORIENTED PROGRAMMING WITH JAVA LAB

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Implementation of process scheduling
2	Illustrated of inter process communication strategies
3	Implementation of mutual exclusion by semaphores
4	Deadlock prevention &avoidance algorithms
5	Virtual memory: paging and segmentation
6	Implementation of page replacement algorithms
7	Implementation of disk scheduling algorithms
8	Implementation of file structures

THEORY	0		TUTORIAL	0		PRACTICAL	45		TOTAL	45

BOOK REFERENCES	
1	Operating systems Laboratory,Al-Ameen Publications 2020
2.	Abraham Silberschatz, PeterBaer Galvinand Greg Gagne, “Operating System Concepts”, John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition,2016.
3.	Andrew S. Tanenbaum, “Modern Operating Systems”, Third Edition Prentice Hall of India Pvt. Ltd,2010.
4.	Harvey M. Deitel, “Operating Systems”, Pearson Education Pvt. Ltd, Second Edition, 2002.

OTHER REFERENCES	
1	https://studentsfocus.com/os-lab-manual-operating-systems-laboratory
2	https://codex.cs.yale.edu/avi/os-book/OS9/practice-exer-dir/index.html
3	https://usermanual.wiki/Pdf/OS20Lab20Manual202017modified.1843321062/
4	https://www.sourcecodesolutions.in/2010/09/cs1254-operating-system-lab.html
5	https://sites.google.com/site/uopops/pm

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. / B.Tech., Common to all	20HSCT1	UNIVERSAL HUMAN VALUES 2 :UNDERSTANDING HARMONY	2	1	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand and aware of themselves, and their surroundings (family, society, nature)	K2	1
CO2	Build more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind	K3	2
CO3	Relate the critical ability and sensitive to their commitment towards what they have understood (human values, human relationship and human society).	K2	3
CO4	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	K3	4
CO5	Appraise local, regional and a national culture in harmony with others	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3					2	2	3	3		3		
CO2		3					2	2	3	3		3		
CO3							2	2	3	3		3		
CO4		2				2	2	2	3	3		3		
CO5							2	2	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**	**6+3**
1. Purpose and motivation for the course, recapitulation from Universal Human Values-I 2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario 6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.		
Topic - 2	**Understanding Harmony in the Human Being - Harmony in Myself!**	**6+3**
7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body' 8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility 9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) 10. Understanding the characteristics and activities of 'I' and harmony in 'I' 11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail 12. Programs to ensure Sanyam and Health.		
Topic - 3	**Understanding Harmony in the Family and Society- Harmony in Human Relationship**	**6+3**
13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship 14. Understanding the meaning of Trust; Difference between intention and competence 15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship 16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals 17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.		
Topic - 4	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**	**6+3**
18. Understanding the harmony in the Nature 19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self regulation in nature 20. Understanding Existence as Co-existence of mutually interacting units in all pervasive space 21. Holistic perception of harmony at all levels of existence.		

Topic - 5	Implications of the above Holistic Understanding of Harmony on Professional Ethics	6+3

22. Natural acceptance of human values

23. Definitiveness of Ethical Human Conduct

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up

THEORY	30		TUTORIAL	15		PRACTICAL	0		TOTAL	45

BOOK REFERENCES	
1	Jeevan Vidya: E.K. Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004
3	The Story of Stuff (Book)by Annie Leonard , 2011
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher.
6	Slow is Beautiful - Cecile Andrews
7	Economy of Permanence - J C Kumarappa
3	India Wins Freedom - Maulana Abdul Kalam Azad
4	Vivekananda - Romain Rolland (English)
4	Gandhi - Romain Rolland (English)

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=XGxNCFjDGEg
2	https://www.c-span.org/video/?292709-1/the-story-stuff

SEMESTER V

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1		Professional Elective - I	PE	50	50	3	0	0	3
2		Open Elective – II	OE	50	50	3	0	0	3
3	20HSCT2	Professional Ethics	HS	50	50	3	0	0	3
THEORY COURSE WITH LABORATORY COMPONENTS									
4	20CSCLT1	Data Communication and Networks	PC	50	50	2	0	4	4
5	20CS5LT2	Internet of Things	PC	50	50	2	0	4	4
6	20IT5LT3	Internet Programming	PC	50	50	2	0	4	4
EMPLOYABILITY ENHANCEMENT COURSE									
7	20PT5T1	Career Guidance - I	EEC	100	--	2	1	0	0
Total						**17**	**1**	**12**	**21**

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.Tech.IT	20ECCE1	DIGITAL IMAGE PROCESSING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Explain the fundamentals of wireless communication technology that facilitate the insight of infrastructure less networks formation, application and design issues of the given Ad hoc and Sensor networks	K2	1
CO2	Apply the MAC Protocol designing issues and contention–based algorithms with reservation and scheduling to achieve node mobility, , bandwidth efficiency and QoS support for the given Ad hoc wireless network	K3	2
CO3	Examine the issues behind the routing protocol blueprint and classification in transport layer to suit with Ad hoc Wireless Network.	K4	3
CO4	Apply the MAC layer protocols to emphasize the energy efficient operation, and assignment operations for the Wireless sensor networks	K3	4
CO5	Develop the architecture, data handling and localization techniques to optimize the location discovery of sensor nodes for the given wireless sensor networks.	K3	5

PRE-REQUISITE	COMPUTER NETWORKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2				2	2	3	3		3	3	2
CO2	3	2	3				2	2	3	3	2	3	2	2
CO3		2	2				2	2	3	3		3		
CO4	2	2	2	3			2	2	3	3		3	2	2
CO5	3	3	2			2	2	2	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
UNIT 1	**TUNING TO SENSOR NETWORKS FUNDAMENTALS**	**9**
Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the wireless channel – Mobile Ad hoc Networks (MANETs) and Wireless Sensor networks (WSNs): concepts and architectures – Applications of Ad Hoc and Sensor networks – Design Challenges in Ad hoc and Sensor Networks.		
UNIT 2	**MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS**	**9**
Issues in designing a MAC Protocol – Classification of MAC Protocols – Contention based protocols – Contention based protocols with Reservation Mechanisms – Contention based protocols with Scheduling Mechanisms – Multi channel MAC – IEEE 802.11		
UNIT- 3	**ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS**	**9**
Issues in designing a routing and Transport Layer protocol for Ad hoc networks – proactive routing, reactive routing (on – demand), hybrid routing – Classification of Transport Layer solutions – TCP over Ad hoc networks.		
UNIT-4	**WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS**	**9**
Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures – data relaying and aggregation strategies – MAC layer protocols: self – organizing, Hybrid TDMA/FDMA and CSMA based MAC – IEEE 802.15.4 – Case study: Wireless Sensor Network in Sustainable Agriculture		
UNIT- 5	**WSN ROUTING, LOCALIZATION & QOS**	**9**
Issues in WSN routing – OLSR – Localization – Indoor and Sensor Network Localization – absolute and relative localization, triangulation – QOS in WSN – Energy Efficient Design – Synchronization – Transport Layer Issues – Case study: WBAN revisited.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	C. Siva Ram Murthy, and B. S. Manoj, "Ad hoc Wireless Networks: Architectures and Protocols", Prentice Hall Professional Technical Reference,First Edition,2008.
2	Kazem Sohraby, Daniel Minoli, &TaiebZnati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.
3	Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006
4	Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication – 2002.
5	Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=qU49jUvxW00
2	https://www.geeksforgeeks.org/responsibilities-and-design-issues-of-mac-protocol/
3	https://snscourseware.org/snscenew/files/1570819850.pdf

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. CSE & ECE B.Tech. IT	20ECCE2	WIRELESS ADHOC AND SENSOR NETWORKS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Explain the fundamentals of wireless communication technology that facilitate the insight of infrastructure less networks formation, application and design issues of the given Ad hoc and Sensor networks	K2	1
CO2	Apply the MAC Protocol designing issues and contention–based algorithms with reservation and scheduling to achieve node mobility, , bandwidth efficiency and QoS support for the given Ad hoc wireless network	K3	2
CO3	Examine the issues behind the routing protocol blueprint and classification in transport layer to suit with Ad hoc Wireless Network.	K4	3
CO4	Apply the MAC layer protocols to emphasize the energy efficient operation, and assignment operations for the Wireless sensor networks	K3	4
CO5	Develop the architecture, data handling and localization techniques to optimize the location discovery of sensor nodes for the given wireless sensor networks.	K3	5

PRE-REQUISITE	COMPUTER NETWORKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2				2	2	3	3		3	3	2
CO2	3	2	3				2	2	3	3	2	3	2	2
CO3		2	2				2	2	3	3		3		
CO4	2	2	2	3			2	2	3	3		3	2	2
CO5	3	3	2			2	2	2	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
UNIT 1	**TUNING TO SENSOR NETWORKS FUNDAMENTALS**	**9**
Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the wireless channel – Mobile Ad hoc Networks (MANETs) and Wireless Sensor networks (WSNs): concepts and architectures – Applications of Ad Hoc and Sensor networks – Design Challenges in Ad hoc and Sensor Networks.		
UNIT 2	**MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS**	**9**
Issues in designing a MAC Protocol – Classification of MAC Protocols – Contention based protocols – Contention based protocols with Reservation Mechanisms – Contention based protocols with Scheduling Mechanisms – Multi channel MAC – IEEE 802.11		
UNIT- 3	**ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS**	**9**
Issues in designing a routing and Transport Layer protocol for Ad hoc networks – proactive routing, reactive routing (on – demand), hybrid routing – Classification of Transport Layer solutions – TCP over Ad hoc networks.		
UNIT-4	**WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS**	**9**
Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures – data relaying and aggregation strategies – MAC layer protocols: self – organizing, Hybrid TDMA/FDMA and CSMA based MAC – IEEE 802.15.4 – Case study: Wireless Sensor Network in Sustainable Agriculture		
UNIT- 5	**WSN ROUTING, LOCALIZATION & QOS**	**9**
Issues in WSN routing – OLSR – Localization – Indoor and Sensor Network Localization – absolute and relative localization, triangulation – QOS in WSN – Energy Efficient Design – Synchronization – Transport Layer Issues – Case study: WBAN revisited.		

THEORY	**45**	**TUTORIAL**	**0**	**PRACTICAL**	**0**	**TOTAL**	**45**

BOOK REFERENCES	
1	C. Siva Ram Murthy, and B. S. Manoj, "Ad hoc Wireless Networks: Architectures and Protocols", Prentice Hall Professional Technical Reference,First Edition,2008.
2	Kazem Sohraby, Daniel Minoli, &TaiebZnati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.
3	Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006
4	Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication – 2002.
5	Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=qU49jUvxW00
2	https://www.geeksforgeeks.org/responsibilities-and-design-issues-of-mac-protocol/
3	https://snscourseware.org/snscenew/files/1570819850.pdf

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.Tech.IT	20IT5E3	IOT ARCHITECTURE & PROTOCOL	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Apply the enabling technologies and communication models of internet of things.	K3	1
CO2	Inspect the machine-to-machine communication model and IOT reference model for end to end communication.	K4	2
CO3	Classify the IOT protocols for various layers and apply for developing real time IOT applications	K4	3
CO4	Develop applications using microcontrollers for addressing real world	K3	4
CO5	Build the applications for smart cities using Raspberry Pi.	K3	5

PRE-REQUISITE	Microprocessor and Microcontroller, Digital Principles and System Design

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					2	2	2	3	3		3	1	
CO2	2	1	3		1		2	2	3	3		3		2
CO3	3	2	2		1	1	2	2	3	3		3		
CO4	2	1	2			3	2	2	3	3		3	2	
CO5	1	2			2		2	2	3	3		3	3	2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
UNIT 1	**INTRODUCTION TO INTERNET OF THINGS**	**9**
Characteristics of IOT, Physical and Logical Design of IOT - IOT Enabling Technologies - Wireless Sensor Networks - Cloud Computing - Big Data Analytics - Communication Protocols - Embedded Systems -Functional Blocks - Communication Models and APIs - IOT Levels and Deployment Templates -Overview of Microcontroller, Basics of Sensors and Actuators - Examples and Working Principles of Sensors and Actuators.		
UNIT 2	**M2M AND IOT ARCHITECTURE**	**9**
Building Architecture - An IOT Architecture Outline - M2M and IOT Technology Fundamentals: Devices and Gateways, Local and Wide Area Networking, Data management, Everything as a Service, M2M and IOT Analytics, Knowledge Management - IOT Reference Model.		
UNIT 3	**IOT PROTOCOLS**	**9**
PHY/MAC Layer: 3GPP MTC, IEEE 802.15 – Wireless HART- Z-Wave, BLE- Zigbee - DASH7 - Network Layer: 6LoWPAN - 6TiSCH - RPL - CORPL - CARP - Transport Layer: TCP - MPTCP – UDP DCCP- Session Layer: HTTP- CoAP- XMPP- AMQP- MQTT.		
UNIT 4	**PROTOTYPING IOT OBJECTS USING MICROCONTROLLER**	**9**
Introduction - Equivalent Microcontroller Platform - Setting up the Board - Programming for IOT - Reading from Sensors, Communication: Connecting Microcontroller with Mobile devices Communication through Bluetooth, WiFi, and Ethernet.		
UNIT 5	**PROTOTYPING IOT OBJECTS USING RASPBERRY PI**	**9**
Introduction to Raspberry Pi - About the board - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Interfacing external gadgets - Controlling Output, Reading Input from Pins. IOT Physical Servers & Cloud Offerings).		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Daniel Minoli, Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, ISBN: 978-1-118-47347-4, Willy Publications.
2	Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.
3	Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, Apress Publications, 2013.
4	Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, Wiley, 2012.
5	CunoPfister, Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud, Kindle Edition.

OTHER REFERENCES	
1	https://en.wikipedia.org/wiki/Internet_of_things
2	https://builtin.com/internet-things
3	https://youtu.be/LlhmzVL5bm8
4	https://youtu.be/6mBO2vqLv38?t=3

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.Tech.,IT	20IT5E4	DISTRIBUTED COMPUTING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Develop the concepts of distributed Systems.	K3	1
CO2	Analyze the communications in distributed Systems.	K4	2
CO3	Classify the distributed databases.	K4	3
CO4	Compare the concepts of distributed system applications.	K4	4
CO5	Discover the distributed models.	K3	5

PRE-REQUISITE	DATA COMMUNICATION AND COMPUTER NETWORKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3				2	2	3	3		3	3	
CO2	3	2		2	2		2	2	3	3		3		
CO3	3		3				2	2	3	3	3	3	2	
CO4	2	3		2	3		2	2	3	3		3		3
CO5	3	2		3	3		2	2	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
UNIT- 1	**INTRODUCTION**	**9**
Distributed Systems: Goal, Advantages, Organization of Multiprocessor Systems and related Hardware and Software Concepts, Design Issues.		
UNIT- 2	**COMMUNICATION IN DISTRIBUTED SYSTEMS**	**9**
Communication - Layered protocols, RPC, RMI, Message oriented communication, Stream oriented communication, Process - Threads, Clients, Servers, Code Migration, Software agents, Naming - entities, locating mobile entities, removing unreferenced entities.		
UNIT - 3	**DISTRIBUTED DATABASES**	**9**
Security, Distributed database systems - CORBA, Distributed COM, Distributed GLOBE, Comparision of CORBA, DCOM, and GLOBE, Distributed File Systems - SUN network file system, CODA file system, other distributed file systems and their comparison.		
UNIT- 4	**APPLICATIONS**	**9**
Distributed document based systems- Word Wide Web, Lotus notes, Distributed Coordination based systems – Introduction, TIB / RENDEZVOUS, JINI and their comparison..		
UNIT-5	**CASE STUDY**	**9**
Case Studies: From the Internet - OPEN SOURCE Security, Distributed database systems - CORBA, Distributed database systems, CORBA, Distributed COM, GLOBE, Comparison of CORBA, DCOM,and GLOBE		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Andrew S. Tanenbaum, Maarten Van Steen, "Distributed System Principles and Paradigms", Pearson Education, 2002.

OTHER REFERENCES	
1	G Coulouris, J. Dollimore, T. Kindberg, "Distributed System Concepts and Design", Addison Wesley, 4/e, 2005**.**
2	HagitAttiya and Jennifer Welch, "Distributed Computing: Fundamentals, Simulations and Advanced Topics", Wiley, 2004.
3	A.S.Tanenbaum, M.Van Steen, "Distributed Systems", Pearson Education, 2004.
4	M.L.Liu, "Distributed Computing Principles and Applications", Pearson Addison Wesley, 2004.

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.Tech, IT	20HSCT2	PROFESSIONAL ETHICS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Develop completion of the course; the student should be able to apply ethics in society.	K3	1
CO2	Discover the ethical issues related to engineering and realize the responsibilities and rights in the society.	K4	2
CO3	Dissect how engineering is applied in association with ethics based on engineering experimentation.	K4	3
CO4	Explain the engineering ethics based safety, responsibilities and rights.	K2	4
CO5	Discover the global issues of professional ethics in engineering.	K4	5

PRE-REQUISITE	CONSTITUTION OF INDIA

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO
CO	-	-	-	-	-	1	2	2	3	3	-	3	-	-
CO	-	-	-	-	-	-	2	2	3	3	-	3	-	-
CO	-	-	-	-	-	-	2	2	3	3	-	3	-	-
CO	-	-	-	-	-	3	2	2	3	3	-	3	-	-
CO	-	-	-	-	-	2	2	2	3	3	-	3	-	-

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**HUMAN VALUES**	**10**
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.		
Topic - 2	**ENGINEERING ETHICS**	**9**
Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas –Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.		
Topic - 3	**ENGINEERING AS SOCIAL EXPERIMENTATION**	**9**
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics –A Balanced Outlook on Law.		
Topic - 4	**SAFETY, RESPONSIBILITIES AND RIGHTS**	**9**
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk -Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest –Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.		
Topic - 5	**GLOBAL ISSUES**	8
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors –Moral Leadership –Code of Conduct – Corporate Social Responsibility.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2013.
2	William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.
3	Andrew S. Tanenbaum, "Modern Operating Systems", Third Edition, Pearson Education, 2009.
4	Harvey M. Deital, "Operating Systems", Third Edition, Pearson Education, 2004.
5	D M Dhamdhere, "Operating Systems: A Concept-Based Approach", 3rd Edition, Tata McGraw-Hill Education, 2007

OTHER REFERENCES	
1	http://nptel.ac.in/courses/106108101/ "Introduction to operating system", Prof P.C.P. Bhatt , IISc-Bangalore
2	https://nptel.ac.in/courses/106106144/2/ "Introduction to operating system", Prof Chester Rebeiro,IIT-Madras.

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.Tech.IT	20CS5LT2	INTERNET OF THINGS	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	To acquire specific scripting knowledge to develop interactive applications	K2	1
CO2	To understand basis of android application development	K3	2
CO3	Apply the programming skills in developing application in Agricore	K3	3
CO4	To apply the programming skills in developing application to enable smart cities.	K3	4
CO5	To apply the programming skills in developing application in Healthcare	K4	5

PRE-REQUISITE	INTERNET OF THINGS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	-	-	-	2	2	3	3	2	3	-	-
CO2	1	2	3	2	2	-	2	2	3	3	-	3	-	2
CO3	3	2	2	-	-	-	2	2	3	3	2	3	-	2
CO4	1	3	2	2	-	-	2	2	3	3	-	3	2	-
CO5	3	2	-	-	-	-	2	2	3	3	3	3	-	2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar & Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**FUNDAMENTALS OF IOT**	**6**
Introduction , Definitions &Characteristics of IOT, IOT Architectures , Physical & Logical Design of IOT ,Enabling Technologies in IOT , History of IOT, About things in IOT, The identifiers in IOT, About the Internet in IOT , IOT frameworks, IOT and M2M		
Topic - 2	**INDUSTRIAL INTERNET APPLICATIONS**	**6**
Industrial internet application:- IOT Fundamentals and components , industrial Manufacturing , monitoring , control , optimization and autonomy , introduction to Hadoop and big data analytics.		
Topic - 3	**APPLICATIONS IN AGRICULTURE**	**6**
Applications in agriculture :- Smart Farming : Weather monitoring , Precision farming , Smart Greenhouse , Drones for pesticides		
Topic - 4	**APPLICATIONS IN IOT**	**6**
Introduction :- Applications in iot enabled smart cities :- Energy consumption , smart energy meters, Home automation , smart grid and solar grid energy harvesting , intelligent parking data lake services scenarios		
Topic - 5	**HEALTH CARE APPLICATIONS**	**6**
Introduction: Architecture of iot for health care, Multiple views coalescence, SBC –ADL to construct the system architecture. Use Cases Wearable devices for remote monitoring of Physiological, ECG, EEG, Diabetes and Blood pressure.		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

COURSE CONTENT	
Experiment-1	Implement a program to Blink LED using Arduino.
Experiment-2	Implement a program to control intensity light using Arduino.
Experiment-3	Implement a program for Buzzer indicator using Arduino.
Experiment-4	Implement a program for LDR using Arduino.
Experiment-5	Implement a program for servo motor control using Arduino.
Experiment-6	Implement Measurement and transmission of room temperature with date and time to web server using WiFi module.
Experiment-7	Detection of ethanol and carbon-dioxide in the air using Gas sensors.
Experiment-8	Detection of obstacles using infrared sensors and measure the distance using ultrasonic sensors.
Experiment-9	Tracking the location of a particular object through GPS module and find the speed of a moving object using accelerometer sensor.
Experiment-10	Creation of dashboard to monitor the Smart Lighting using Freedboard io/ PubNub cloud server.

Experiment-11	Program for RGB LED using Ardiuno
Experiment-12	Experiment on HTTP – to – COAP semantic mapping proxy in IOT tool kit

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Muthusubramanian R, Salivahanan S and Muraleedaharan K A . : "Basic Electrical , Electronics and Computer Engineering ",Tata McgrawHill,second Edition.(2006
2	Olivier Hersent , David Boswarthick, Omar Elloumi , " The Internet of Things : Key applications and protocols " Willey Publications 2nd edition,2013.
3	Marco Schwartz – Internet od Things with the Arduino Yun,Packt Publishing ,2014
4	Adrian McEwen,Hakimcassimally, "Designing the Internet of Things ",Willey Publications 2012.

OTHER REFERENCES	
1	https://en.wikipedia.org/wiki/Internet_of_things
2	https://builtin.com/internet-things
3	https://youtu.be/LlhmzVL5bm8
4	https://youtu.be/6mBO2vqLv38?t=3

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.Tech. IT	20IT5LT3	INTERNET PROGRAMMING	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Construct a basic website using HTML and Cascading style sheet	K3	1
CO2	Build dynamic web page with validation using java script objects and by applying different event handling mechanism	K3	2
CO3	Develop server side programs using servlets and jsp	K3	3
CO4	Construct simple web pages in PHP and to data represent data in XML Format.	K3	4
CO5	Examine the AJAX and web services to develop interactive web applications	K4	5

PRE-REQUISITE	PYTHON PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1			3	2		1	3	3		3	2	1
CO2	3	1	1		3	2		1	3	3	2	3	3	2
CO3	3		1		3	2		1	3	3	1	2	3	2
CO4	3	1	2		3	2		1	3	3	2	3	3	2
CO5	3							1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment & Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**WEBSITES BASCICS, HTML 5, CSS 3, WEB 2.0**	**6**
Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls – CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.		
Topic - 2	**CLIENT SIDE PROGRAMMING**	**6**
Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling-DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL.		
Topic - 3	**SERVER SIDE PROGRAMMMING**	**6**
Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions-Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example – JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.		
Topic - 4	**PHP AND XML**	**6**
An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions-Form Validation- Regular Expressions – File handling – Cookies – Connecting to Database. XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).		
Topic - 5	**INTRODUCTION TO AJAX AND WEBSERVICES**	**6**
AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

LIST OF EXPERIMENTS	
1	Create a web page with the following using HTML i) To embed a map in a web page ii)To fix the hot spots in that map iii)Show all the related information when the hot spots are clicked
2	Create a web page with the following. i) Cascading style sheets. ii) Embedded style sheets. Inline style sheets. Use our college information packet tracer.

3	Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
4	Write programs in Java using Servlets: i)To invoke servlets from HTML forms ii) Session tracking using hidden form fields and Session tracking for a hit count
5	Write programs in Java to create three-tier applications using servlets for conducting on-line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
6	Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
7	Redo the previous task using JSP by converting the static web pages into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database
8	Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by takingthe user information from the XML document
9	i)Validate the form using PHP regular expression. ii) PHP stores a form data into database.
10	Write a web service for finding what people think by asking 500 people‘s opinion for any consumer product.
11	Write a program in Java for creating simple chat application with datagram sockets and datagram packets.
12	Write programs in Java to do the following. • Set the URL of another server. • Download the homepage of the server. • Display the contents of home page with date, content type, and Expiration date. Last modified and length of the home page.

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Stephen Wynkoop and John Burke ―Running a Perfect Website‖, QUE, 2nd Edition,1999.
2	Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3	Jeffrey C and Jackson, ―Web Technologies A Computer Science Perspective‖, Pearson Education, 2011
4	Gopalan N.P. and Akilandeswari J., ―Web Technology‖, Prentice Hall of India, 2011.

OTHER REFERENCES	
1	https://www.w3schools.com/html/
2	https://en.wikipedia.org/wiki/JavaScript
3	https://www.php.net/
4	https://www.youtube.com/watch?v=rJesac0_Ftw
5	https://youtu.be/rJesac0_Ftw

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.Tech., IT	20CSCLT1	DATA COMMUNICATION AND NETWORS	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Classify the importance of layering, addressing and annotate the protocol stack of OSI and TCP/IP model.	K4	1
CO2	Discover and analyse error and flow control algorithms for communication between adjacent nodes in a network.	K4	2
CO3	Identify and apply the suitable routing algorithms for the given network.	K3	3
CO4	Simulate the network topologies using NS2 for data communication.	K2	4
CO5	Implement protocols to understand and describe the devices and services used to support communications in data networks and the Internet	K3	5

PRE-REQUISITE	COMPUTER NETWORKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3					1	3	3	2	3	2	
CO2	1	2	3	2	2			1	3	3		3		2
CO3	3	2	2					1	3	3	2	3		2
CO4	1	3	2	2				1	3	3		3	2	
CO5	3	2						1	3	3	3	3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment & Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**DATA COMMUNICATIONS**	**6**
Introduction: Data Communications, Networks, Network Types, Protocol Layering, TCP/IP Protocol Suite, OSI Model - Physical Layer: Introduction to Physical Layer, Multiplexing and Spectrum Spreading - Transmission Media: Guided Media, Unguided Media.		
Topic - 2	**DATA LINK LAYER**	**6**
Introduction to Data Link Layer: Link Layer Addressing - Error Detection and Correction: Block Coding, Cyclic Codes, Checksum, Forward Error Correction - Data Link Control: DLC services, Data-Link Layer Protocols, HDLC, Point-to-Point Protocol - Media Access Control: Random Access and Controlled Access - Ethernet: IEEE 802.3 - IEEE 802.11.		
Topic - 3	**NETWORK LAYER**	**6**
Network Layer Services - Packet Switching - IPV4 Addresses - Forwarding of IP Packets - Network Layer Protocols: IP, ICMPv4, Mobile IP - Routing Algorithms- Unicast Routing Protocols - Next Generation IP: IPv6 Addressing, IPv6 Protocol.		
Topic - 4	**TRANSPORT LAYER**	**6**
Introduction to Transport Layer: Simple Protocol, Stop-and-Wait Protocol, Go-Back-N Protocol, Selective-Repeat Protocol, Bidirectional Protocols: Piggybacking - User Datagram Protocol - Transmission Control Protocol - Congestion Control.		
Topic - 5	**APPLICATION LAYER**	**6**
Client Server Programming - WWW - HTTP - FTP - Electronic Mail - Telnet - SSH - DNS - SNMP - DHCP - MQTT - IMAP - TLS/SSL		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

LIST OF EXPERIMENTS	
1	Experiment on configuring network topology using packet tracer.
2	Experiment on packet capturing and analyzing using packet tracer.
3	Experiment on error correction code like CRC and Checksum.
4	Experiment on ARP and RARP in live network using Wireshark.
5	Experiment on chat programming using TCP and UDP sockets.
6	Experiment on routing algorithms like Distance Vector and Link State Routing.
7	Implementation of Various Topologies using NS2 Simulator.
8	Program to simulate Stop & Wait protocol.

9	Implementation of Sliding Window Protocol..
10	Program to simulate Distance Vector Routing algorithm.
11	Create a color palette with matrix of buttons Set background and foreground of the control text area by selecting a color from color palette. In order to select Foreground or background use check box control as radio buttons To set background images
12	Create the Client Side Scripts for Validating Web Form Controls using DHTML
13	Write a Programs using AJAX

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Behrouz A. Forouzan, Data Communication and Networking, Fifth Edition, McGraw Hill Education (India) Private Limited, 2013
2	Andrew S Tanenbaum and David J Wetherall, Computer Networks, Fifth Edition, Pearson Education, 2011.
3	William Stallings, Data and Computer Communications, Tenth Edition, Prentice Hall, 2013.
4	Larry L Peterson and Bruce S Davie, Computer Networks: A Systems Approach, Fifth Edition, Elsevier, 2011.
5	James F Kurose and Keith W Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Sixth Edition, Addison-Wesley, 2013

OTHER REFERENCES	
1	http://www.nptel.ac.in/downloads/106105080, “Computer Networks”, Prof.Sujoy Ghosh, IIT Kharagpur.
2	https://www.elsevier.com/journals/subjects/computer-science

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. / B. Tech. (CSE, EEE, ECE & IT)	20PT5T1	Career Guidance - I	2	1	0	0

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand the basic concepts of logical reasoning Skills	K1	1
CO2	Understand the basic concepts of Quantitative Aptitude.	K2	2
CO3	Understand the importance and type of communication in personal and professional environment.	K3	3
CO4	To provide insight into much needed technical and non technical qualities in career planning.	K4	4

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3			3	3		3		
CO2						2			3	3		2		
CO3						3			3	2		1		
CO4						2			3	3		2		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Quiz
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**LOGICAL REASONING**	**5**
LR 1: Series, Odd man out, Analogy LR 2: Coding and Decoding LR 3: Direction, Ranking and Ordering LR 4: Blood Relation LR 5: Venn Diagram, Decision Making LR 6: Syllogism		
Topic - 2	**QUANTITATIVE APTITUDE**	**12**
NR 1: Average NR 2: Percentage NR 3: Profit and Loss NR 4: Ages NR 5: Ratio and Proportion NR 6: Allegation and Mixture NR 7: Time and Work NR 8: Time, Speed and Distance NR 9: Trains, Boats and Streams		
Topic - 3	**VERBAL REASONING & BUSINESSES COMMUNICATION**	**3**
VR 1:Preposition & Conjunction VR 2: Synonyms, Antonyms & Tenses BS1: Art of Introduction, Communication Barriers, Personal Interview.		
Topic - 4	**TECHNICAL CODING**	**10**
TECH 1: I/O, Operaters TECH 2: Conditional statement (branching and jumping statement) TECH 3: Control statements and patterns programming TECH 4: 1D and pointers.		

THEORY	**20**		**TUTORIAL**	**10**		**PRACTICAL**	**0**		**TOTAL**	**30**

BOOK REFERENCES	
1	Logical Reasoning and Data Interpretation for CAT by Nishit K. Sinha
2	Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha
3	A Modern Approach To Verbal Reasoning by R S Aggarwal.
4	Computer Programming for Beginners: Fundamentals of Programming Terms and Concepts - Nathan Clark

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=x0WkptLF6oE&list=PLpyc33gOcbVADMKqylI__O_O_RMeHTyNK
2	https://www.youtube.com/watch?v=LMY7GoAMcDI
3	https://www.youtube.com/watch?v=K7sj1yzXzng
4	https://www.youtube.com/watch?v=fyzmCU931QE
5	https://www.youtube.com/c/TechnicalCoding

SEMESTER VI

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1		Professional Elective - II	PE	50	50	3	0	0	3
2	20IT6T1	Big Data Analytics	PC	50	50	3	1	0	4
3		Open Elective - III	OE	50	50	3	0	0	3
4		Professional Elective - III	PE	50	50	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENTS									
5	20IT6LT1	Mobile Application Development	PC	50	50	2	0	4	4
6	20IT6LT2	Graphics and Multimedia	PC	50	50	2	0	4	4
EMPLOYABILITY ENHANCEMENT COURSE									
7	20PT6T1	Career Guidance - II	EEC	100	-	2	1	-	-
Total						**18**	**2**	**8**	**21**

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.Tech.,IT	20IT6E1	INDUSTRIAL AND MEDICAL IOT	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Develop conceptual design of Medical and Industrial IoT architecture	K3	1
CO2	Apply sensors and various protocols for industry standard solutions.	K3	2
CO3	Explain Articulate privacy and security measures for industry standard solutions.	K2	3
CO4	Build about Internet of Medical Things (IoMT) and its applications in Healthcare industry	K3	4
CO5	Develop various applications using IoT in Healthcare Technologies.	K3	5

PRE-REQUISITE	INTERNET OF THINGS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3			2	2	3	3		3	2	2
CO2	2	2	2	3			2	2	3	3		3	2	
CO3	2	3		3			2	2	3	3		3	2	
CO4	3		2	3			2	2	3	3		3		
CO5	3	2		3			2	2	3	3		3	2	3

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**INDUSTRIAL IOT INTRODUCTION**	**9**
Introduction to IOT, What is IIOT? IOT Vs. IIOT, History of IIOT, Components of IIOT - Sensors, Interface, Networks, Key terms – IOT Platform, Interfaces, API, clouds, Data Management Analytics, Mining &Manipulation; Role of IIOT in Manufacturing Processes Use of IIOT in plant maintenance practices, Sustainability through Business excellence tools Challenges & Benefits in implementing IIOT		
Topic - 2	**IIOT ARCHITECTURE**	**9**
IOT components ;Various Architectures of IOT and IIOT, Advantages & disadvantages, Industrial Internet - Reference Architecture; IIOT System components: Sensors, Gateways, Routers, Modem, Cloud brokers, servers and its integration, WSN, WSN network design for IOT.		
Topic - 3	**SENSORS AND PROTOCOLS**	**9**
Introduction to sensors, Roles of sensors in IIOT, Various types of sensors, Design of sensors, sensor architecture, special requirements for IIOT sensors, Role of actuators, types of actuators. Need of protocols; Types of Protocols, Wi-Fi, Wi-Fi direct, Zigbee, Z wave, Bacnet, BLE, Modbus, SPI , I2C, IIOT protocols –COAP, MQTT, 6lowpan, lwm2m, AMPQ. Hardwire the sensors with different protocols such as HART, MODBUS-Serial & Parallel, Ethernet, BACNet		
Topic - 4	**PRIVACY AND SECURITY**	**9**
Introduction to web security, Conventional web technology and relationship with IIOT, Vulnerabilities of IoT, Privacy, Security requirements, Threat analysis, Trust, IoT security tomography and layered attacker model, Identity establishment, Access control, Message integrity, Non-repudiation and availability		
Topic - 5	**IOMT INTRODUCTION**	**9**
What are IoMT and its working? Tracking assets and resources, Internet of things in hospitals, collection and integration of clinical data, Major benefits of IoT in healthcare, Disadvantages of IoT in healthcare.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Veneri, Giacomo, and Antonio Capasso. Hands-on Industrial Internet of Things: Create a Powerful Industrial IoT Infrastructure Using Industry 4.0, 1st edition, Packt Publishing Ltd, 2018.
2	Reis, Catarina I., and Marisa da Silva Maximiano, eds. Internet of Things and advanced application in healthcare, 1st edition, IGI Global, 2016.

OTHER REFERENCES	
1	Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, 1st Edition, Apress, 2017
2	Aboul Ella Hassanien, Nilanjan Dey and Sureaka Boara, Medical Big Data and Internet of Medical Things: Advances, Challenges and Applications, 1 st edition, CRC Press, 2019.

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.Tech., IT	20IT6E2	CYBER SECURITY	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Construct the concept of cybercrime in mobile devices.	K3	1
CO2	Illustrate the cyber security challenges in the modern devices.	K3	2
CO3	Analyze the working principle of cyber security tools and methods.	K4	3
CO4	Apply the concept of cyber forensics to set a cyber forensics laboratory	K3	4
CO5	Discover the process of cyber security systems in the organizations.	K4	5

PRE-REQUISITE	DATA COMMUNICATION AND NETWORKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		2		2		2	2	3	3		3		2
CO2	3	2	2				2	2	3	3		3	2	
CO3	2	2	2	3			2	2	3	3	3	3	3	
CO4	3	2					2	2	3	3		3	2	2
CO5	2	3	2	3			2	2	3	3		3	2	3

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO CYBERCRIME**	**9**
Cybercrime- definition and origins of the world- Cybercrime and information security Classifications of cybercrime- Cybercrime and the Indian ITA 2000 - A Global Perspective on cybercrimes- Cloud Computing-Proliferation of Mobile and Wireless Devices- Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era.		
Topic - 2	**CYBER SECURITY CHALLENGES IN MODERN DEVICES**	**9**
Security Challenges Posed by Mobile Devices- Registry Settings for Mobile Devices Authentication Service Security- Attacks on Mobile/Cell Phones, Mobile Devices, - Security Implications for Organizations- Organizational Measures for Handling Mobile-Devices-Related Security Issues Organizational Security Policies and Measures in Mobile Computing Era,Laptops.		
Topic - 3	**TOOLS AND METHODS**	**9**
Tools and Methods Used in Cyber line Proxy Servers and Anonymizers- Phishing -Password Cracking, Key loggers and Spywares, - Virus and Worms, Steganography - DoSDDoS Attacks - SQL Injection, Buffer Over Flow - Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft) - The Legal Perspectives - Cyberlaw: The Indian Context - The Indian IT Act.		
Topic - 4	**CYBER FORENSICS**	**9**
Understanding Computer Forensics - Historical Background of Cyber forensics - Digital Forensics Science - The Need for Computer Forensics -Cyber forensics and Digital Evidence - Forensics Analysis of Email - Digital Forensics Lifecycle - Chain of Custody Concept - Network Forensics - Approaching a Computer Forensics Investigation - Setting of a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography.		
Topic - 5	**ORGANIZATIONS IMPLICATIONS**	**9**
Organizational Implications Cost of Cybercrimes and IPR Issues: - Lesson for Organizations Web Treats for Organizations: The Evils and Perils - Security and Privacy Implications from Cloud Computing - Social Media Marketing: Security Risk and Perils for Organization - Social Computing and the Associated Challenges for Organizations - Protecting People- Privacy in the Organization, Organizational Guidelines for Internet Usage - Safe Computing Guidelines and Computer Usage Policy.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Nina Godbole, SunitBelapure, Cyber Security, Wiley India, New Delhi 2012
2	Harish Chander, cyber laws & IT protection, PHI learning pvt.ltd, 2012.
3	Dhiren R Patel, Information security theory &practice,PHI learning pvt ltd,2010
4	MS.M.K.Geetha&Ms.SwapneRaman Cyber Crimes and Fraud Management, MACMILLAN,2012.
5	Pankaj Agarwal : Information Security & Cyber Laws (Acme Learning), Excel, 2013.

OTHER REFERENCES	
1	https://youtu.be/xR02CQCgcNM
2	https://youtu.be/sLzGlFfbU7E
3	https://youtu.be/OkFj1ePW2cU

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.Tech., IT	20IT6E3	INFORMATION ETHICS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Apply the vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks	K3	1
CO2	Compare the Perform penetration & security testing	K4	2
CO3	Discover a professional ethical hacker	K4	3
CO4	Identify the skills to become a security analyst	K3	4
CO5	Explain the security issues in each layer	K2	5

PRE-REQUISITE	DATA COMMUNICATION AND NETWORKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2		2		2	2	3	3		3		
CO2	3	3	3	2	2		2	2	3	3		3	2	
CO3		2		2	2		2	2	3	3		3		
CO4	3	2	2	3			2	2	3	3		3		
CO5			3	3		2	2	2	3	3		3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**ETHICAL HACKING OVERVIEW AND VULNERABILITIES**	**9**
Understanding the importance of security, Concept of ethical hacking and essential Terminologies Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking.		
Topic - 2	**FOOT PRINTING AND PORT SCANNING**	**9**
Foot printing - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS.		
Topic - 3	**SYSTEM HACKING**	**9**
Aspect of remote password guessing, Role of eavesdropping ,Various methods of password cracking, Keystroke Loggers, Understanding Sniffers ,Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.		
Topic - 4	**HACKING WEB SERVICES AND SESSION HIJACKING**	**9**
Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools.		
Topic - 5	**HACKING WIRELESS NETWORKS**	**9**
Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless, DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010
2	Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010
3	RajatKhare, "Network Security and Ethical Hacking", Luniver Press, 2006
4	Ramachandran V, BackTrack 5 Wireless Penetration Testing Beginner's Guide", Packet, 3/e
5	Thomas Mathew, "Ethical Hacking", OSB publishers, 2003

OTHER REFERENCES	
1	https://youtu.be/XLvPpirlmEs
2	https://youtu.be/UhjrCluTOA0
3	https://youtu.be/_BSlzCjlSMA

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.Tech., IT	20IT6E4	DATA VISUALIZATION	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Examine the basics of Data Visualization	K4	1
CO2	Examine visualization of distributions	K4	2
CO3	Develop programs on visualization of time series, proportions & associations	K3	3
CO4	Apply visualization on Trends and uncertainty	K3	4
CO5	Explain principles of proportions	K2	5

PRE-REQUISITE	DATABASE MANAGEMENT SYSTEMS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	3				2	2	3	3		3	1	
CO2			2		3		2	2	3	3	1	3		
CO3	2	3	1	1	1	2	2	2	3	3		3		3
CO4	1	2					2	2	3	3		3	2	
CO5	1		3	2	2		2	2	3	3	1	3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
UNIT- 1	**INTRODUCTION TO VISUALIZATION**	**9**
Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics, Coordinate Systems and Axes- Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Colour Scales-Colour as a Tool to Distinguish, Colour to Represent Data Values ,Colour as a Tool to Highlight, Directory of Visualizations- Amounts, Distributions, Proportions, x–y relationships, Geospatial Data		
UNIT - 2	**VISUALIZING DISTRIBUTIONS**	**9**
Visualizing Amounts-Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps, Visualizing Distributions: Histograms and Density Plots- Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time, Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots-Empirical Cumulative Distribution Functions, Highly Skewed Distributions, Quantile-Quantile Plots, Visualizing Many Distributions at Once-Visualizing Distributions Along the Vertical Axis, Visualizing Distributions Along the Horizontal Axis		
UNIT - 3	**VISUALIZING ASSOCIATIONS & TIME SERIES**	**9**
Visualizing Proportions-A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total ,Visualizing Nested Proportions- Nested Proportions Gone Wrong, Mosaic Plots and Tree maps, Nested Pies ,Parallel Sets. Visualizing Associations Among Two or More Quantitative Variables-Scatterplots, Correlograms, Dimension Reduction, Paired Data. Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series , Multiple Time Series and Dose–Response Curves, Time Series of Two or More Response Variables		
UNIT - 4	**VISUALIZING UNCERTIANITY**	**9**
Visualizing Trends-Smoothing, Showing Trends with a Defined Functional Form, Detrending and Time-Series Decomposition, Visualizing Geospatial Data-Projections, Layers, Choropleth Mapping, Cartograms, Visualizing Uncertainty-Framing Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizing the Uncertainty of Curve Fits, Hypothetical Outcome Plot		
UNIT - 5	**PRINCIPLE OF PROPORTIONAL INK**	**9**
The Principle of Proportional Ink-Visualizations Along Linear Axes, Visualizations Along Logarithmic Axes, Direct Area Visualizations, Handling Overlapping Points-Partial Transparency and Jittering, 2D Histograms, Contour Lines, Common Pitfalls of Colour Use-Encoding Too Much or Irrelevant Information ,Using Nonmonotonic Colour Scales to Encode Data Values, Not Designing for Colour-Vision Deficiency		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Claus Wilke, “Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures”, 1st edition, O’Reilly Media Inc, 2019.
2	Tony Fischetti, Brett Lantz, R: Data Analysis and Visualization,O’Reilly ,2016
3	Ossama Embarak, Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems,Apress, 2018

OTHER REFERENCES	
1	https://www.netquest.com/hubfs/docs/ebook-data-visualization-EN.pdf
2	https://www.coursera.org/learn/python-for-data-visualization#syllabu
3	https://www.coursera.org/learn/data-visualization

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.E., CSE B, Tech. IT	20IT6T1	BIG DATA ANALYTICS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
Upon completion of the course, students will be able to		**RBT Level**	**Topics Covered**
CO1	Identify the type of data based on the characteristics of datasets, compare trivial data with big data and explain the lifecycle of data analytics for real world applications.	K2	1
CO2	Develop the storage and processing techniques for big data and apply them for a given scenario using Hadoop.	K3	2
CO3	Analyze big data using quantitative, qualitative and machine learning approaches and implement regression, clustering and classification algorithm for a given big data application.	K4	3
CO4	Compare data models and computing models used for data analytics and apply predictive modeling for processing unstructured data.	K4	4
CO5	Discover analytical models for financial services, banking and recommender systems using marketing analysis, sentiment analysis and predictive analysis	K4	5

PRE-REQUISITE	DATA BASE MANAGEMENT SYSTEM

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2						1	3	3		3		
CO2	3	2						1	3	3		3		
CO3	3	3	3		2			1	3	3		3	2	2
CO4	3	2			1			1	3	3		3		
CO5	3	2	3		2			1	3	3		3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**FUNDAMENTALS OF BIG DATA**	**9+3**
Understanding Big Data: Concepts and Terminology, Big Data Characteristics, Different Types of Data – Big Data Analytics Lifecycle - Enterprise Technologies and Big Data Business Intelligence. Case Study: Identifying data characteristics and types of data.		
Topic - 2	**STORING AND PROCESSING BIG DATA**	**9+3**
Big Data Storage Concepts: Clusters, File Systems and Distributed File Systems, NoSQL, Sharding, Replication, CAP Theorem, ACID, BASE - Big Data Processing Concepts: Parallel Data Processing, Distributed Data Processing, Hadoop, Processing Workloads, Cluster, Processing in Batch Mode, Processing in Realtime Mode - Big Data Storage Technology: On-Disk Storage Devices, In-Memory Storage Devices..		
Topic - 3	**BIG DATA ANALYSIS**	**9+3**
Quantitative Analysis – Qualitative Analysis – Data Mining – Statistical Analysis – Machine Learning – Semantic Analysis – Visual Analysis – Case Study : Correlation – Regression – Time Series Plot – Clustering – Classification.		
Topic - 4	**ANALYTICS MODELS – PREDICTIVE MODELING**	**9+3**
Introduction – Data Models – Computing Models. Predictive Modeling for Unstructured Data: Introduction – Applications of Predictive Modeling – Featured Engineering – Pattern Mining.		
Topic - 5	**APPLICATIONS FOR BIG DATA ANALYTICS**	**9+3**
Big Data Analytics for Financial Services and Banking: Introduction – Customer insights and marketing analysis – Sentiment Analysis – Predictive Analytics – Model Building – Fraud detection and Risk Management – Integration of Big Data Analytics into operations. Big Data Analytics and Recommender Systems: Introduction – Background – Overview – Evaluations of Recommenders – Issues..		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	C.S.R. Prabhu, Aneesh SreevallabhChivukula, Aditya Mogadala, Rohit Ghosh, L.M. Jenila, “Big Data Analytics: Systems, Algorithms, Applications”, First edition, Springer, 2019.
2	Paul Buhler, Wajid Khattak, Thomas Erl, “Big Data Fundamentals: Concepts, Drivers & Techniques”, Second Edition, Prentice Hall, 2016.
3	Anil Maheshwari, “Data Analytics” , First Edition, Tata Mcgraw Hill, 2017.
4	Venkat Ankam, “Big Data Analytics”, First Edition, Packt Publishing Limited, 2016.
5	Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, First Edition, Wiley, 2015.

OTHER REFERENCES	
1	https://onlinecourses.nptel.ac.in/noc16_mg06, “Introduction to Data Analytics”, Dr. Nandan Sudarsanam, Dr. Balaraman Ravindran, IIT- Madras
2	https://nptel.ac.in/courses/106104135/48, “Big Data”, Prof.ArnabBhattaacharya, IIT-Kanpur.
3	https://lecturenotes.in/subject/884/big-data-analysis-bda/note
4	https://www.youtube.com/watch?v=pkPdhznqEI4

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.Tech.IT	20IT6E5	WEARABLE COMPUTING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify and understand the need for development of wearable devices and its influence on various sectors.	K3	1
CO2	List the applications of various wearable inertial sensors for biomedical applications.	K4	2
CO3	Compare the design and development of various wearable bio-electrode and physiological activity monitoring devices for use in healthcare applications.	K4	3
CO4	Apply and analyze the usage of various biochemical and gas sensors as wearable devices.	K3	4
CO5	Analyze the use of various wearable locomotive tools for safety and security, navigation.	K4	5

PRE-REQUISITE	INTERNET OF THINGS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2			2	2	3	3		3	2	3
CO2	2	2	2				2	2	3	3		3	3	3
CO3	2	2	3				2	2	3	3		3		
CO4		2	2	3			2	2	3	3		3		2
CO5		3	2	2			2	2	3	3		3		3

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO WEARABLE DEVICES**	**9**
Motivation for development of Wearable Devices, The emergence of wearable computing and wearable electronics, Types of wearable sensors:Invasive, Non-invasive;Intelligent clothing, Industry sectors' overview – sports, healthcare, Fashion and entertainment, military, environment monitoring, mining industry, public sector and safety		
Topic - 2	**WEARABLE INERTIAL SENSORS**	**9**
Wearable Inertial Sensors - Accelerometers, Gyroscopic sensors and Magnetic sensors; Modality of Measurement- Wearable Sensors, Invisible Sensors, In-Shoe Force and Pressure Measurement; Applications: Fall Risk Assessment, Fall Detection , Gait Analysis, Quantitative Evaluation of Hemiplegic and Parkinson's Disease patients. Physical Activity monitoring: Human Kinetics, Cardiac Activity, Energy Expenditure measurement: Pedometers, Actigraphs.		
Topic - 3	**WEARABLE DEVICES FOR HEALTHCARE-1**	**9**
Electrode – design, geometry, material; Fabrication of interdigitated (IDE) electrodes, choice of substrate, sensing film; Wearable Bioelectric impedance devices for Galvanic skin response; Wearable ECG devices: Basics of ECG and its design, Electrodes and the Electrode–Skin Interface; Wearable EEG devices: Principle and origin of EEG, Basic Measurement set-up, electrodes and instrumentation; Wearable EMG devices: EMG/ SEMG Signals, EMG Measurement – wearable surface electrodes, SEMG Signal Conditioning, Applications. Smart textile for neurological rehabilitation system (NRS), Study of flexible and wearable EMG sensors. Epidermal electronics system (EES), Study of Multiparametric(ECG, EEG, EMG) Epidermal Electronics Systems.		
Topic - 4	**WEARABLE DEVICES FOR HEALTHCARE-2**	**9**
Wearable Blood Pressure (BP) Measurement: Cuff-Based Sphygmomanometer, Cuffless Blood Pressure Monitor. Study of flexible and wearable Piezoresistive sensors for cuffless blood pressure measurement. Wearable sensors for Body Temperature: Intermittent and Continuous temperature monitoring, Detection principles – thermistor, infrared radiation, thermopile, Modality of measurement wearable, adhesive/tattoo type. Conductive textile electrodes, Knitted Piezo resistive Fabric (KPF) sensors.		
Topic - 5	**WEARABLE BIOCHEMICAL AND GAS SENSORS**	**9**
Wearable Biochemical Sensors: Parameters of interest, System Design –Textile based, Microneedle based; Types: Non invasive Glucose Monitoring Devices, Gluco Watch® G2 Biographer, Gluco Track TM; Pulse oximeter, Portable Pulse Oximeters, wearable pulse oximeter; Wearable capnometer for monitoring of expired carbon dioxide. Wearable gas sensors: Metal Oxide (MOS) type, electro chemical type, new materials-CNTs, graphene, Zeolites; Detection of atmospheric pollutants.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	"Seamless Healthcare Monitoring", Toshiyo Tamura and Wenxi Chen, Springer 2018
2	"Wearable Sensors -Fundamentals, Implementation and Applications", by Edward Sazonov and Michael R. Neuman, Elsevier Inc., 2014.
3	"Wearable and Autonomous Biomedical Devices and Systems for Smart Environment", by Aimé Lay-Ekuakille and Subhas Chandra Mukhopadhyay, Springer 2010

OTHER REFERENCES	
1	“Wearable Electronics Sensors - For Safe and Healthy Living”, Subhas Chandra Mukhopadhyay, Springer 2015
2	“Environmental, Chemical and Medical Sensors”, by Shantanu Bhattacharya, A K Agarwal, NripenChanda, Ashok Pandey and Ashis Kumar Sen, Springer Nature Singapore Pte Ltd. 2018
3	M. Mardonova and Y. Choi, "Review of Wearable Device Technology and Its Applications to the Mining Industry," Energies, vol. 11, p. 547, 2018.
4	N. Luo, W. Dai, C. Li, Z. Zhou, L. Lu, C. C. Y. Poon, et al., "Flexible Piezoresistive Sensor Patch Enabling Ultralow Power Cuffless Blood Pressure Measurement," Advanced Functional Materials, vol. 26, pp. 1178-1187, 2016.
5	S. Yang, Y.-C. Chen, L. Nicolini, P. Pasupathy, J. Sacks, B. Su, et al., “Cut-and-Paste” Manufacture of Multiparametric Epidermal Sensor Systems," Advanced Materials, vol. 27, pp. 6423-6430, 2015.

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.Tech., IT	20IT6E6	INFORMATION SECURITY ANALYSIS AND AUDIT	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify the security principles and components in information management using security SDLC for a business environment.	K3	1
CO2	Analyze the security threats and attacks and apply a security policy to overcome the threats in a given environment.	K4	2
CO3	Identify and analyze risk factors, vulnerabilities to provide a security solution for managing the risks.	K3	3
CO4	Compare the security models and frameworks and use best practices and standards to develop a security policy for an organization	K4	4
CO5	Apply security technologies for informational protection in an organization	K3	5

PRE-REQUISITE	COMPUTER NETOWRKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3			2	2	3	3	2	3		3
CO2		2	2	2			2	2	3	3		3	2	3
CO3	3	3	2				2	2	3	3	2	3		2
CO4	2	2	3				2	2	3	3		3	2	
CO5	2	2	2	3			2	2	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**SECURITY REQUIREMENTS AND SECURE SDLC**	**9**
What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.		
Topic - 2	**SECURITY INVESTIGATION**	**9**
Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies		
Topic - 3	**SECURITY ANALYSIS**	**9**
Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem.		
Topic - 4	**LOGICAL DESIGN**	**9**
Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.		
Topic - 5	**PHYSICAL DESIGN**	**9**
Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Micki Krause, Harold F. Tipton, — Handbook of Information Security Management, Vol 1-3 CRCPress LLC, 2004.
2	Stuart McClure, Joel Scrambray, George Kurtz, —Hacking Exposed, Tata McGrawHill, 2003
3	Matt Bishop, — Computer Security Art and Science, Pearson/PHI, 2002.
4	Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Sixth Edition, Cengage Learning, 2017.
5	Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, John Wiley & Sons, 2008.

OTHER REFERENCES	
1	https://nptel.ac.in/courses/106106129 ," Introduction to Information Security", Prof. V. Kamakoti
2	https://nptel.ac.in/courses/106106141, " Information Security-II", Prof. V. Kamakoti
3	https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm
4	https://www.youtube.com/watch?v=UXMIxCYZu8o
5	https://www.youtube.com/watch?v=Ih9f4MVpPfg

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.Tech.IT	20CS6E7	SOFTWARE PROJECT MANAGEMENT	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Analyze activities, methodologies for project planning and project evaluation to develop a successful project using Cost-benefit Evaluation Techniques.	K4	1
CO2	Inspect the quality of software using agile methods, extreme programming and scrum for a given project and estimate the effort and cost for software development activity using COSMIC Full function points and COCOMO II metrics.	K4	2
CO3	Apply critical path method and precedence networks for a given project to identify the critical activities that affect the target completion time.	K3	3
CO4	Explain the need for the continuous monitoring and control of a project for a given project plan to complete the project on time.	K2	4
CO5	Examine how to manage people, ways to increase staff motivation and team working using Oldham-Hackman job characteristic model for the successful Completion of a project	K4	5

PRE-REQUISITE	SOFTWARE ENGINEERING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3				2	2	3	3	3	3	2	
CO2	3	3	2				2	2	3	3	2	3		3
CO3	2		3				2	2	3	3		3	2	
CO4	3	3			2		2	2	3	3		3		
CO5		2	2	3			2	2	3	3		3	2	3

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**PROJECT EVALUATION AND PROJECT PLANNING**	**9**
Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Stakeholders - Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost–Benefit analysis - Evaluation techniques – Strategic program Management – Stepwise Project Planning		
Topic - 2	**PROJECT LIFE CYCLE AND EFFORT ESTIMATION**	**9**
Software process and Process Models – Choice of Process models - mental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM –Agile Tools: JIRA Agile - Axosoft - Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II A Parametric Productivity Model - Staffing Pattern – Case Study : Task Manager Application - Evaluation of the Cost Estimation Models.		
Topic - 3	**ACTIVITY PLANNING AND RISK MANAGEMENT**	**9**
Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CPM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical patterns – Cost schedules. Case Study: Analyzing CPM and PERT methods for project scheduling in a construction company.		
Topic - 4	**PROJECT MANAGEMENT AND CONTROL**	**9**
Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control- Software Configuration Management – Managing contracts – Contract Management.		
Topic - 5	**STAFFING IN SOFTWARE PROJECTS**	**9**
Managing people – Organizational behavior – Best methods of staff selection – Motivation – The OldhamHackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Bob Hughes, Mike Cotterell and Rajib Mall, “Software Project Management”, Tata McGraw Hill, Fifth Edition, New Delhi, 2012.
2	Robert K. Wysocki “Effective Software Project Management” – Wiley Publication, 2011.
3	Walker Royce: “Software Project Management”- Addison-Wesley, 1998.
4	Gopalaswamy Ramesh, “Managing Global Software Projects” – McGraw Hill Education (India), Fourteenth Reprint 2013.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=FCn0xVZQx3w
2	https://www.rcet.org.in/uploads/academics/rohini_55071442419.pdf
3	https://www.javatpoint.com/cocomo-model
4	https://en.wikipedia.org/wiki/Software_configuration_management#:~:text=In%20software%20engineering%2C%20software%20configuration,and%20the%20establishment%20of%20baselines.
5	https://www.sciencedirect.com/science/article/pii/S1877042814028286/pdf?md5=d22856a61e08683d63419dfdf7ba5483&pid=1-s2.0-S1877042814028286-main.pdf

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.Tech.IT	20IT6E8	VIRTUAL REALITY	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify the components of the virtual reality system	K3	1,2
CO2	Analyze the various input and output devices used for virtual reality	K4	2
CO3	Apply the different modelling concepts to visual virtualization	K3	3
CO4	Discover the performance of given simple applications related to virtual reality	K4	4
CO5	Compare the 3D technology with virtual programming concepts	K4	5

PRE-REQUISITE	INTERNET OF THINGS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3			2	2	3	3		3	2	2
CO2	3	3	2				2	2	3	3				
CO3		2	2				2	2	3	3		3		2
CO4	3	3	2			2	2	2	3	3			3	
CO5	2	2	2			3	2	2	3	3	2			2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**9**
The three I's of virtual reality, commercial VR technology and the five classic components of a VR system, Augmented Reality and Telepresence.		
Topic - 2	**INPUT AND OUTPUT DEVICES**	**9**
Input Devices : (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces. Output Devices: Graphics displays, sound displays & haptic feedback.		
Topic - 3	**MODELING**	**9**
Geometric modeling, kinematics modeling, physical modeling, behaviour modeling, model management and Modeling real-life from sensors.		
Topic - 4	**HUMAN FACTORS**	**9**
Methodology and terminology, user performance studies, VR health and safety issues. Applications:Medical applications, military applications, robotics applications, Virtual product design (CAD display, process simulation, virtual prototyping)		
Topic - 5	**VR PROGRAMMING**	**9**
VR Programming-I: Introducing Unity 3D, Project panel, Scene hierarchy, Simple game object, Scene editor. VR Programming-II: Middle VR, device management, graphics card limitation, 3D user interactions, deployment, VR software: VRPN, VR Juggler.		

THEORY	**45**	**TUTORIAL**	**0**	**PRACTICAL**	**0**	**TOTAL**	**45**

BOOK REFERENCES	
1	Virtual Reality Technology, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons, Inc., Second Edition,2006
2	Killer Game Programming in Java, Andrew Davison, O'reilly-SPD, 2005
3	Understanding Virtual Reality, interface, Application and Design, William R.Sherman, Alan Craig, Elsevier (Morgan Kaufmann), First edition, 2002.
4	3D Modeling and surfacing, Bill Fleming, Elsevier (Morgan Kauffman), 1999.
5	3D Game Engine Design, David H.Eberly, Elsevier, Second Edition, 2006.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=DCQYBHz7RDs
2	https://www.youtube.com/watch?v=7yXlLgZkiJM
3	https://www.youtube.com/watch?v=pDr26zf4qz4
4	https://www.marxentlabs.com/what-is-virtual-reality/
5	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6817702/

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.Tech., IT	20IT6LT1	MOBILE APPLICATION DEVELOPMENT	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand Android Introduction, Applications, and Activities.	K2	1
CO2	Plan User interfaces and developing interface tools.	K3	2
CO3	Discover files and databases in android applications.	K4	3
CO4	Understand small computing technology and sensors.	K2	4
CO5	Develop advanced android programs using tools.	K3	5

PRE-REQUISITE	COMPUTER NETWORKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			2	3	2	3	3	3	3	3	3	3
CO2	3	3				3	2	3	3	3	3	3	3	2
CO3	3	3			2	3	2	3	3	3	3	3		
CO4	3	3			2	3	2	3	3	3	3	3		
CO5	3	2				3	2	3	3	3	3	3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests.
	2	Mini Project & Model practical examination.
	3	End Semester Examinations.
INDIRECT	1	Course End Survey.

COURSE CONTENT		
Topic - 1	**ANDROID OVERVIEW**	**6**
Overview of Android platform - Android SDK features - setting up the mobile app development environment along with an emulator - Android Application Development Architecture - creating an applications and activities - Application manifest.		
Topic - 2	**INTERFACE TOOLS**	**6**
Creating user interface - Views - creating views - Layouts - Drawable resources - resolution and density independence - Menus - Intents - Adapters - Using Internet resources – Dialogs.		
Topic - 3	**FILES AND DATABASES**	**6**
Saving Simple Application Data - creating and saving preferences - preferences activity - saving activity state - loading files - file management tools - sending emails through application - Introducing Android databases – SQLite - Web Database - Firebase My SQL – PHP.		
Topic - 4	**SMALL COMPUTING TECNOLOGY AND SENSORS**	**6**
Audio, Video Using the Camera - Telephony And SMS - Bluetooth Networks - Managing network connectivity - WI-FI - Sensors-Sensors and the Sensor Manager - Interpreting sensor values - Using the compass, Accelerometer and Orientation sensor.		
Topic - 5	**ADVANCED TECHNOLOGY**	**6**
Paranoid Android - Using Wake Locks - AIDL to Support IPC for Services - General API's- Payment gateway, Android jetpack - Technology II – IOS - Introduction to Objective C - IOS features.		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

LIST OF EXPERIMENTS	
1	Setting up Android Platform, Android Virtual Device and create application to display Welcome message.
2	Build a score keeper app that gives a user the ability to keep track of the score of two different teams playing a game of choice. Include different Buttons which can be clicked for different events in the game to add points.
3	Create a Musical Structure App to store and present the user with the library of songs available in different categories of classical and Melodies. Write code to play the song chosen by the user from the library of music.
4	Create an application to calculate the electricity bill and create an appropriate alert message as well as send the value to the given mobile number using SMS.
5	Write an android program to demonstrate a Menu 'File' with New and Open as menu items. Give toast messages on click of each menu item.
6	Create an application to fetch the current Location information (Latitude and longitude) and display it in the alert message.

7	Write an android program to implement the following operations using SQLite Database. • Create the SQLite Database Object. • Execute the CRUD Operations required for the application • Close the database.
8	Develop an application to implement phone number Verification by OTP using Firebase in Android.
9	Create an application to extract employee information from the JSON message and load it in UI.
10	. Develop the following mobile application using android • Education Quiz App • Tour Guide App • News Feed App.
11	Write a sample program to show how to make a SOCKET Connection from j2me phone.
12	Develop Networked Applications using the Wireless Toolkit
13	Design BMI Calculator Application

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Jeff Mc Wherter and Scott Gowell, " Professional Mobile Application Development" Wrox,2012
2	David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson "Beginning ios 6 Development: Exploring the iOS SDK", Apress, 2013
3	"Teach Yourself Android Application Development in 24 Hours", SAMS publication, 3/e, 2013
4	Anubhav Pradhan, Anil V. Deshpande, "Composing Mobile Apps: Learn. Explore. Apply. Using Android", Wiley publication, 2014.
5	Barry Burd, "Android Application Development All in one for Dummies", John Wiley & Sons publication, 2011.

OTHER REFERENCES	
1	http://developer.android.com/develop/index.htmm
2	https://www.tutorialspoint.com/android
3	http://www.androidhive.info/
4	https://www.codeschool.com/learn/ios
5	https://onlinecourses.nptel.ac.in/noc20_cs52/preview

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.Tech., IT	20IT6LT2	GRAPHICS AND MULTIMEDIA	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand the structure of modern computer graphics systems and primitives.	K2	1
CO2	Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.	K2	2
CO3	Develop 3D UI computer graphics programs using OpenGL	K3	3
CO4	Compare various algorithms used for modelling and rendering graphical 3D data.	K2	4
CO5	Compare interactive animations using various animation techniques.	K4	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				3	2	3	3	3	3	3		
CO2		2		3		3	2	3	3	3	3	3		
CO3		2			3	3	2	3	3	3	3	3		
CO4		1		2		3	2	3	3	3	3	3		
CO5					1	3	2	3	3	3	3	3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests.
	2	Mini Project & Model practical examination.
	3	End Semester Examinations.
INDIRECT	1	Course End Survey.

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO COMPUTER GRAPHICS AND GRAPHICS PRIMITIVES**	**6**
Basic of Computer Graphics- Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards.		
Topic - 2	**2D TRANSFORMATION AND VIEWING**	**6**
Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping.		
Topic - 3	**INTRODUCTION TO 3D GRAPHICS**	**6**
Introduction to 3D graphics: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, Bazier curves and surfaces, B-spline curves and surfaces.		
Topic - 4	**3D TRANSFORMATION AND VIEWING**	**6**
Visible surface detection methods: back-face detection - depth sorting- BSP tree methods. Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.		
Topic - 5	**ILLUMINATION MODELS AND COMPUTER ANIMATION**	**6**
Basic illumination models- Light intensities- Radiosity lighting model. Computer animation: Design of animation sequence, raster animation, computer animation languages, key frame systems, motion specifications.		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

LIST OF EXPERIMENTS	
1	Study of Fundamental Graphics Functions.
2	Implementation of Line drawing algorithms: DDA Algorithm, Bresenham's Algorithm.
3	Implementation of Circle drawing algorithms: Bresenham's Algorithm, Mid-Point Algorithm.
4	Programs on 2D transformations.
5	Programs on 3D transformations.
6	Write a program to implement Cohen Sutherland line clipping algorithm.
7	Write a program to draw Bezier curve.
8	Using Flash/Maya perform different operations (rotation, scaling move etc..) on objects.
9	Create a Bouncing Ball using Key frame animation and Path animations.

10	Design a poster for 2019 election and show the difference in resolution and quality for Print and Web.
11	Write a program to implement Line Clipping Algorithm using Liang Barsky Algorithm.
12	Write a program to Implement Polygon Clipping Algorithm using Sutherland -Hodgman Algorithm.

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Edward Angel, Interactive Computer Graphics: A Top-Down Approach with OpenGL, 4th edition, Addison-Wesley, 2005.
2	Sumanta Guha, Computer Graphics Through OpenGL: From Theory to Experiments, 3rd edition,2018
3	Fabio Ganovelli, et.al, Introduction to Computer Graphics: A Practical Learning Approach, Taylor and Francis group, 2015
4	Donald Hearn, M. Pauline Baker, Computer Graphics, 2nd edition, C version, Prentice Hall, 1996
5	Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.

OTHER REFERENCES	
1	https://www.coursera.org/learn/introtoalice
2	https://nptel.ac.in/courses/106103224
3	https://www.springer.com/journal/11042
4	https://www.amazon.in/Computer-Graphics-Foley-Feiner-Hughes/dp/0321399528
5	https://www.amazon.com/Animation-Beginners-Principles-Graphics-Learning/dp/1686282702?tag=uuid10-20

SEMESTER VII

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1		Professional Elective - IV	PE	50	50	3	0	0	3
2	20IT7T1	Block Chain Fundamentals	PC	50	50	3	1	0	4
3		Open Elective - IV	OE	50	50	3	0	0	3
4		Professional Elective - V	PE	50	50	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENTS									
5	20IT7LT1	Information Security	PC	50	50	2	0	4	4
6	20IT7LT2	Advanced Java Programming	PC	50	50	2	0	4	4
LABORATORY COURSE									
7	HX8001	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	100	-	0	0	6	3
Total						**16**	**1**	**14**	**24**

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech-IT	20IT7E1	COGNITIVE IOT	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Compare the enabling technologies and communication models of internet of things.	K2	1
CO2	Relate the machine-to-machine communication model and IoT reference model for end to end communication.	K2	2
CO3	Analyze the IoT protocols for various layers and apply for developing real time IoT applications	K4	3
CO4	Develop applications using microcontrollers for addressing real world needs.	K4	4
CO5	Develop applications for smart cities using Raspberry Pi.	K4	5

PRE-REQUISITE	INTERNET OF THINGS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1						2	2	3	3		3		3
CO2	2	1	3				2	2	3	3		3		
CO3	3	2					2	2	3	3	2	3	3	
CO4	2	1					2	2	3	3	3	3	-	
CO5	1	2					2	2	3	3	3	3	3	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO INTERNET OF THINGS**	**9**
Characteristics of IoT, Physical and Logical Design of IoT - IoT Enabling Technologies - Wireless Sensor Networks - Cloud Computing - Big Data Analytics - Communication Protocols - Embedded Systems - Functional Blocks - Communication Models and APIs - IoT Levels and Deployment Templates - Overview of Microcontroller, Basics of Sensors and Actuators - Examples and Working Principles of Sensors and Actuators.		
Topic - 2	**M2M AND IOT ARCHITECTURE**	**9**
Building Architecture - An IoT Architecture Outline - M2M and IoT Technology Fundamentals: Devices and Gateways, Local and Wide Area Networking, Data management, Everything as a Service, M2M and IoT Analytics, Knowledge Management - IoT Reference Model.		
Topic - 3	**IOT PROTOCOLS**	**9**
PHY/MAC Layer: 3GPP MTC, IEEE 802.15 – Wireless HART- Z-Wave, BLE- Zigbee - DASH7 - Network Layer: 6LoWPAN - 6TiSCH - RPL - CORPL - CARP - Transport Layer: TCP - MPTCP - UDP-DCCP- Session Layer: HTTP- CoAP- XMPP- AMQP- MQTT.		
Topic - 4	**PROTOTYPING IOT OBJECTS USING MICROCONTROLLER**	**9**
Introduction - Equivalent Microcontroller Platform - Setting up the Board - Programming for IoT - Reading from Sensors, Communication: Connecting Microcontroller with Mobile devices - Communication through Bluetooth, WiFi, and Ethernet.		
Topic - 5	**PROTOTYPING IOT OBJECTS USING RASPBERRY PI**	**9**
Introduction to Raspberry Pi - About the board - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Interfacing external gadgets - Controlling Output, Reading Input from Pins. IoT Physical Servers & Cloud Offerings		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2	Daniel Minoli, Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, ISBN: 978-1-118-47347-4, Willy Publications.
3	Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.
4	Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, Apress Publications, 2013.
5	Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, Wiley, 2012.

OTHER REFERENCES	
1	https://builtin.com/internet-things
2	https://www.youtube.com/watch?v=LlhmzVL5bm8
3	https://www.youtube.com/watch?v=6mBO2vqLv38
4	https://www.youtube.com/watch?v=KeaeuUcw02Q
6	https://www.youtube.com/watch?v=Fj02iTrWUx0

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech-IT	20IT7E2	INFORMATION SECURITY MANAGEMENT	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	State the business drivers behind the information security analysis design process.	K2	1
CO2	Illustrate the major components, scope, and target audience for each of the levels of security policy	K2	2
CO3	Apply the suitable security technologies to segregate the organizations systems from the insecure Internet.	K3	3
CO4	Examine the underlying foundations of modern cryptosystems and analyze the traditional symmetric encryption systems with more modern asymmetric encryption systems.	K4	4
CO5	Identify the underlying foundations of modern cryptosystems and analyze the traditional symmetric encryption systems with more modern asymmetric encryption systems.	K3	5

PRE-REQUISITE	COMPUTER NETWORKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	-	1	-	-	-	3	-	-	2	3	-
CO2	2	1	1	-	2	-	2	-	-	3	-	3	-	3
CO3	2	2	3	1	3	-	-	2	-	-	-	-	-	-
CO4	1	2	3	-	3	-	-	-	-	2	-	-	2	-
CO5	2	1	3	2	-	-	-	-	-	-	-	-	-	-

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO INFORMATION SECURITY**	**9**
The History of Information Security-Key Information Security Concepts-The Security Systems Development Life Cycle- Security Professionals and the Organization- Need for Security.		
Topic - 2	**INFORMATION SECURITY POLICY, STANDARDS AND PRACTICES**	**9**
Information Security Planning and Governance - Information Security Policy, Standards, and Practices-The Information Security Blueprint -Security Education, Training, and Awareness Program-Continuity Strategies.		
Topic - 3	**SECURITY TECHNOLOGIES**	**9**
Introduction-Access Control, Identification, Authentication, Authorization and Accountability-Firewalls Virtual Private Networks (VPNs)- Intrusion Detection and Prevention Systems - Scanning and Analysis Tools- Biometric Access Controls.		
Topic - 4	**CRYPTOGRAPHY**	**9**
Foundations of Cryptology-Cipher Methods-Cryptographic Algorithms-Cryptographic Tools-Protocols for Secure Communications-Attacks on Cryptosystems.		
Topic - 5	**LEGAL, ETHICAL, AND PROFESSIONAL ISSUES IN INFORMATION SECURITY**	**9**
Law and Ethics in Information Security - General Computer Crime Laws - International Laws and Legal Bodies - Agreement on Trade-Related Aspects of Intellectual Property Rights - Digital Millennium Copyright Act (DMCA) - Ethics and Information Security-Codes of Ethics and Professional Organizations.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Michael E Whitman, Herbert J Mattord , Principles of Information Security ,Sixth Edition,Cengage Learning,2017.
2	Mark Stamp, Information Security : Principles and Practices, Wiley ,Second edition,2011
3	William Stallings, Cryptography and Network Security: Principles and Practice, Prentice Hall of India/Pearson Education, New Delhi, 2007.
4	Charles B.fleeger and Shari Lawrence Pfleeger, Security in Computing, Pearson Education, 2014.
5	Dieter Gollmann, Computer Security, John Wiley & Sons Ltd., 2011.

OTHER REFERENCES	
1	https://www.bmc.com/blogs/introduction-to-information-security-management-systems-isms/
2	https://www.youtube.com/watch?v=WhxHO7aInMU
3	https://www.youtube.com/watch?v=fIETyoJKGXw
4	https://www.youtube.com/watch?v=XsgNlriPs40
5	https://www.youtube.com/watch?v=bNhIfHhrklo

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech-IT	20IT7E3	DIGITAL MARKETING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Relate to digital media marketing and the need for analytics on the data captured.	K1	1
CO2	Choose the appropriate tools for performing different digital analytics on the digital marketing data.	K3	2
CO3	Analyze and appraise the outcomes of digital influence and listening.	K4	3
CO4	Develop a research plan and perform search analysis on the digital marketing data.	K3	4
CO5	Summarize the strategies for Mobile analytics and Business Intelligence	K2	5

PRE-REQUISITE	BIG DATA ANALYTICS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	2	2	3	3	3	3	3	-
CO2	2	-	-	-	2	-	2	2	3	3	-	3	3	-
CO3	2	-	-	-	-	-	2	2	3	3	-	3	-	-
CO4	3	2	-	-	2	-	2	2	3	3	3	3	2	3
CO5	3	-	-	-	-	-	2	2	3	3	-	3	2	-

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**DIGITAL MEDIA AND ANALYTICS**	**9**
Digital media types – Owned and earned social metrics – Paid searches and Organic Searches – Aligning Digital and Traditional Analytics – Identifying social media listening tools – Understanding social media engagement software – Social media engagement tools.		
Topic - 2	**TOOLS FOR DIGITAL ANALYTICS**	**9**
Social Media Listening Tools - Evolution, Social analytics life cycle, Social media monitoring software: Sysomos, Radian6, Visible Technologies, Zoho social and others. Search Analytics Tools – Basics of search, Search analytics use cases, Search data, Google trends, YouTube trends, Google Adwords keyword, Yahoo clues, and Collecting insights through search data. Audience Analysis Tools – Audience Analysis Use Cases, Audience analysis tool types – Audience analysis Techniques, Event Triggers. Content Analysis Tools - Content Audits-Optimizing Content Distribution, Analysing Content Consumption. Engagement Analysis Tools – Social Media Engagement Software (SMES), using SMES, study of different SMES in the market.		
Topic - 3	**DIGITAL INFLUENCE AND LISTENING**	**9**
Reality of Digital Influence - Media List - Klout, PeerIndex - Online Versus Offline Influence - Using the Influencer List - Developing Social Media Listening Program - Using Listening Data for Program Planning - Implementing Listening Program - Conversation Audit - Online Influencers - Conducting Social brand benchmarking - Use of Online data for crisis anticipation - Identifying known issues - Crisis day monitoring and ongoing reporting - Corrections after crisis - Improving customer service - Social customer service conflict - Social customer service models.		
Topic - 4	**RESEARCH PLAN AND SEARCH ANALYSIS**	**9**
Launching new product – Product life cycle – Introduction Phase – Growth Phase – Maturity Phase. Formulating research plan – Developing source list – Research methods – Constructing reports – Delivering reports – Report use cases – Building central repository of information – Search analytics for digital strategy – Search analytics for content strategy and planning – Search analytics for paid advertising.		
Topic - 5	**ROI, MOBILE ANAYTICS AND BUSINESS INTELLIGENCE**	**9**
Return on Investment (ROI) – Return on Engagement, Influence, Experience – Tracking ROI – Understanding measurement fundamentals – Measurement reporting cadence - Mobile Analytics – Mobile market landscape – Mobile marketing measurement – Marketing activities – Audience/visitor metric – Mobile app performance - Social CRM – Social CRM initiative – Social CRM Initiative - Future of Digital Data – Business Intelligence		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Chuck Hemann and Ken Burbary, “Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World”, Que Publishing, 1 edition, ISBN-13: 978-0789750303, 2013.
2	Simon Kingsnorth, “Digital Marketing Strategy: An Integrated Approach to Online Marketing”, Kogan Page Publisher, First edition, ISBN-13: 978-0749474706, 2016.
3	Dave Chaffey, Fiona Ellis-Chadwick, “Digital Marketing – Strategy, Implementation and Practice”, Pearson Education, Sixth edition, ISBN-13: 978-1292077611, 2016.

4	Eric Enge, Andy Crestodina, Larry Kim, Steve Rayson and Chad White, "How the Pros Turn Marketing Analytics Into Effective Marketing Strategies", Alexa, An Amazon Company. https://blog.alexa.com/wp-content/uploads/2016/12/How-to-Pros-Turn-MarketingAnalytics-into-Effective-Marketing-Strategies-ebook.pdf

OTHER REFERENCES	
1	https://www.coursera.org/learn/marketing-analytic
2	https://blog.hubspot.com/marketing/what-is-digital-marketing
3	https://www.youtube.com/watch?v=bixR-KIJKYM
4	https://www.youtube.com/watch?v=ZVuHLPl69mM
5	https://www.hubspot.com/digital-marketing

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech-IT	20IT7E4	SOTWARE QUALITY ASSURANCE	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Outline different approaches to testing software applications	K2	1
CO2	Analyze specifications and identify appropriate test generation strategies	K4	2
CO3	Develop an appropriate test design for a given test object	K4	3
CO4	Identify applicable measurements for the verification and validation effort	K3	4
CO5	Examine the testing effort based on adequate measures	K4	5

PRE-REQUISITE	SOFTWARE PROJECT MANAGEMENT

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			3	2		2	2	3	3	2	3	3	
CO2	3		3			2	2	2	3	3		3		
CO3			2				2	2	3	3	2	3		3
CO4	2						2	2	3	3		3	2	
CO5	2						2	2	3	3	3	3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**9**
Introduction – Views on quality – Cost of quality - Quality models – Quality frameworks – Verification and Validation – Defect taxonomy – Defect management – Statistics and measurements – IEEE standards – Quality assurance and control processes.		
Topic - 2	**VERIFICATION**	**9**
Introduction – Verification techniques – Inspections, reviews, walk-throughs – Case studies.		
Topic - 3	**TEST GENERATION**	**9**
Software testing- Validation – Test plan – Test cases - Test Generation – Equivalence partitioning – Boundary value analysis – Category partition method – Combinatorial generation - Decision tables – Examples and Case studies.		
Topic - 4	**STRUCTURAL TESTING**	**9**
Introduction – Test adequacy criteria – Control flow graph – Coverages: block, conditions, multiple conditions, MC/DC, path – Data flow graph – Definition and use coverages – C-use, P-use, Def- clear, Def-use – Finite state machines – Transition coverage – Fault based testing – Mutation analysis – Case studies.		
Topic - 5	**FUNCTIONAL TESTING**	**9**
Introduction – Test adequacy criteria - Test cases from use cases – Exploratory testing - Integration, system, acceptance, regression testing – Testing for specific attributes: Performance, load and stress testing – Usability testing – Security testing - Test automation – Test oracles.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Boriz Beizer, "Software Testing Techniques", 2nd Edition, DreamTech, 2009.
2	Aditya P. Mathur, "Foundations of Software Testing", Pearson, 2008.
3	Mauro Pezze and Michal Young, "Software Testing and Analysis. Process, Principles, and Techniques", John Wiley 2008.
4	Stephen H. Kan, "Metrics and Models in Software Quality Engineering", 2nd Edition, Pearson, 2003.
5	Kshirasagar Naik and Priyadarshi Tripathy (Eds), "Software Testing and Quality Assurance: Theory and Practice", John Wiley, 2008.

OTHER REFERENCES	
1	"Combinatorial Methods in Software Testing", tp://csrc.nist.gov/groups/SNS/acts/index.html
2	https://www.youtube.com/watch?v=5_cTi5xBlYg
3	https://www.youtube.com/watch?v=NfPxruCo1kg
4	https://www.youtube.com/watch?v=tj2LwVZ6NX4
5	https://www.bmc.com/blogs/quality-assurance-software-testing/

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech., IT	20IT7T1	BLOCK CHAIN FUNDAMENTALS	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify and explain the key benefits of block chain for a business or a network environment	K3	1
CO2	Classify the components of block chain, explain the roles of the components in developing block chain system and build a new revenue streams to a given business scenario	K4	2
CO3	Discover the core components of Bitcoin Network with the necessary scriplets and Design a Bitcoin Wallet for a given P2P network specification.	K4	3
CO4	Develop Ethereum Eco system, Ethereum Virtual Machine and Encoding schemes and Develop a DApp for a given business model.	K3	4
CO5	Apply the given business model and critique the strengths and flaws of block chain implementation..	K3	5

PRE-REQUISITE	COMPUTER NETWORKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2			2	2	3	3		3	2	2
CO2	3	3	2	2		2	2	2	3	3		3		3
CO3			2				2	2	3	3		3	3	
CO4		2	2				2	2	3	3		3		
CO5				2		3	2	2	3	3		3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar and tutorials
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**GETTING STARTED WITH BLOCK CHAIN**	**9+3**
What is Blockchain – Centralized Vs. Decentralized Systems – Layers of Blockchain – Why is Blockchain Important – Blockchain uses and Use Cases.		
Topic - 2	**WORKING OF BLOCK CHAIN**	**9+3**
Blockchain foundation – Cryptography – Game Theory – Merkle Trees – Properties of Blockchain solutions – Blockchain Transactions – Distributed Consensus Mechanisms – Blockchain Applications – Scaling Blockchain		
Topic - 3	**WORKING OF BITCOIN**	**9+3**
History of Money – Dawn of Bitcoin – The Bitcoin Blockchain – The Bitcoin Network – Bitcoin Scripts – Full Nodes vs SPVs – Bitcoin Wallets..		
Topic - 4	**WORKING OF ETHERIUM**	**9+3**
From Bitcoin to Ethereum – Ethereum Blockchain – Merkle Patricia Tree – RLP Encoding – Ethereum Transaction and Message Structure – State Transaction Function – Gas and Transaction Cost – Smart Contracts – Ethereum Virtual Machine – Ethereum Ecosystem : Swarm – Whisper – DApp – Development Components Hands-On Case study: DApp – Setting up a Private Ethereum Network: Install go-etherum – Create geth Data directory – Create a geth account		
Topic - 5	**ENTERPRISE BLOCKCHAIN AND ITS CHALLENGES**	**9+3**
Blockchain Vs Distributed Databases, How does an enterprise view blockchain?, Types of blockchain technology, what is blockchain in business?, Blockchain for business – how does the blockchain work?, Business benefits of blockchain, Example use cases, Challenges in enterprise adoption, Hyperledger, Corda, Example Enterprise Applications.		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda, “Beginning Blockchain – A Beginner’s Guide to Building Blockchain Solutions”,Apress Publication, 2018.
2	Manav Gupta, “Blockchain for the Enterprise: the definitive guide to adoption of blockchain in the enterprise”, ISBN-10:1999387104, 2018
3	Andreas M. Antonopoulos ,” Mastering Bitcoin – Programming the Open Blockchain”, O’Reilly Publication,2017
4	Michael J. Casey and Paul Vigna , “The Truth Machine – The Blockchain and the Future of Everything”,St.Martin’s Press,2018
5	William Mougayar, “The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology”, Wiley Edition, 2016

OTHER REFERENCES	
1	https://www.investopedia.com/terms/b/blockchain.asp
2	https://www.youtube.com/watch?v=SSo_EIwHSd4&vl=en
3	https://www.investopedia.com/articles/investing/031416/bitcoin-vs-ethereum-driven-different-purposes.asp

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech-IT	20IT7E5	PRIVACY AND SECURITY IN IOT	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify the requirements needed for a given IoT applications referring the IoT framework.	K2	1
CO2	Analyse the pre requites to perform Fog networking for a given application.	K4	2
CO3	Identify suitable IoT service, platform or model to deploy for a given IoT application.	K2	3
CO4	Analyze the IoT standards IEEE, IETF, ITU, IPSO, OCF, IIC, ETSI and criticize the role of open source in IoT considering the consumers' perception of the open source projects.	K4	4
CO5	Analyze the security functions and privacy requirements to adapt for a given IoT application.	K4	5

PRE-REQUISITE	INTERNET OF THINGS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2				2	2	3	3		3	3	3
CO2	3	3		2			2	2	3	3		3	2	3
CO3	3	3	2	3			2	2	3	3		3	3	3
CO4	3	3		3			2	2	3	3		3	2	
CO5	3	2	2				2	2	3	3		3	3	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**IOT EVOLUTION AND REQUIREMENTS**	**9**
IoT overview–IoT reference Framework – Factors for emerging IoT–Internet in IoT–The things in IoT– IoT requirements for Networking Protocols.		
Topic - 2	**IOT PROTOCOL STACK AND FOG COMPUTING**	**9**
IoT protocol stack: Link layer–Internet layer–Application Protocol layer–Application Services Layer–Fog Computing: Definition–Drivers for Fog–Characteristics of Fog–Enabling Technologies and prerequisites.		
Topic - 3	**IOT SERVICES PLATFORMS AND MODEL**	**9**
IoT Service platform functions–IoT Platform manager–Entities, services and location–Communication manager–Data Management and Repository–Element Manger–Firmware Manager–Topology manager–Group manger–API manger–IoT Service model: Anything as a Service.		
Topic - 4	**VERTICAL MARKETS,STANDARDS AND ROLE OF OPEN SOURCE IN IOT**	**9**
IoT verticals–Industry organizations and Standards overview–IEEE,IETF,ITU,IPSO,OCF,IIC,ETSI and oneM2M–Role of Open source: Open source movement–open source Versus Standards–Open source partnering with standards–A tour of open source activities in IoT.		
Topic - 5	**IOT SECURITY AND PRIVACY**	**9**
Introduction–IoT security challenges – Security requirements–Three domain architecture– Cloud, fog and sensing domains attacks and countermeasures.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Ammar Rayes, Samer Salam, “Internet of Things from Hype to Reality: The Road to Digitization”,Springer, First edition, 2017.
2	Batalla, J.M, Mastorakis G., Mavromoustakis C.X, Pallis E, “Beyond the Internet of Things”, Springer, 2017.
3	Rajkumar Buyya, Amir Vahid Dastjerdi , “Internet of Things: Principles and Paradigms”,Elsevier,2016.
4	Mukhopadhyay, Subhas Chandra, “ Internet of Things- Challenges and Opportunities”,Springer, 2014.

OTHER REFERENCES	
1	https://nptel.ac.in/courses/106/105/106105166/, “Introduction to Internet of Things”, Prof. Sudip Misra, Department of Computer Science and Engineering, IIT, Kharagpur.
2	https://www.techtarget.com/iotagenda/definition/IoT-security-Internet-of-Things-security
3	https://www.youtube.com/watch?v=Fki7MCRWgdo
4	https://www.youtube.com/watch?v=jw4jmHEEXkk
5	https://www.youtube.com/watch?v=OIPU-WQobZs

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech. IT	20IT7E6	CRYPTOGRAPHY AND NETWORK SECURITY	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Analyze the basic concepts of network security	K4	1
CO2	Identify the types of symmetric ciphers and its principles	K3	2
CO3	Classify the types of Asymmetric ciphers and its principles	K2	3
CO4	Develop Algorithms for data integration	K3	4
CO5	Explain the privacy issues and Use the procedures in internet security	K2	5

PRE-REQUISITE	COMPUTER NETWORKS, INTERNET PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3						2	2	3	3		3		3
CO2	3	2	3	3			2	2	3	3		3	3	2
CO3	3	2	2	2			2	2	3	3		3		
CO4	3	3	3	3			2	2	3	3		3	2	2
CO5	3	3	2			3	2	2	3	3		3	3	2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**9**
Computer security concepts - OSI security architecture - security attacks service mechanism - model for network security – classical encryption techniques – Block cipher principles.		
Topic - 2	**SYMMETRIC CIPHERS**	**9**
Data encryption standard – block cipher operations – cipher block chaining mode – advanced encryption standard – double DES – triple DES – round function – key expansion		
Topic - 3	**ASYMMETRIC CIPHERS AND KEY MANAGEMENT**	**9**
Primary numbers – testing for primality – public key cryptography RSA – distribution of public keys – key management and distribution – public key infrastructure – symmetric key distribution using asymmetric encryption-Block cipher operation-electronic code book		
Topic - 4	**CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS**	**9**
Cryptographic hash functions – application – two simple hash functions – requirements and security hash functions based on cipher block chaining –secure hash algorithm (SHA) – SHA – 3 – message authentication codes-Digital principle and authentication protocols.		
Topic - 5	**NETWORK AND INTERNET SECURITY**	**9**
Transport level security – web security issues – secure socket layer (SSL) – transport layer security (TLS) – HTTPS – Secure shell – pretty good privacy (PGP) – firewalls – IP security-E commerce		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	William Stallings, Cryptography and Network security Principles and Practices, 5th edition, Pearson Education, 2010
2	William Stallings, Network security essentials Ã¢?? application and standards, Prentice Hall of India , 2010
3	Charles P.Fleeger, Shari Lawrence P.Fleeger, Security in computing, Prentice Hall of India, 2009
4	W. Mao, Modern Cryptography Ã¢?? Theory and Practice, Pearson Education, 2007
5	Wade Trappe, Lawrence C Washington, Introduction to Cryptography with coding theory, Pearson Education, 2007

OTHR REFERENCES	
1	https://www.notesforgeeks.in/2021/07/cs8792-cryptography-and-network-security-syllabus-2017-regulation.html
2	https://www.studocu.com/in/document/anna-university/cryptography-and-network-security/cs8792-cryptography-and-network-security/8876690
3	https://cse-r17.blogspot.com/2020/09/cs8792-cryptography-and-network.html
4	https://padeepz.net/cs6701-syllabus-cryptography-and-network-security-regulation-2013-anna-university/
5	https://www.rejinpaul.com/2016/07/cs6701-cryptography-and-network-security-syllabus-notes-question-bank-with-answers.html

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech-IT	20IT7E7	COMPUTER VISION	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate different image representation, their mathematical representation and different their data structures used.	K2	1
CO2	Compare different segmentation algorithm for given input.	K2	2
CO3	Choose 3D object from given set of images.	K3	3
CO4	Plan a moving object in video using the concept of motion analysis.	K3	4
CO5	Examine the object using the concept of computer vision.	K4	5

PRE-REQUISITE	GRAPHICS AND MULTIMEDIA

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		2		2	2	3	3		3	3	3
CO2	3	3		3	2		2	2	3	3		3	2	
CO3	3	3		3			2	2	3	3		3		2
CO4	3	3	2	3			2	2	3	3		3	3	
CO5	3	3		3			2	2	3	3		3	2	3

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**IMAGE ITS REPRESENTATIONS AND PROPERTIES**	**9**
The image, its representations and properties – image representations a few concepts, Image digitization, Digital image properties, Color images, Camera's : an overview. Mathematical and physical background – Linear integral transforms, Images as stochastic processes, Image formation physics.		
Topic - 2	**DATA STRUCTURES FOR IMAGE ANALYSIS**	**9**
Data structures for image analysis- levels of image data representation, traditional image data structures, and Hierarchical data structures. Image understanding-fitting via random sample consensus, point distribution model.		
Topic - 3	**SEGMENTATION II**	**9**
Segmentation II – Mean Shift Segmentation , Active contour models – snakes, Geometric deformable model – level sets and geodesic active contours, Fuzzy connectivity, Towards 3D graph – based image segmentation, Graph cut segmentation.		
Topic - 4	**3D VISION GEOMETRY**	**9**
3 D Vision Geometry – 3 D Vision tasks, basics of projective geometry, A Single perspective camera, Scene reconstruction from multiple views, two camera stereopsis, Use of 3D vision Shape from X, Full 3D objects, 3D model-based vision, 2D view based representations of a 3D scene.		
Topic - 5	**MOTION ANALYSIS**	**9**
Motion Analysis- Different Motion Analysis methods, Optical flow, analysis based on correspondence of interest points, Detection of specific motion patterns, video tracking.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Milan Sonka, Vaclav Hlavac, Roger Boyle, "Digital Image Processing and Computer Vision" Cengage Learning, 1st Edition, 2008.
2	Digital image processing, by Gonzales Woods 3rd Edition, Pearson Education.
3	Fundamental of Digital Image Processing by Anil K. Jain, PHI Pub.

OTHER REFERENCES	
1	https://onlinecourses.nptel.ac.in/noc21_ee23/preview
2	https://www.youtube.com/watch?v=xhr_o4S-_zg
3	https://www.youtube.com/watch?v=pRSpp4EUL3A
4	https://www.youtube.com/watch?v=OcycT1Jwsns
5	https://www.youtube.com/watch?v=715uLCHt4jE

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech., IT	20IT7LT1	INFORMATION SECURITY	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify the security principles and components in information management using security SDLC for a business environment.	K3	1
CO2	Analyze the security threats and attacks and apply a security policy to overcome the threats in a given environment.	K4	2
CO3	Identify and analyze risk factors, vulnerabilities to provide a security solution for managing the risks.	K3	3
CO4	Compare the security models and frameworks and use best practices and standards to develop a security policy for an organization	K4	4
CO5	Apply security technologies for informational protection in an organization.	K3	5

PRE-REQUISITE	COMPUTER NETWORKS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3				1	3	3	2	3		3
CO2		2	2	2				1	3	3		3	2	3
CO3	3	3	2				2	1	3	3	2	3		2
CO4	2	2	3					1	3	3		3	2	
CO5	2	2	2	3				1	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**SECURITY REQUIREMENTS AND SECURE SDLC**	**6**
What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.		
Topic - 2	**SECURITY INVESTIGATION**	**6**
Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues – An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies		
Topic - 3	**SECURITY ANALYSIS**	**6**
Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem.		
Topic - 4	**LOGICAL DESIGN**	**6**
Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.		
Topic - 5	**PHYSICAL DESIGN**	**6**
Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

LIST OF EXPERIMENTS	
1	Implement Ceaser Cipher
2	Implement Affine Cipher with equation c=3x+12
3	Implement Play fair Cipher with key entered by user.
4	Implement poly alphabetic Cipher
5	Implement Auto Key Cipher
6	Implement Hill Cipher.
7	Implement Rail fence technique
8	Implement Simple Columner Transposition technique
9	Implement Advanced Columner Transposition technique
10	Implement Simple RSA Algorithm with small numbers.

11	Implement Simplified DES
12	Make a study of one IDS (For ex. Snort)
13	Installation of rootkits and study about the variety of options
14	Setup a honey pot and monitor the honeypot on network (KF Sensor)
15	Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG)

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda, "Beginning Blockchain – A Beginner's Guide to Building Blockchain Solutions",Apress Publication, 2018.
2	Manav Gupta, "Blockchain for the Enterprise: the definitive guide to adoption of blockchain in the enterprise", ISBN-10:1999387104, 2018
3	Andreas M. Antonopoulos ," Mastering Bitcoin – Programming the Open Blockchain", O'Reilly Publication,2017
4	Michael J. Casey and Paul Vigna , "The Truth Machine – The Blockchain and the Future of Everything",St.Martin's Press,2018
5	William Mougayar, "The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology", Wiley Edition, 2016

OTHER REFERENCES	
1	https://www.investopedia.com/terms/b/blockchain.asp
2	https://www.youtube.com/watch?v=SSo_EIwHSd4&vl=en
3	https://www.investopedia.com/articles/investing/031416/bitcoin-vs-ethereum-driven-different-purposes.asp

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech., IT	20IT7LT2	ADVANCED JAVA PROGRAMMING	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Examine the basic structure of Java program.	K4	1
CO2	Apply various types of inheritance and packages under different accessibility.	K3	2
CO3	Discover the concept of interfaces, exceptions and multithreading nature of Java	K4	3
CO4	Develop applications in Java with files and Strings handling	K3	4
CO5	Develop desktop based java applications using Java Applet, AWT and its components	K3	5

PRE-REQUISITE	OBJECT ORIENTED PROGRAMMING WITH JAVA

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3				1	3	3		3	2	3
CO2	2	2					2	1	3	3	3	3		2
CO3	2	2	2					1	3	3		3		
CO4		3	3	2				1	3	3	2	3		2
CO5	2				2	3	2	1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**JAVA BASICS**	**6**
The Genesis of Java - Overview of Java - Data Types, Variables, and Arrays - Operators - Control Statements - Introducing Classes - Methods and Classes. I/O Basics - Reading Console Input -Writing Console output.		
Topic - 2	**INHERITANCE AND PACKAGES**	**6**
Inheritance: Basics - Using Super - Creating a Multilevel Hierarchy - Method overriding - Using Abstract Classes - Packages and Interfaces: Packages - Access Protection - Importing Packages		
Topic - 3	**INTERFACES, EXCEPTIONS AND THREAD**	**6**
Interfaces Definitions and Implementations - Exception Handling: Types - Try and Catch - Throw - Multi-threaded Programming: Creating Threads - Inter Thread Communication.		
Topic - 4	**STRING HANDLING AND FILES**	**6**
File - The Byte Streams - The Character Streams - Using Stream I/ O - Serialization. String Handling: Special String operations and Methods - String Buffer - Exploring java.lang: Simple type Wrappers - System - Math - Utility Classes: String Tokenizer - Date and Time - Collection Interfaces -Collection Classes		
Topic - 5	**APPLETS, EVENT HANDLING AND AWT**	**6**
Applet Basics - Applet Architecture - Applet Display Methods - Event Handling Mechanisms - Event Classes - Event Listener - Working with Windows , Graphics , Colors and Fonts - AWT Controls - Layout Managers and Menus - JDBC Concepts		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

LIST OF EXPERIMENTS	
1	The retail store management wants to automate the process of generating the bill amount for its customers. Assume that there is only one customer and one item purchased by the customer. The business rules/constraints are given below: 1. The item ids of the items sold by the retail store are 5001, 5002, 5003, 5004 and 5005 2. Quantity purchased by the customer must be greater than 0 and less than 5. Item price must be minimum Rs. 5. 3. If the constraints mentioned in 1, 2 and 3 are satisfied, bill amount must be calculated based on the quantity purchased and item price. 4. Otherwise appropriated error message(s) must be displayed.
2	In the happy shopping retail application, there are many customers who visit the retail store to purchase various items. The shop wants to maintain the details of the customers. Let us assume as of now there are 3 customers (John, Ally and Roy) and the details include customer name, customer id, telephone number and address. Customer ID must be generated automatically by the application itself. Write java program for the scenario using classes and objects
3	Programs to demonstrate the concept of reusability in java with inheritance and interfaces
4	Happy shopping retail store wants to display the customer information. The information depends on the type of customer (Regular and Privileged Customer).Generate the customerId for the customers

	in the constructor of customer class. In Regular Customer class, initialize the discount value using constructor. In Privileged Customer class, initialize the membership card type(Gold or Silver) in the constructor. The developer wants to write a single method that would display all the customer information. Assume customerId, discount and cardType are private members in the respective classes.
5	The happy learning school maintains the details of the students in the Student management Application. The details such as email Id and telephone number must be validated before it is updated in the database using the criteria that the email Id should has exactly one '@' sign and only one '.' after '@'. Also check the total number of digits in mobile number must be 10.
6	Programs for packages and exceptions.
7	IBB bank wants to maintain the account of customers. Transactions such as deposit some amount to an account and withdraw some amount from an account are possible. Now, for a given account, if two or more transactions occur simultaneously, then only one transaction should be allowed at a time instead of simultaneous transaction processing in order to avoid data inconsistency. Write a java program to synchronize the transaction.
8	Program to store and manipulate data using ArrayList
9	Develop a java classwith a instance variable 'CountryMap' HashMap(M1) and add a method saveCountryCapital(String CountryName, String capital). This method should insert the passed country and capital as key/value in the map M1 and return the Map (M1). Develop a method getCapital (String CountryName) which returns the capital for the country passed from the Map M1.
10	. Implement the following using Java Database Connectivity a) Library Management System b) Course Registration Systemc) Online Reservation System
11	A) Write a Java program that implements a simple client/server application. The client sends data to a server. The server receives the data, uses it to produce a result, and then sends the result back to the client. The client displays the result on the console. For ex: The data sent from the client is the radius of a circle, and the result produced by the server is the area of the circle. (Use java.net) B) Write a Java program to retrieve the information from the given URL? (Note: Read the URL from Command Line Arguments).
12	Write a java program to create a sample TCP chat application where client and server can chat with each other?
13	Installation of Apache Tomcat webserver.
14	A) Write a java Program to create a simple servlet and run it using tomcat server. B) Write a java Program to create a servlet to read information from client Registration page?
15	A) Write a java Program to create a JSP page to display a simple message along with current Date? B) Write a java Program to create a JSP page to display the random number?

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Herbert Schildt, Java 2-Complete Reference, Tata Mc Graw Hill, 2015
2	Deitel & Deitel, Java How to Program, Prentice Hall of India, 2010
3	Gary Cornell and Cay S.Horstmann, Core Java Vol.1 and Vol.2, Sun Microsystems Press, 2008
4	Jeff Linwood and Dave Minter, Beginning Hibernate Second Edition, Apress 2010
5	Rod Johnson, Juergen Hoeller, Alef Arendsen, Thomas Risberg, Colin Sampaleanu, Java Development with the Spring Framework, Wiley-India, 2012

OTHER REFERENCES	
1	https://www.tutorialspoint.com/java/java_overview.htm
2	https://www.tutorialride.com/core-java/packages-interfaces-in-java.htm
3	https://www.youtube.com/watch?v=U_wTP8L8_9Y
4	https://www.youtube.com/watch?v=YEzX3l6PXCk

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.Tech., IT	HX8001	Professional Readiness for Innovation, Employability and Entrepreneurship	0	0	6	3

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Intelligent Systems Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Utilize an writing tool in AI for paraphrasing and text manipulations
2	Demonstrate an image generator AI tool to induce the user creativity
3	Construct an Art tool in AI for inducing the user creativity
4	Implement an Logo generator tool in AI for various logo creations
5	Apply a website developing AI tool for creating an appealing website for a customer:
6	Implement any SEO Tool to create a beneficial blog for the viewers
7	Analyze Breadth First Search using PYTHON program(BFS)
8	Develop a PYTHON program to implement Depth First Search (DFS)
9	Implement Backtracking Search using PYTHON program
10	Create a PYTHON program for job scheduling
11	Create a Video by using video generator AI tool
12	Implement a productivity AI tool for mind mapping brain storming and work flows by using GIT mind AI

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**45**		**TOTAL**	**45**

BOOK REFERENCES	
1	Intelligent Systems Laboratory Manual, Al-Ameen Publications, 2020
2	https://onlinelibrary.wiley.com/toc/26404567/2022/4/4

OTHER REFERENCES	
1	https://www.iitk.ac.in/ee/intelligent-systems-laboratory
2	https://mksaad.wordpress.com/2019/02/05/artificial-intelligence/
3	https://mrcet.com/LaboratoryManuals.html

SEMESTER VIII

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
LABORATORY COURSES									
1	20IT8L2	Internship in Industry	EEC	100	-	4 Weeks			3
2	20IT8L1	Project Work	EEC	50	50	0	0	20	10
Total						**0**	**0**	**20**	**13**

OPEN ELECTIVES (OE) OFFERED BY THE DEPARTMENT

Sl. No.	Course Code	Course Title	L	T	P	C
1.	20CSO01	Object Oriented Programming Using Java	3	0	0	3
2.	20CSO02	Computer Architecture	3	0	0	3
3.	20CSO03	Data Structures	3	0	0	3
4.	20CSO04	Operating Systems	3	0	0	3
5	20CSCT5	Python Programming	3	0	0	3
6	20CSO06	Cloud Computing	3	0	0	3
7	20CSO07	Artificial Intelligence	3	0	0	3
8	20IT6T1	Big Data Analytics	3	0	0	3
9	20CSO09	Internet of Things	3	0	0	3

Semester	Programme	Course Code	Course Name	L	T	P	C
		20CSO01	OBJECT ORIENTED PROGRAMMING USING JAVA	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
Upon completion of the course, students will be able to		**RBT Level**	**Topics Covered**
CO1	Apply a Java program for the given problem statement using operator, arrays, classes and methods.	K3	1
CO2	Develop solution for a given problem using Inheritance and Packages to achieve reusability and implement exception handling code to handle the run time errors.	K3	2
CO3	Inspect a Java code for the given problem statement using String handling functions and I/O streams.	K4	3
CO4	Compare an applet for a given scenario to embed dynamic content in the web page	K4	4
CO5	Apply a simple GUI application for a given scenario using AWT components and to access the backend Database using JDBC.	K3	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2					1	3	3		3		2
CO2		2	1	2	2		1	1	3	3	1	3	1	
CO3		1						1	3	3	3	3	2	3
CO4	1		1	3			1	1	3	3		3	2	2
CO5	1	2	3		3		1	1	3	3	1	3		1

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**OVERVIEW OF JAVA**	**9**
Concepts of Object Oriented Programming – An Overview of Java – Data types, Variables and Arrays – Operators – Control statements – Classes – Methods..		
Topic - 2	**INHERITANCE AND EXCEPTION HANDLING**	**9**
Inheritance: Basics – Super keyword – Method Overriding – Dynamic Method dispatch – Abstract classes – final keyword. Packages and Interfaces: Packages – Access protection – Importing Packages – Interfaces - Exception Handling		
Topic - 3	**STRING HANDLING AND I/O**	**9**
Multithreading - String Handling: String Constructors – Special String Operations – Character Extraction – String comparison – Searching and Modifying a String – String Buffer – String Tokenizer. Input/Output: The Stream Classes – The Byte Streams – The Character Streams – Serialization.		
Topic - 4	**COLLECTIONS**	**9**
Collections: List – Array List – Set – Hash Set – Tree Set- Queue – Priority Queue - Map – Hash Map – Iterator – Enumerator- Wrapper Classes- Auto boxing and Un boxing- Regular Expressions.		
Topic - 5	**STREAM API AND JDBC**	**9**
Lambda Expression – Lambda Parameters - Functional Interfaces - Creating Thread- Stream API – Creating Java streams - Intermediate Operations: map – filter – sort – Terminal Operations: Collect – reduce – for each - try with resources. Java Database Connectivity - Manipulating Databases with JDBC.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Herbert Schildt, “Java - The Complete Reference”, Ninth Edition, McGraw-Hill Education, 2014.
2	Rajkumar Buyya, S Thamarai Selvi, Xingchen Chu, “Object Oriented Programming with Java – Essentials and Applications”, McGraw-Hill Education, 2009..
3	Paul Deitel, Harvey Deitel, “Java How to Program”, Prentice Hall, Tenth Edition, 2014
4	Kathy Sierra, Bert Bates, “Head First Java”, Second Edition, O'Reilly Media, 2005..
5	“Java 6 Programming Black Book”, Kogent Learning Solutions Inc.,2007.

OTHER REFERENCES	
1	http://www.nptelvideos.com/video.php?id=1471&c=15
2	http://nptel.ac.in/courses/106105084/30,Java Programming, Prof. Indranil Sengupta, IIT kharagpur

Semester	Programme	Course Code	Course Name	L	T	P	C
		20CSO02	COMPUTER ARCHITECTURE	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
Upon completion of the course, students will be able to		**RBT Level**	**Topics Covered**
CO1	Analyze the performance and describe the instruction set using different addressing modes for a given computer architecture and organization.	K4	1
CO2	Develop the arithmetic operations involving addition, subtraction, division, multiplication and floating point number operations for a given computer organization.	K3	2
CO3	Classify the data path and describe the effect of data hazard, control hazard for a given pipeline processor.	K4	3
CO4	Apply the memory hierarchy and analyze the operation of cache memory for a given computer organization	K3	4
CO5	Compare the standard I/O interfaces and data transfer techniques to access I/O devices for the given computer system.	K4	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2					1	3	3		3		2
CO2		2	1	2	2		1	1	3	3	1	3	1	
CO3		1						1	3	3	3	3	2	3
CO4	1		1	3			1	1	3	3		3	2	2
CO5	1	2	3		3		1	1	3	3	1	3		1

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**BASIC STRUCTURE OF COMPUTERS**	**9**
Functional Units – Basic Operational Concepts– Bus Structures - Instruction Set Architecture–RISC – CISC – Instructions and Instruction Sequencing– Addressing modes– Performance and Metrics.		
Topic - 2	**ARITHMETIC OPERATIONS**	**9**
Addition and Subtraction – Design of Fast Adders – Signed operand Multiplication – Fast Multiplication - Integer Division – Floating Point Numbers and Operations		
Topic - 3	**PROCESSOR AND CONTROL UNIT**	**9**
Basic concepts –Role of Cache Memory – Pipelining Performance – Types of Hazards- Data hazards – Instruction Hazards (prediction) – Data path and Control Considerations.		
Topic - 4	**MEMORY SYSTEMS**	**9**
Memory hierarchy – Speed , Size and Cost – Semiconductor RAM – ROM–Cache Memory – Mapping FUNCTIONS – Replacement Algorithms – Measuring Cache Performance.		
Topic - 5	**I/O ORGANIZATION**	**9**
Accessing I/O devices – Programmed Input / Output – Interrupts – Direct Memory Access –Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB).		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	V.CarlHamacher, ZvonkoVaranesic and SafwatZaky, “Computer Organization“, 5 thEdition, McGraw-Hill Inc, 2012.
2	David A. Patterson and John L. Hennessey, “Computer organization and design“, Morgan Kauffman/ Elsevier, 5 th Edition, 2014.
3	M. Morris Mano, “Computer System Architecture”, 3rd Edition Pearson Education, 2017
4	William Stallings “Computer Organization and Architecture”, 10th Edition, Pearson Education, 2015.

OTHER REFERENCES	
1	http://nptel.ac.in/courses/106102062/1, “Computer Architecture”, Prof. Anshul Kumar, IIT-Delhi. .
2	http://nptel.ac.in/courses/106105084/30,Java Programming,Prof. Indranil Sengupta, IIT kharagpur

Semester	Programme	Course Code	Course Name	L	T	P	C
		20CSO03	DATA STRUCTURES	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
Upon completion of the course, students will be able to		**RBT Level**	**Topics Covered**
CO1	List ADT for a given list or table using array and linked list implementation by ensuring the ordering of data elements.	K4	1
CO2	Develop stack and queue ADT for a given list using array and linked list implementation and apply specific ADT for a given application	K3	2
CO3	Examine a tree for a given list of data by ensuring tree properties and analyze in order, preorder, post order traversal for a constructed tree.	K4	3
CO4	Discover a suitable shortest path algorithm for a given graph such that the sum of the edges weights is minimum.	K4	4
CO5	Apply a suitable searching and hashing algorithms for a given list of data considering the size and ordering of data.	K3	5

PRE-REQUISITE	**NIL**

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2					1	3	3		3		2
CO2		2	1	2	2		1	1	3	3	1	3	1	
CO3		1						1	3	3	3	3	2	3
CO4	1		1	3			1	1	3	3		3	2	2
CO5	1	2	3		3		1	1	3	3	1	3		1

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**LISTS**	**9**
Abstract Data Types (ADT) – List ADT – Array-Based Implementation – Linked List Implementation– Singly Linked Lists- Circularly Linked Lists -Doubly-Linked Lists – Applications of Lists.		
Topic - 2	**STACKS AND QUEUES**	**9**
Stack ADT – Queue ADT – Circular Queue – Applications of Stacks and Queues.		
Topic - 3	**TREES**	**9**
Preliminaries - Binary Trees - Binary Tree Traversal - Binary Search Trees- Expression Trees - AVL Trees-Binary Heap - Heap Sort		
Topic - 4	**GRAPHS**	**9**
Definitions–Graph Traversal- Topological Sort– Shortest-Path Algorithms: Unweighted Shortest PathsDijikstra's Algorithm– Minimum Spanning Tree– Prim's and Kruskal's Algorithms– Undirected Graphs		
Topic - 5	**SEARCHING AND HASHING**	**9**
Searching: Linear Search – Binary Search. Hashing – General idea-Hash Function- Separate Chaining – Open Addressing: Linear Probing – Quadratic Probing- Double Hashing.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	M. A. Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2015..
2	Richard F. Gilberg, and Behrouz A. Forouzan, "Data Structures - A Pseudocode Approach with C", Second Edition, Thomson Brooks/cole, 2011.
3	Reema Thareja, "Data Structures Using C", First Edition,Oxford University Press, 2011
4	ISRD Group, "Data Structures Using C", First Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2007.
5	" Data Structures through C, Yashwant Kanetkar, BPB Publications.

OTHER REFERENCES	
1	http://www.nptel.ac.in/courses/106102064, Introduction to data structure, Mr.Varma, IIT Bombay
2	http://nptel.ac.in/courses/106102064, Video Lectures, Data Structures and Algorithms, IIT Delhi.

Semester	Programme	Course Code	Course Name	L	T	P	C
		20CSO04	OPERATING SYSTEMS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
Upon completion of the course, students will be able to		**RBT Level**	**Topics Covered**
CO1	Construct the structure and functions of Operating Systems for multiuser environment considering Linux process and thread management as a case study.	K3	1
CO2	Explain the process scheduling algorithms for a given set of process considering the arrival time, burst time and resources	K2	2
CO3	Analyze the memory allocation techniques and page replacement algorithms for a given reference strings with minimum page fault..	K4	3
CO4	Analyze file allocation methods for efficient file organization considering Linux virtual file system as a case study.	K4	4
CO5	Examine the disk scheduling algorithms with minimum seek time for a given disk request and analyze the architecture of iOS and Android Mobile Operating Systems.	K4	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1					1	3	3		3		1
CO2		3		3			1	1	3	3	1	3	2	
CO3			2		3		1	1	3	3		3		3
CO4	2					2		1	3	3	2	3	2	
CO5		1					1	1	3	3	3	3		1

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	OPERATING SYSTEMS AND PROCESS MANAGEMENT	**9**
Operating System Overview: Objectives and Functions – Evolution of Operating Systems – Computer Organization – Operating System Operations – Services – System Calls – System Programs – Operating System Structure – OS Generation – System Boot. Processes: Process concept – Process scheduling – Operations on processes – Inter process communication – Threads: Overview – Multicore Programming – Multithreading Models. Case Study: Linux Process and Thread Management.		
Topic - 2	PROCESS SCHEDULING AND SYNCHRONIZATION	**9**
CPU Scheduling: Concepts – Scheduling criteria – Scheduling algorithms. Process Synchronization: The critical section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – Monitors. Deadlocks: System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock. Case Study: Linux Scheduling.		
Topic - 3	MEMORY MANAGEMENT	**9**
Main Memory: Background – Swapping – Contiguous memory allocation – Paging – Segmentation. Virtual Memory: Background – Demand paging – Page replacement – Allocation of frames – Thrashing. Case Study: Linux Memory Management.		
Topic - 4	FILE SYSTEMS	**9**
File-System Interface: File concept – Access methods – Directory and disk structure – File-system mounting – Sharing and Protection. File-System Implementation: Structure and Implementation – Directory implementation – Allocation methods – Free-space management. Case Study: Linux Virtual File System.		
Topic - 5	I/O SYSTEMS	**9**
I/O Systems: I/O Hardware - Mass Storage Structure: Overview, Disk Structure and Attachment - Disk Scheduling and Management – Swap-space management – RAID. Mobile OS:iOS and Android – Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2013.
2	William Stallings, “Operating Systems – Internals and Design Principles”, 7th Edition, Prentice Hall, 2011.
3	Andrew S. Tanenbaum, “Modern Operating Systems”, Third Edition, Pearson Education, 2009.
4	Harvey M. Deital, “Operating Systems”, Third Edition, Pearson Education, 2004.
5	D M Dhamdhere, “Operating Systems: A Concept-Based Approach”, 3rd Edition, Tata McGraw-Hill Education, 2007

OTHER REFERENCES	
1	http://nptel.ac.in/courses/106108101/ “Introduction to operating system”, Prof P.C.P. Bhatt , IISc-Bangalore
2	https://nptel.ac.in/courses/106106144/2/ “Introduction to operating system”, Prof Chester Rebeiro,IIT-Madras.

Semester	Programme	Course Code	Course Name	L	T	P	C
		20CSCT5	PYTHON PROGRAMMING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Classify and make use of python programming elements to solve and debug simple logical problems.	K2	1
CO2	Experiment with the various control statements in Python.	K3	2
CO3	Develop python programs using functions and strings.	K3	3
CO4	Experiment with the usage of pointers and functions.	K3	4
CO5	Analyze a problem and use appropriate packages and modules to solve it.	K4	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3			2	3	2	3	3	3	3	3		
CO2			2			3	2	3	3	3	3	3		
CO3			2			3	2	3	3	3	3	3		2
CO4			2		2	3	2	3	3	3	3	3	2	2
CO5	3	3	2			3	2	3	3	3	3	3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Mini Project
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT											
Topic - 1	**BASICS OF PYTHON PROGRAMMING**										**9**
Introduction - Python Interpreter - Interactive and script mode -Values and types, operators, expressions, statements, precedence of operators, Multiple assignments, comments.											
Topic - 2	**CONTROL STATEMENTS AND FUNCTIONS IN PYTHON**										**9**
Conditional (if), alternative (if-else), chained conditional (if-elif-else) – Iteration - while, for, break, continue, pass – Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Lambda functions.											
Topic - 3	**DATA STRUCTURES: STRINGS,LISTSAND SETS**										**9**
Strings - String slices, immutability, string methods and operations –Lists - creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions - list processing - list comprehension, searching and sorting, Sets - creating sets, set operations											
Topic - 4	**DATA STRUCTURE STUPLES, DICTIONARIES**										**9**
Tuples - Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value – Dictionaries - operations and methods, Nested Dictionaries.											
Topic - 5	**FILES,MODULES,PACKAGES**										**9**
Files and exception: text files, reading and writing files format operator-Command line arguments-errors and exceptions-handling exceptions –Modules-Packages-illustrative programs-word count-copy file.											
THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**	

BOOK REFERENCES	
1	Ashok NamdevKamthane,Amit Ashok Kamthane, “Programming andProblem Solving with Python” , Mc-Graw Hill Education,2018.
2	Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second edition, Updated for Python 3, Shroff / O’Reilly Publishers,2016.
3	Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt.Ltd.,2016.
4	Timothy A. Budd,” Exploring Python”, Mc-Graw Hill Education (India) Private Ltd.,2015.
5	Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning,2012.

OTHER REFERENCES	
1	https://www.coursera.org/specializations/python
2	https://www.youtube.com/watch?v=rfscVS0vtbw
3	https://nptel.ac.in/courses/106/106/106106212/

Semester	Programme	Course Code	Course Name	L	T	P	C
		20CSO06	CLOUD COMPUTING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
Upon completion of the course, students will be able to		**RBT Level**	**Topics Covered**
CO1	Analyze and identify a specific cloud deployment model and delivery model to adopt for any given cloud application.	K4	1
CO2	List the role of data center, virtualization, web, multitenant and service technologies in providing resilient, elastic and cost-efficient computing for a given cloud system..	K4	2
CO3	Plan and identify the required cloud computing mechanisms to deploy in cloud architectures when developing a given cloud application	K3	4
CO4	Explain and evaluate the ability of cloud computing architectures to meet a set of requirements for a given business application	K2	5
CO5	Inspect suitable security mechanism to provide security for a given cloud application.	K4	3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2		2			1	3	3		3		2
CO2	2		1	2	1	1	1	1	3	3	1	3	2	
CO3		3						1	3	3	3	3	2	1
CO4	1		1	1			1	1	3	3		3	1	2
CO5	1	2			3	2	1	1	3	3	1	3		3

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**UNDERSTANDING CLOUD COMPUTING**	**9**
Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – Ondemand Provisioning.		
Topic - 2	**CLOUD ENABLING TECHNOLOGY**	**9**
Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.		
Topic - 3	**CLOUD COMPUTING MECHANISM**	**9**
Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.		
Topic - 4	**CLOUD COMPUTING ARCHITECTURE**	**9**
Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-asa-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.		
Topic - 5	**SECURITY IN THE CLOUD**	**9**
Hadoop – Map Reduce – 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.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Thomas Erl, ZaighamMahood, Ricardo Puttini, “Cloud Computing, Concept, Technology and Architecture”, Prentice Hall, 2013..
2	K.Chandrasekaran, “Essentials of Cloud Computing”, CRC Press, 2015.
3	Kai Hwang, Geoffrey C Fox, Jack J.Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers,2012
4	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing‖, Tata McGrawHill, 2013.
5	“ ArshdeepBahga, Vijay Madisetti, ―Cloud Computing: A Hands-On Approach‖, Universities Press, 2014..

OTHER REFERENCES	
1	. .https://nptel.ac.in/courses/106/105/106105223/,“Google Cloud Computing Foundation Course”, Prof. Soumya Kanti Ghosh, IIT Kharagpur.

Semester	Programme	Course Code	Course Name	L	T	P	C
		20CSO07	ARTIFICIAL INTELLIGENCE	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
Upon completion of the course, students will be able to		**RBT Level**	**Topics Covered**
CO1	Apply a suitable set of production rules or apply constraint satisfaction technique to solve a given problem in AI.	K3	1
CO2	Discover the appropriate search strategy to find an optimal solution for a given AI problem.	K4	2
CO3	Apply resolution procedure to derive conclusion from the given set of statements in knowledge representation	K3	3
CO4	Inspect Bayesian theory, Bayesian networks, Dumpster Shafer theory for probabilistic reasoning to handle uncertainty.	K4	4
CO5	Explain the ability of AI to solve problems in the areas of Natural Language Processing and Robotics.	K2	5

PRE-REQUISITE	**NIL**

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2				1	1	3	3		3	2	3
CO2	3	3		2				1	3	3		3		
CO3	3	2				2	1	1	3	3		3		
CO4	2	3		2			1	1	3	3		3		
CO5	2	2						1	3	3		3	2	2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTELLIGENT AGENTS**	**9**
Introduction- What is AI-Why AI? -Foundation of AI- History of AI- Intelligent Agents: Agents and Environments - Characteristics–Structure of Agents. Problem formulation-Production systems-Problem characteristics-Production system characteristics- Constraints Satisfaction Problems.		
Topic - 2	**PROBLEM SOLVING METHODS**	**9**
Search Strategies- Uninformed Search strategies :BFS-Uniform-cost search-DFS-Iterative Deepening DFS Bidirectional Search. Informed Search strategies: Greedy BFS-A* search– Local Search Algorithms and Optimization Problems.		
Topic - 3	**KNOWLEDGE REPRESENTATION**	**9**
Knowledge Representation -Using Predicate logic :Representing simple facts-Representing instance and ISA re relationships-Computable functions and predicates- Resolution – Forward chaining -Backward chaining.		
Topic - 4	**UNCERTAINITY AND PROBABLISTIC REASONING**	**9**
Uncertainty: Acting under Uncertainty-Inference using Full Joint Distributions -Bayes' rule. Probabilistic Reasoning: Semantics of Bayesian networks-Exact Inference- Dempster- Shafer theory-Fuzzy set and fuzzy logic		
Topic - 5	**AI APPLICATIONS**	**9**
Natural Language Processing: Information Retrieval- Information Extraction–Speech Recognition .Robotics : Hardware – Perception – Planning – Moving.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Stuart Russel and Peter Norvig "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education.
2	Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", 3 rd Edition, McGraw Hill-2008
3	Deepak Khemani ,"A First Course in Artificial Intelligence", Tata Mc Graw Hill Education 2013.
4	Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press, 2009.
5	" M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008.

OTHER REFERENCES	
1	http://nptel.ac.in/courses/106106126/1,"Introduction, State space search, Heuristic search, problem decomposition, Planning, Constraint satisfaction", Prof. Deepak Khemani, Department of Computer Science and Engineering, IIT, Madras.

Semester	Programme	Course Code	Course Name	L	T	P	C
		20IT6T1	BIG DATA AND ANALYTICS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
Upon completion of the course, students will be able to		**RBT Level**	**Topics Covered**
CO1	Identify the type of data based on the characteristics of datasets, compare trivial data with big data and explain the lifecycle of data analytics for real world applications.	K2	1
CO2	Discover the storage and processing techniques for big data and apply them for a given scenario using Hadoop..	K4	2
CO3	Analyze big data using quantitative, qualitative and machine learning approaches and implement regression, clustering and classification algorithm for a given big data application.	K4	3
CO4	Build data models and computing models used for data analytics and apply predictive modeling for processing unstructured data.	K3	4
CO5	Develop analytical models for financial services, banking and recommender systems using marketing analysis, sentiment analysis and predictive analysis	K3	5

PRE-REQUISITE	**NIL**

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	**Programme Learning Outcomes (POs)**												**PSOs**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2						1	3	3		3		
CO2	3	2						1	3	3		3		
CO3	3	3	3		2			1	3	3		3	2	2
CO4	3	2			1			1	3	3		3		
CO5	3	2	3		2			1	3	3		3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**FUNDAMENTALS OF BIG DATA**	**9**
Understanding Big Data: Concepts and Terminology, Big Data Characteristics, Different Types of Data – Big Data Analytics Lifecycle - Enterprise Technologies and Big Data Business Intelligence. Case Study: Identifying data characteristics and types of data.		
Topic - 2	**STORING AND PROCESSING BIG DATA**	**9**
Big Data Storage Concepts: Clusters, File Systems and Distributed File Systems, NoSQL, Sharding, Replication, CAP Theorem, ACID, BASE - Big Data Processing Concepts: Parallel Data Processing, Distributed Data Processing, Hadoop, Processing Workloads, Cluster, Processing in Batch Mode, Processing in Realtime Mode - Big Data Storage Technology: On-Disk Storage Devices, In-Memory Storage Devices..		
Topic - 3	**BIG DATA ANALYSIS**	**9**
Quantitative Analysis – Qualitative Analysis – Data Mining – Statistical Analysis – Machine Learning – Semantic Analysis – Visual Analysis – Case Study : Correlation – Regression – Time Series Plot – Clustering – Classification.		
Topic - 4	**ANALYTICS MODELS – PREDICTIVE MODELING**	**9**
Introduction – Data Models – Computing Models. Predictive Modeling for Unstructured Data: Introduction – Applications of Predictive Modeling – Featured Engineering – Pattern Mining.		
Topic - 5	**APPLICATIONS FOR BIG DATA ANALYTICS**	**9**
Big Data Analytics for Financial Services and Banking: Introduction – Customer insights and marketing analysis – Sentiment Analysis – Predictive Analytics – Model Building – Fraud detection and Risk Management – Integration of Big Data Analytics into operations. Big Data Analytics and Recommender Systems: Introduction – Background – Overview – Evaluations of Recommenders – Issues..		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	C.S.R. Prabhu, Aneesh SreevallabhChivukula, Aditya Mogadala, Rohit Ghosh, L.M. Jenila, “Big Data Analytics: Systems, Algorithms, Applications”, First edition, Springer, 2019.
2	Paul Buhler, Wajid Khattak, Thomas Erl, “Big Data Fundamentals: Concepts, Drivers & Techniques”, Second Edition, Prentice Hall, 2016.
3	Anil Maheshwari, “Data Analytics” , First Edition, Tata Mcgraw Hill, 2017.
4	Venkat Ankam, “Big Data Analytics”, First Edition, Packt Publishing Limited, 2016.
5	Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, First Edition, Wiley, 2015.

OTHER REFERENCES	
1	https://onlinecourses.nptel.ac.in/noc16_mg06, “Introduction to Data Analytics”, Dr. Nandan Sudarsanam, Dr. Balaraman Ravindran, IIT- Madras
2	https://nptel.ac.in/courses/106104135/48, “Big Data”, Prof.ArnabBhattaacharya, IIT-Kanpur.
3	https://lecturenotes.in/subject/884/big-data-analysis-bda/note
4	https://www.youtube.com/watch?v=pkPdhznqEI4

Semester	Programme	Course Code	Course Name	L	T	P	C
		20CSO09	INTERNET OF THINGS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	To acquire specific scripting knowledge to develop interactive applications	K2	1
CO2	To understand basis of android application development	K3	2
CO3	To apply the programming skills in developing application in Agricore	K5	3
CO4	To apply the programming skills in developing application to enable smart cities.	K3	4
CO5	To apply the programming skills in developing application in Healthcare	K4	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	-	-	-	2	2	3	3	2	3	-	-
CO2	1	2	3	2	2	-	2	2	3	3	-	3	-	2
CO3	3	2	2	-	-	-	2	2	3	3	2	3	-	2
CO4	1	3	2	2	-	-	2	2	3	3	-	3	2	-
CO5	3	2	-	-	-	-	2	2	3	3	3	3	-	2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar & Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**FUNDAMENTALS OF IOT**	**9**
Introduction , Definitions &Characteristics of IOT, IOT Architectures , Physical & Logical Design of IOT ,Enabling Technologies in IOT , History of IOT, About things in IOT, The identifiers in IOT, About the Internet in IOT , IOT frameworks, IOT and M2M		
Topic - 2	**INDUSTRIAL INTERNET APPLICATIONS**	**9**
Industrial internet application:- IOT Fundamentals and components , industrial Manufacturing , monitoring , control , optimization and autonomy , introduction to Hadoop and big data analytics.		
Topic - 3	**APPLICATIONS IN AGRICULTURE**	**9**
Applications in agriculture:- Smart Farming : Weather monitoring , Precision farming , Smart Greenhouse , Drones for pesticides.		
Topic - 4	**APPLICATIONS IN IOT**	**9**
Introduction :- Applications in iot enabled smart cities :- Energy consumption , smart energy meters, Home automation , smart grid and solar grid energy harvesting , intelligent parking data lake services scenarios.		
Topic - 5	**HEALTH CARE APPLICATIONS**	**9**
Introduction: Architecture of iot for health care, Multiple views coalescence, SBC –ADL to construct the system architecture. Use Cases Wearable devices for remote monitoring of Physiological, ECG, EEG, Diabetes and Blood pressure.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Muthusubramanian R, Salivahanan S and Muraleedaharan K A . : ”Basic Electrical , Electronics and Computer Engineering “,Tata Mcgraw Hill,second Edition.(2006
2	Olivier Hersent , David Boswarthick, Omar Elloumi , “ The Internet of Things : Key applications and protocols “ Willey Publications 2nd edition,2013.
3	Marco Schwartz – Internet od Things with the Arduino Yun,Packt Publishing ,2014
4	Adrian McEwen,Hakim cassimally, ”Designing the Internet of Things “,Willey Publications 2012.

OTHER REFERENCES	
1	https://en.wikipedia.org/wiki/Internet_of_things
2	https://builtin.com/internet-things
3	https://youtu.be/LlhmzVL5bm8
4	https://youtu.be/6mBO2vqLv38?t=3